Exhibit 25

Appendix Three

Hazardous Substance Report

Mighty River Power
Southdown Power Station Expansion
Addition of One Gas Turbine Generator

Consent Issues for Stormwater, Site Contamination, Hazardous Substances and Plant Foundations

Mighty River Power
Southdown Power Station Expansion :
Addition of One Gas Turbine Generator

Consent Issues for Stormwater, Site Contamination Hazardous Substances and Plant Foundations

Prepared By:
John Crawford

Roger Williams

Graeme Proffit
Reviewed By:

Opus International Consultants Limited
Hamilton Office
Opus House, Princes Street
Private Bag 3057
Hamilton, New Zealand

Telephone: +64 7 838 9344
Facsimile: +64 7 838 9324

Date: 18 August 2003
Reference: G:\Weg\37220
Status: Draft 4

Contents

APPENDICES

Executive Summary

General

Mighty River Power proposes to expand its Southdown power station with the addition of one diesel or gas fuelled gas turbine generator. The new machine will be installed within the existing site together with two new Diesel storage tanks and ancillary buildings.

This report addresses the following issues with respect to the proposed expansion:

- Hazardous Substances Management
- Stormwater Management
- Foundation Requirements
- Contaminated Site Management

The power station site is located at the southern end of Hugo Johnston Drive, Southdown, Auckland. The original site consisted of non-engineered fill over Basaltic lava over interbedded silts and sands over Waitemata series. The site is known to have been contaminated by asbestos waste. The site has an existing, permitted activity stormwater retention and discharge system.

Foundations

The basalt lava flow is generally thick enough to provide a suitable 'raft' foundation for the proposed structures. However, there are a number of holes in the lava flow. If and where these are encountered under the proposed structures, the integrity of the 'raft' will need to be completed by filling these holes with concrete or a well-engineered fill. An engineered fill would be required from the top of the basalt to the underside of the new constructions.

A 725mm ID Watercare sewer passes under the area where the new storage tanks and associated bund would be sited. This sewer is constructed within the basalt layer. Practically, the sewer could be bridged for construction of the bund and tanks. However, agreement will be required from Watercare for such an arrangement. If this is not forthcoming, an expensive re-routing of the sewer will be required.

No major problems are envisaged in the foundations for the construction of an additional gas turbine generator on this site.

Further site investigations are required for specific design of the foundations prior to the design phase.

Site Contamination

Review of available information indicates that substantial remediation of asbestos-contaminated soil has occurred on the existing power station site. Asbestos-contaminated fill was removed down to basalt rock over much of the site, including the area of the proposed new gas turbine generator to the south of the existing plant, and the location of the new diesel tanks and motor control centre in the south east corner of the site. The excavated area was backfilled with clean fill,

some of which may have come from elsewhere on the site. Some residual asbestos contamination may exist in crevices in the surface of the basalt.

In general it is expected that any residual contamination will be small and therefore pose a low risk. Any residual contamination should not, therefore, impose any particular constraints to the foundation design of the proposed expansion. Residual risks during the construction works should be readily managed.

There is perhaps a minor risk of the "clean" fill containing minor asbestos contamination if soil was used from "clean" areas elsewhere on the site, as provided for in the specification. A small amount of investigation of the fill would be of benefit to planning the work, and may allow a lower level of risk-management during the work. Alternatively, risk management action could be tailored to what is found from soil sampling as foundation excavation approaches the basalt.

Management of the residual risk requires the writing of a project-specific management plan. A lower level of risk management than was adopted during the 1995 remediation works will be possible.

Hazardous Substances

The site stores and uses a range of hazardous substances required for day-to-day operation of the power station. An inventory is provided in Appendix 1. The proposed plant expansion will require additional volumes of these substances to be stored. This applies particularly to diesel fuel (where the stored volume will increase from 1.2m^3 to 9,424m^3), transformer oil and lubricating oil.

A Hazardous Facility Screening Procedure has been undertaken in accordance with requirements of the District Plan (Ref 7) Rule 5E.7.1. Fuel storage requirements dominate the results of a Hazardous Facility Screening Procedure undertaken for the proposed expansion. Substantial bunding and discharge management facilities will need to be put in place to manage any risk of gross discharge to the site or surrounding environment. Likewise, all operating machines and transformers are provided with their own bunded storage allowing managed separation of dripped or spilt oil and treatment of the captured water. Water from blind sumps should be discharged to trade waste. However, it is proposed that stormwater collected in the fuel bunding area will be discharged through the managed stormwater system after careful inspection for visible signs of oil contamination and after passing through oil sorbent materials.

Site specific fuel transport and unloading facilities will be required. The final configuration of these facilities will need to be determined, at detailed design in consultation with the supplying oil company.

Site management procedures, and particularly emergency / spill management procedures will need to be amended accordingly to cater for the additional volumes of oil and chemicals stored on site and the introduction of a large volume of diesel storage.

Stormwater

The Proposed Auckland Regional Plan: Air, Land and Water, lists the site activity as 'high risk', making the discharge of stormwater from the site a discretionary activity requiring a resource consent under Rules 5.5.20 and 5.5.21.

The required stormwater containment and treatment device is in place and operational. This is compliant with the requirements of ARC TP10 (Ref 8) for the existing and proposed stormwater discharge profile. The new fuel storage bunding area will intercept a large amount of direct rainfall, which will not contribute to peak run-off flows. These captured flows will need to be released under a strict inspection regime and in conjunction with management of discharges from the existing stormwater treatment pond.

Under Rule 5.5.20, a site specific Environmental Management Plan is required. This is appended to this report in draft form.

Abbreviations

ACC	Auckland City Council
AEE	Assessment of Environmental Effects
ARC	Auckland regional Council
ARI	Average Recurrence Interval
EMS	Environmental Management Services Limited
ERMA	Environmental Risk management Authority
GT	Gas Turbine Generator
HASNO	Hazardous Substances and New Organisms
HFSP	Hazardous Facility Screening Procedure
ID	Internal Diameter
Opus	Opus International Consultants Ltd
PDP	Pattle Delamore Partners Limited
RMA	Resource Management Act
ST	Steam turbine
T&T	Tonkin and Taylor Limited
WQV	Water Quality Volume

1 Introduction

1.1 Background

Mighty River Power owns and operates a combined cycle, cogeneration power station at Hugo Johnston Drive, Southdown in Auckland. The existing facilities were commissioned in 1996. The generation facility consists of two natural gas fired gas turbine generator sets. The stacks incorporate boilers that feed an additional steam turbine / generator set. Some steam is exported off the site to industry in the area. Ancilliary features include:

- Switch yard facilities and transformers;
- Water cooling system (Cooling Towers);
- Water treatment plant;
- Control and administration building;
- Stormwater drainage and containment system.

1.2 This Project

Mighty River Power (MRP) proposes to expand the facility with the addition of one gas turbine generator that may be fuelled on either diesel or gas. The new machine will be installed within the existing site together with two new diesel storage tanks and ancillary buildings.

Opus International Consultants Ltd (Opus), together with Pattle Delamore Partners Ltd (PDP) have been commissioned to review the following issues with respect to the proposed expansion:

- Hazardous Substances Management
- Stormwater Management
- Foundation Requirements
- Contaminated Site Management

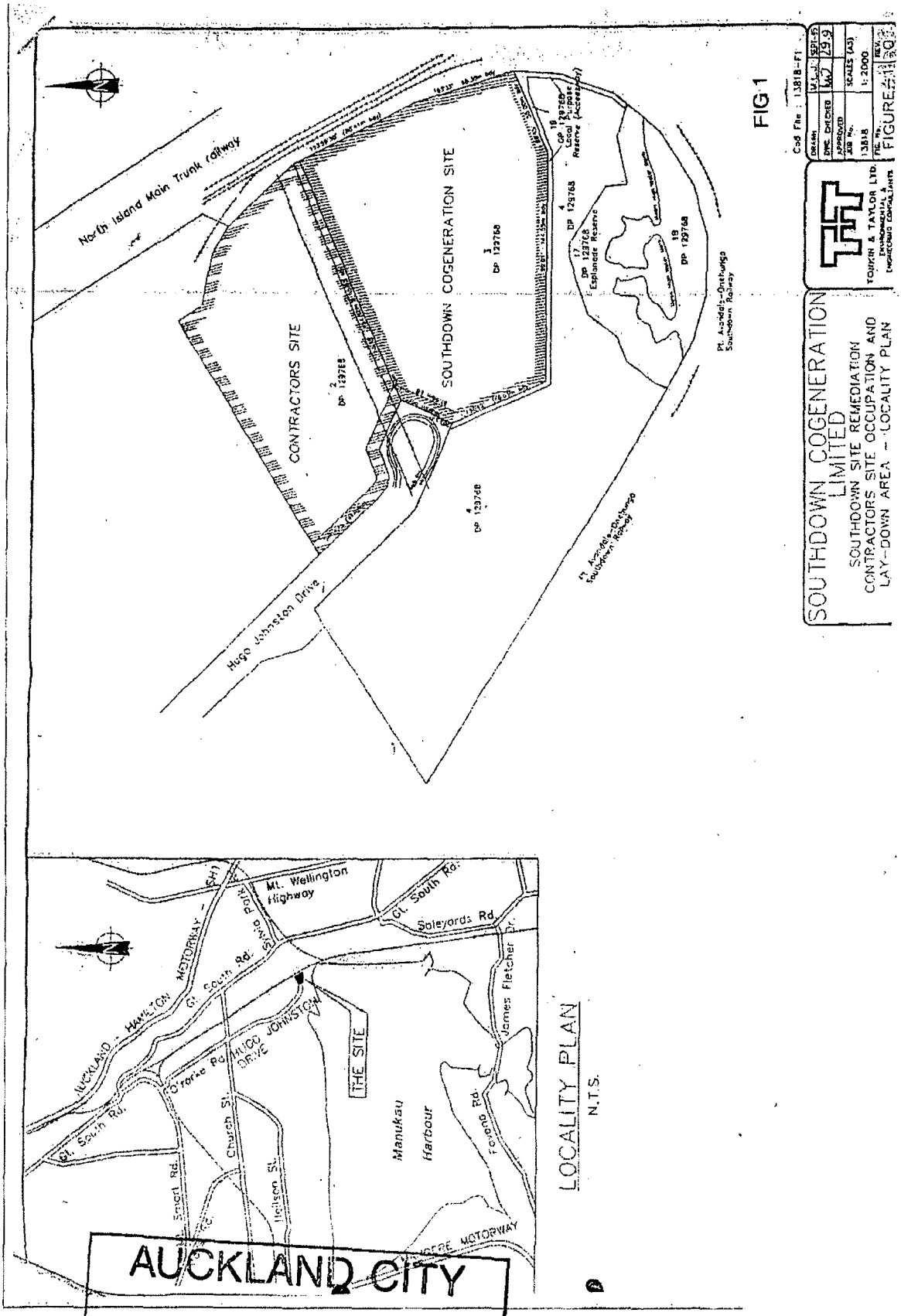


FIG 1

LOCALITY PLAN
N.T.S.

OPUS

2 Planning Background

2.1 General

The management of hazardous substances is predominantly governed by the Hazardous Substances and New Organisms Act 1996 (HSNO) and the Resource Management Act 1991 (RMA) and their respective regulations. (Ref 20).

2.2 Hazardous Substances and New Organisms Act 1996

The HSNO Act establishes a comprehensive assessment and approval process for manufactured and imported substances to ensure that any substances deemed to be hazardous (as defined by the HSNO Regulations) are subjected to an integrated, consistent and performance based control system for all stages of their life cycle. Minimum performance requirements covering containment, packaging, identification/labelling, tracking, competency of handling, emergency preparedness and disposal. Most of these requirements are stipulated in the Material Safety Data Sheets supplied with the substances when supply to a site is initiated. Generally, the approvals required by the HSNO Act are not site specific but for the introduction of the substance to New Zealand or for its 'release' for use in New Zealand.

HSNO regulations, under the HSNO Act require that by the year 2006, all hazardous chemical handling operations will be required to be undertaken by a certified Chemical Handler. All organizations using such chemicals will be required to maintain such a certified person on standby 24 hours per day, 7 days per week to undertake any necessary 'after hours' chemical handling. Mighty River Power Southdown site will have to meet this requirement and have operators trained appropriately.

2.3 Resource Management Act 1991

It is the RMA that addresses those aspects of hazardous substances management associated with a particular location or use. Generally this function is undertaken at local government level with territorial or regional councils making specific provisions for the control of hazardous facilities in their areas of jurisdiction. In this case, it is the Proposed Auckland Regional Plan: Air, Land and Water (Ref 19) that provides a mechanism (via schedule 3) for distinguishing between facilities deemed to be of low risk and those of higher risk requiring resource consents and more specific control mechanisms.

Under the RMA, specific designs are required for the following to meet minimum performance standards:

- *Site Design*
- *Site Layout*
- *Storage Facilities*
- *Site Drainage Systems*
- *Spill Containment systems*

- *Washdown facilities*
- *Underground Storage Tanks*
- *Signage*
- *Waste Management*

2.4 Proposed Auckland Regional Plan: Air, Land and Water, October 2001.

With respect to 'Part 3 Section 5 Discharges to Land or Water' (Ref 19), the proposed activity is listed as 'high risk' in schedule 3 being Petrochemical power generation on a site greater than 5,000m^2. Therefore, the activity is classified as discretionary under rule 5.5.20 and as such, requires the preparation of a site specific Environmental Management Plan (Refer to section 7.5).

Under rule 5.5.21(a), a stormwater discharge consent is required as the new activities on the site will have commenced since the date of notification of the Regional Plan.

No stormwater discharge permit is currently held for this site. The discharge as configured is a permitted activity.

2.5 City of Auckland - District Plan - Isthmus Section - Operative 1999

The site lies within Auckland City and is covered by the City of Auckland District Plan Isthmus Section which was made operative in 1999. It should be noted also that the site is only 1.2 kilometres from the nearest boundary with Manukau City.

Issues covered by this report that relate to plan requirements include:

- Underground services and pipelines
- Storage and use of hazardous chemicals
- Use of a contaminated site.

The site is located in the Business 6 Zone of the operative District Plan. This zone is specifically structured to provide for and protect land in the zone for the operation of "noxious and unpleasant" industrial activities.

The plan recognises that traditionally heavy and noxious industry has located adjacent to harbours and estuaries and that this has had an effect on the local marine environment. However the relocation of such industry is recognised as not being practical and the Southdown industrial area is *"considered to be of regional significance"*. It is regarded as one of the few areas where noxious industry can be located with adequate water and trade waste capacity, and with limited disruption to the surrounding community.

The plan also recognises the reverse sensitivity issues and seeks to avoid activities in this area that are likely to attract members of the public to the area as well as residential activities.

The site is located adjacent to the coastal margin of the Manukau Harbour. To the south of the site the coastal margin is zoned Open Space Activity Zone while the railways which border one side of the site and are close to other site boundaries are zoned Special Purpose Activity land and a Designated Work. Of significance is that along the southwestern boundary of the site from Hugo Johnston Drive is a narrow strip of Open Space zoned land

that is related to the existing walkway. The existing stormwater pond is adjacent to this area.

'District Plan Part 5E - Hazardous Facilities' is of particular relevance to this report. Part 5E requires a Hazardous Facility Screening Procedure to be carried out to determine the 'Effects Ratios' for hazardous substances stored and/or used on the site. This will determine if the proposed activity is permitted or if it requires a resource consent. For the 'Business 6' zone, an Effects Ratio of less than 1 means it is a Permitted Activity, 1 -2 means it is a Controlled Activity and greater than 2 means it is a discretionary activity.

2.6 Auckland Regional Coastal Plan

The Auckland Regional Coastal Plan includes consideration of discharges of contaminants into the coastal marine area. The existing stormwater treatment system discharges treated stormwater to Ann's Creek and the Mangere Inlet.

Ann's Creek is identified as Coastal Protection Area 1 in the Coastal Plan whereas the Managere Inlet forms part of the Manukau Harbour, which is identified as an Area of Significant Conservation Value.

Rule 20.5.3 permits discharges into the coastal marine area subject to the following conditions:

(a) The discharge does not contain contaminants that will cause more than minor adverse effects on the receiving waters and the marine environment; and;

(b) The discharge does not contain human sewage or hazardous substances as defined by the Hazardous Substances and New Organisms Act 1996, and any regulations made under section 75 of that Act; and

(c) The discharge will not, after reasonable mixing give rise to any or all of he following effects:

- *a. The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or*
- *b. Any conspicuous change in the colour or visual clarity of water in the coastal marine area; or*
- *c. Any emission of objectionable odour; or*
- *d. Any significant adverse effects on aquatic life, and*

(d) The discharge does not change the natural temperature of the receiving water, after reasonable mixing by more than 3 degrees Celsius; and

(e) The discharge does not involve the disturbance of foreshore and seabed that cannot be remedied by natural processes within 48 hours of the disturbance occurring in any Coastal Protection Area 1, and 7 days in other parts of the coastal marine area; and

(f) That public access to and along the coast is not restricted by the volume or movement of the discharge; and

(g) The discharge does not modify, damage or destroy any site, building, place or area scheduled for preservation or protection in Cultural Schedules 1 and 2.

Non compliance with these conditions requires a resource consent for a non complying activity. It is expected that the stormwater treatment system is capable of meeting these conditions and therefore that a consent for stormwater discharge under the coastal plan is not likely to be required.

3 Existing Site Subsurface Geological Conditions

3.1 Background Reports

The power station is located at the southern end of Hugo Johnston Drive, Southdown, Auckland. It is immediately adjacent the old Southdown freezing works and an asbestos cement pipe factory is also know to have existed in the vicinity at one time. The power station site is known to have been contaminated by asbestos waste. This could have been from the freezing works or the pipe factory or both. In development of the power station, extensive remediation works were undertaken to decontaminate the site. These works are discussed in sections 3 and 4 of this report.

Tonkin and Taylor Ltd (T&T) have undertaken most of the past geotechnical and development investigations for the site. The T&T reports available are:

- *Southdown Cogeneration Site Geotechnical Investigation Report (GIR) Revised 31 August 1995*
- *Southdown Site Remediation Verification Report, December 1995.*
- *Management Plan for Asbestos Decontamination Activities and Long Term Site Management Draft for Comment, December 1994.*

3.2 Geological Conditions

The GIR gives details of the existing site. The report gives profiles of the original surface, the surface of the basalt and the base of the basalt.

The general soil profile found on site (described from ground level down) as per the précis from R W Beck (Ref 18) review is:

1. Non-engineered fill from 0 to 7.5 metres thick but generally less than 2 metres.

2. Basaltic lava flow varying from 0 to 7.5 metres but with variable thickness and quality possessing some holes.

3. Firm to stiff weakly consolidated interbedded silts and clays containing some organic silts and clays. May be compressible.

4. Waitemata Series with good bearing capacity encountered at a depth from ground level of 16.6 metres to 19.2 metres.

The existing power station is situated in the middle of the site in contamination zones 2 and 3 (refer section 4 below). It appears that most of this area was exposed basalt and capping was carried out by skimming the surface and capping with 500mm of scoria as an engineered fill. Refer to Figure 4.

The GIR indicates a basalt flow grading down from the northeast with a higher level of RL 5.5 m, to the southwest with a lower level of RL 1.5m, and with some dimples (Fig 2). Three of these dimples form holes through the basalt, these holes are in the western quarter of the existing site (Fig 3).

3.3 Other Site Features

Other features of the existing site are.

1. A high pressure gas line that has been relocated to lie within the site along the southern and eastern boundaries.
2. A 725mm sewer that runs parallel to the eastern boundary approx 20m within the site. This sewer has an IL of -0.5m and therefore would have been excavated in a trench through approximately 5 to 6m of basalt.
3. A 375mm sewer that runs roughly parallel to the southern boundary varying from 0 to 30 m from the boundary. This sewer grades to the east and would have been excavated in a trench through approximately 1.5 to 4.0 m of basalt.

3.4 Geotechnical Implications

The basalt has flowed over a relatively level surface of interbedded silts and clays at RL 0.0 to 3.0m.

If the loading on the site is increased significantly by new construction then the interbedded silts and clays could consolidate and cause settlement.

The basalt, where present in a reasonable thickness (ie most of the site), would act as a raft and spread any surface loads, reducing the net pressure and thus any differential settlement.

The holes in the basalt mean that piling to the basalt layer would be unpredictable and that some piles could punch through. Piles that punch through the basalt could found in the Waitemata Series RL -10.0 to -13.0 m. Differential settlement could occur between piles founded at the different levels because of the compressibility of the interbedded silts and clays.

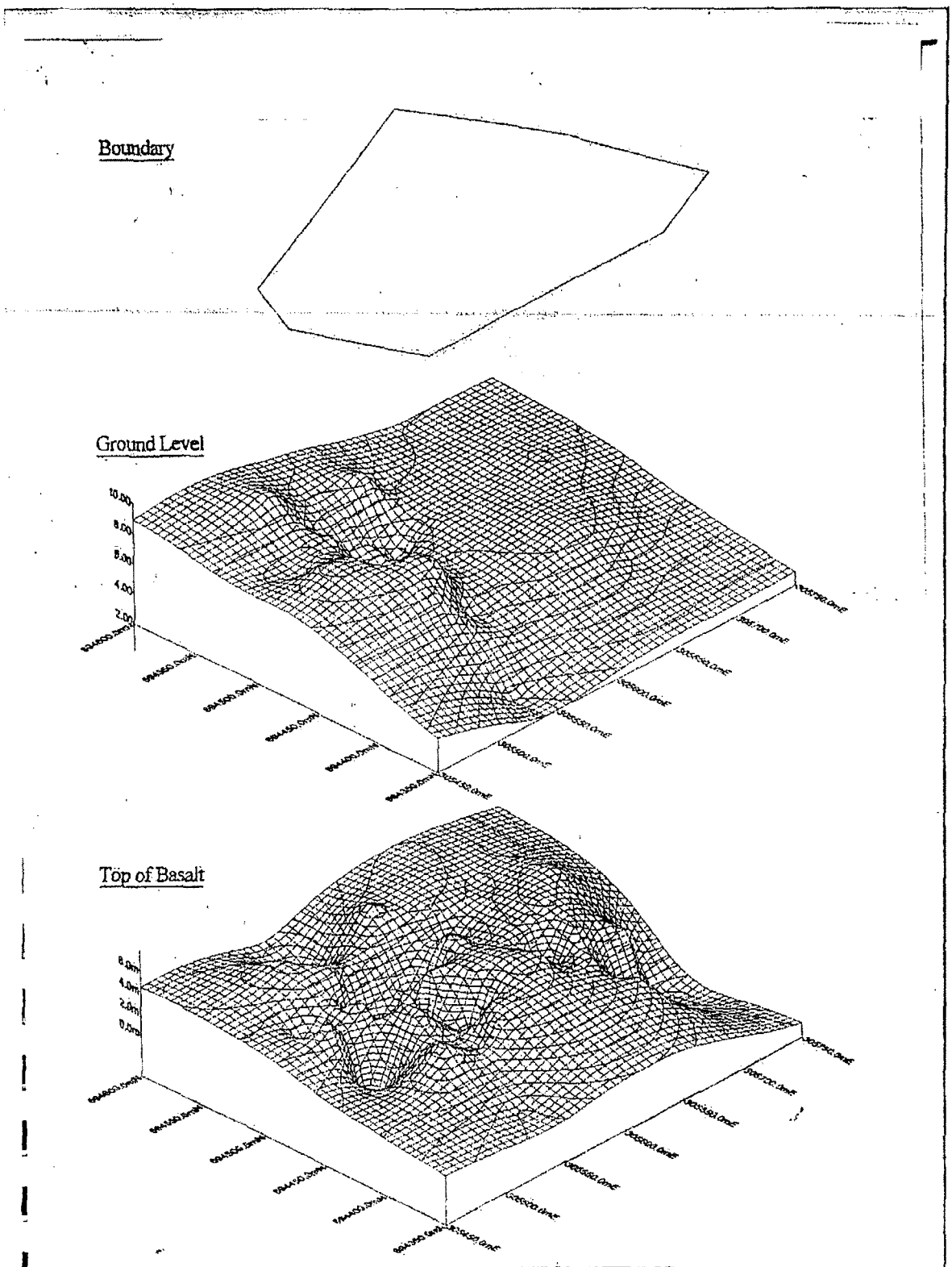
The sewers constructed across the site cut through the basalt.

The actual thickness of the soils on the top of the basalt varies from 0.5 to 1.5 metres over the majority of the site thus it is recommended that foundations are either founded directly on the basalt or on engineered fill on top of the basalt rather than piling.

In the dimples in the basalt and where the basalt has been removed to form sewers the foundation options are:

1. Fill with engineered fill.
2. Restore the integrity of the basalt by filling with a fairly thick layer of concrete.

The solution will depend on the individual structures to be constructed on the site.



DELTA CATALYTIC ENGINEERING

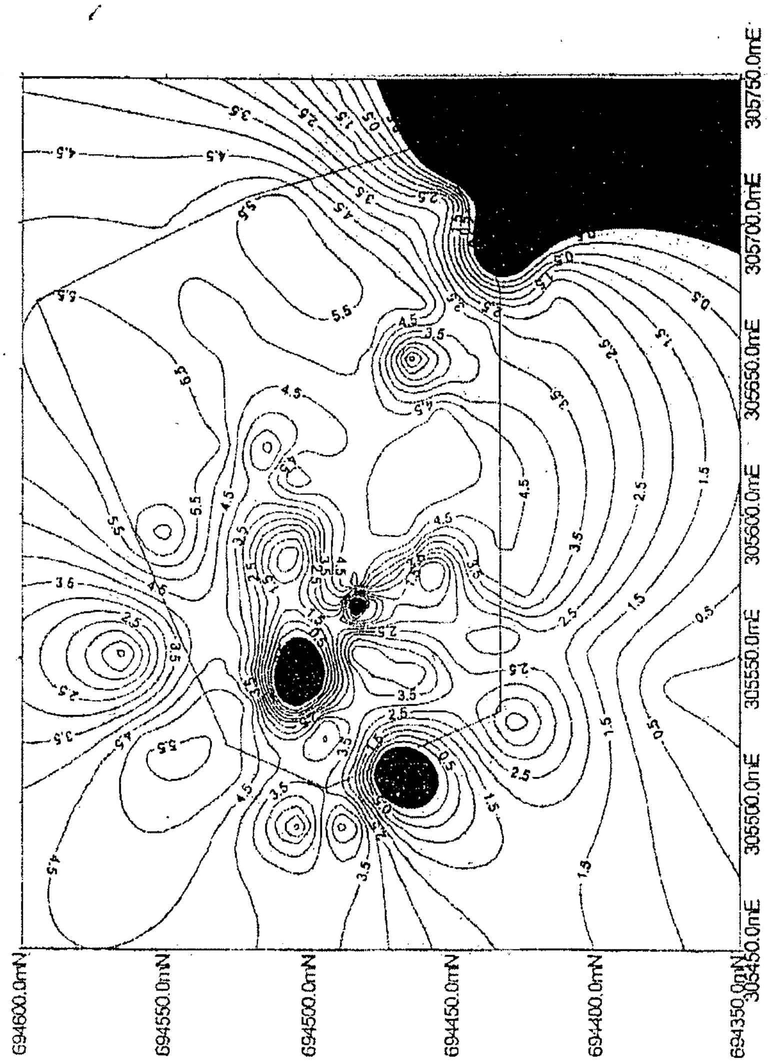
SOUTHDOWN GENERATION SITE

Figure 7: 3D Surface Plots of Ground Level and Top of Basalt

FIG 2

OPUS

FIG 3



Shaded are areas of no basalt (Approximate only).

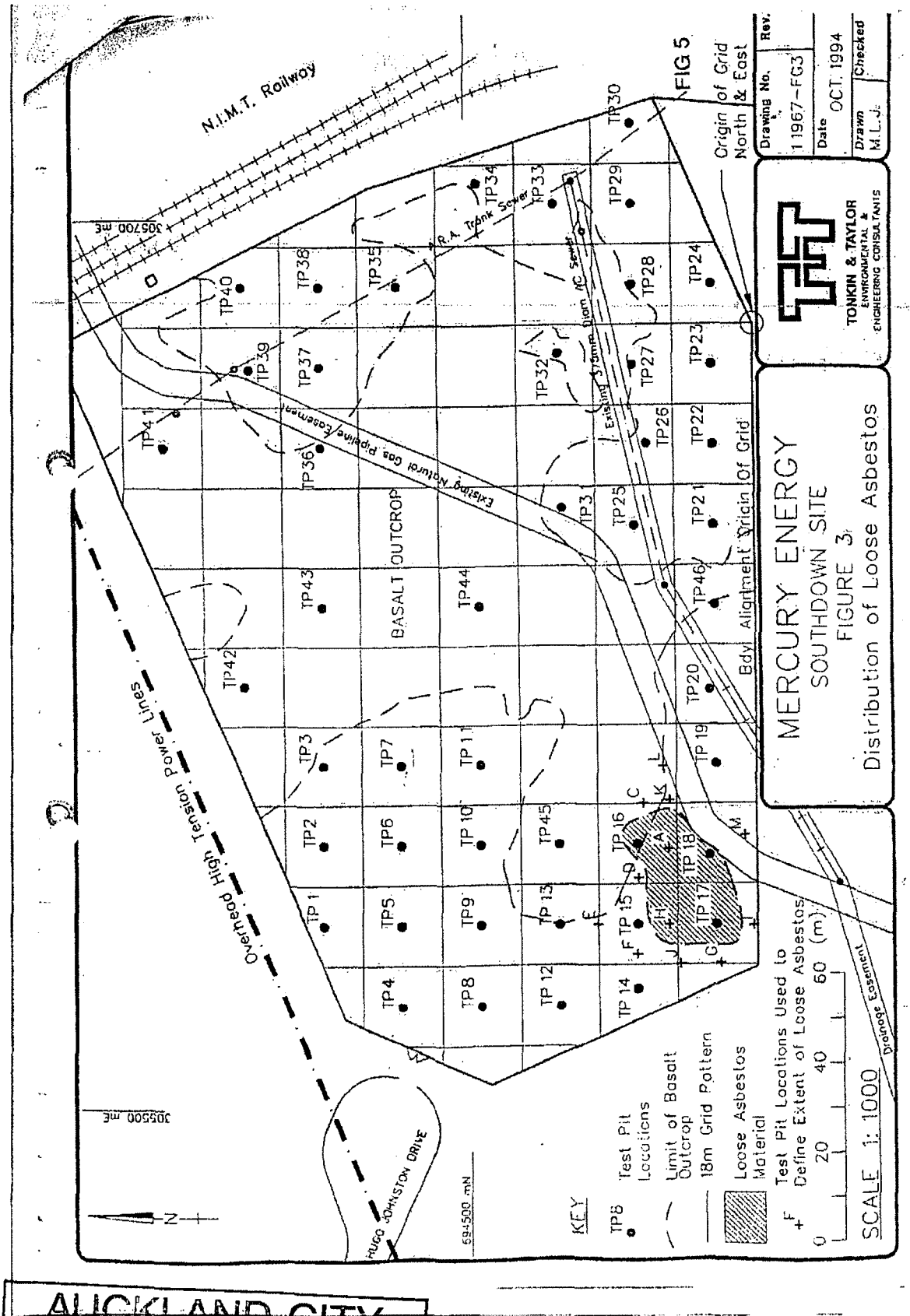
DELTA CATALYTIC ENGINEERING

SOUTHDOWN GENERATION SITE

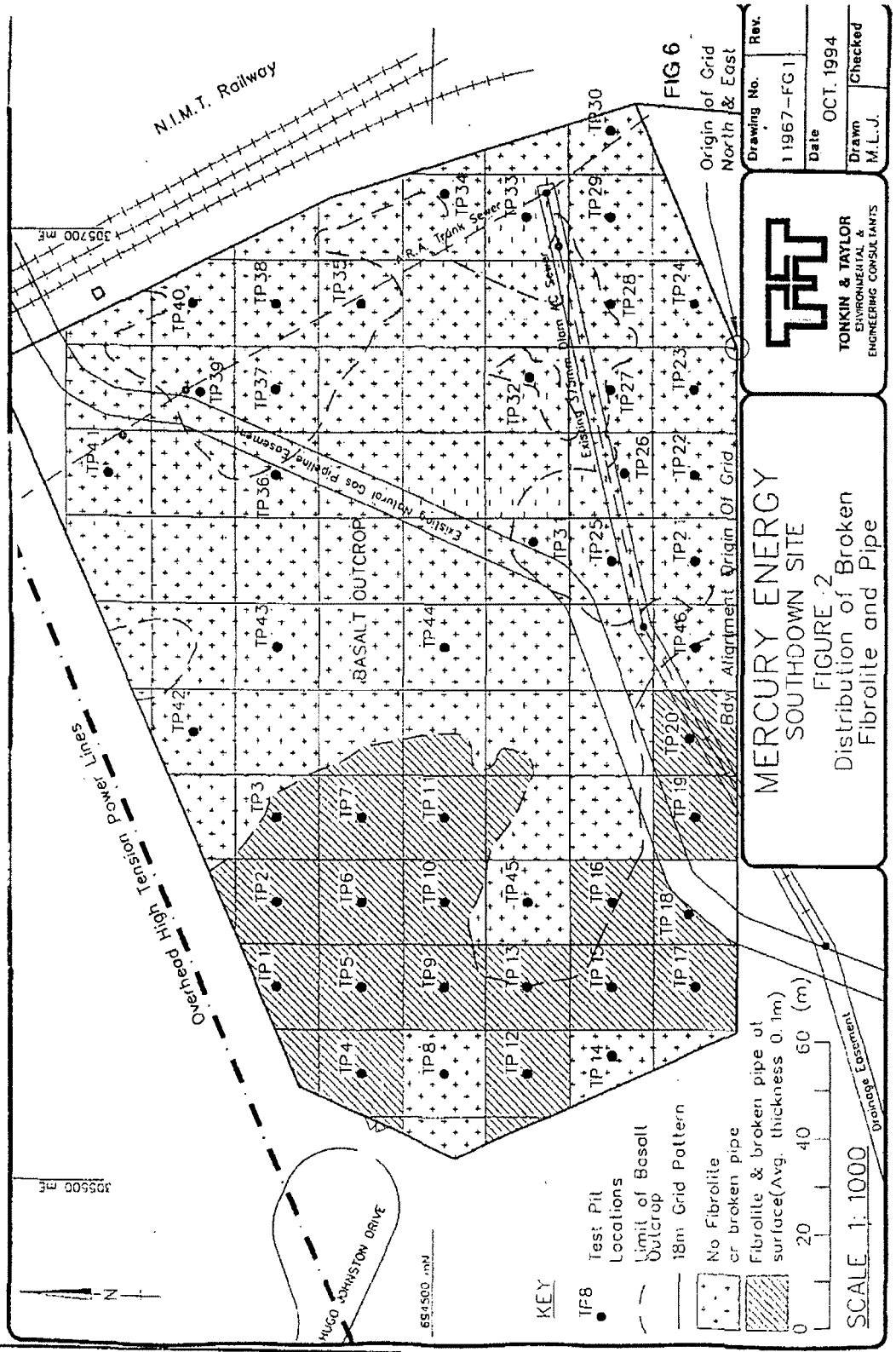
Figure 7a: Contour Plot of Top of Basalt

Insert Fig 4 Here

OPUS



OPUS



OPUS

4 Existing Site – Contamination Conditions

4.1 Introduction

This section of the report reviews the likely ground conditions with respect to asbestos contamination at the locations of proposed extension works at Mighty River Power's Southdown power station. The objective is to assess whether there are likely to be major constraints to the design of the proposed extension to the power station from any contamination, and to assess the likely risks from asbestos exposed during construction. This review is restricted to two areas. These are the location of a proposed gas turbine generator to be installed to the south of the existing gas turbine generators and the proposed locations of bunded diesel tanks and a control building, in the south east corner of the site, east of the existing plant and south of the switchyard.

(Note: This section of the report, together with sections 7.3 and 8.2 were drawn from a letter form report from Graeme Proffitt of Pattle Delamore Partners to Noel Kortright of Environmental Management Services Limited. The letter is included, in full, as Appendix 5 to this report.)

4.2 Sources of Information

This review principally draws on a number of documents prepared by Tonkin and Taylor Ltd. (T&T). These are listed below and later referred to in the text:

Mercury Energy Southdown Development Site Contamination Assessment Report (Draft), Reference 11967, November 1994

Mercury Energy Limited, Assessment of Environmental Effects Relating to Decontamination Activities and Associated Earthworks. Reference 11967, December 1994

Mercury Energy Limited, Management Plan for Asbestos Decontamination Activities and Long Term Site Management (Draft for Comment). Reference 11967, December 1994

Southdown Cogeneration Station Site Remediation – Specification. June 1995 (The earthworks drawings referred to in the specification have not been sighted.)

Delta Catalytic Engineering and Construction Ltd, Southdown Cogeneration Site, Geotechnical Investigation Report, Reference 13188, 31 August 1995

Southdown Cogeneration Limited, Southdown Site Remediation Verification Report, Reference 13934, December 1995.

Vector Limited, Long Term Site Management Plan 164 – 220 Hugo Johnson Drive, Reference 17047, March 1999

In addition, a number of letters, faxes and drawings were reviewed, as supplied by EMS in a letter of 5 July 2003. Documents also included a number of communications between T&T staff and clients or related parties giving details of the remediation works.

4.3 Contamination of the Existing Site

The existing power station plant and ancillary facilities were constructed on Lot 3 DP 129768. Geotechnical investigations carried out in 1988 (as reported in the 1995 geotechnical report) revealed the presence of asbestos and other contamination in the fill overlying the basalt lava flow. T&T carried out a further test pit assessment of asbestos contamination in late 1994 (see list of source documents above). By this stage the site had been levelled and some fill and asbestos material had been removed from the site, apparently some time after the 1988 geotechnical investigations. No documentation has been seen regarding this work, presumably carried out for the then Auckland Electric Power Board.

The 1995 geotechnical report mentioned as part of the background information the dumping of machine oil and other wastes on the land. Subsequent reports (and in particular T&T's contamination assessment report and remediation specification) did not mention hydrocarbon contamination and no measures were taken to manage or remediate hydrocarbon contamination during subsequent works. It is presumed that such contamination was not significant and therefore does not require further consideration.

The November 1994 contamination assessment identified four asbestos contamination zones as a result of the investigations. Drawing 11967-F4 in the investigation report, reproduced as drawing 11967-F2 in the Assessment of Environmental Effects (AEE) for the remediation works, shows the boundaries of the contamination zones. The boundaries of the zones were subsequently modified for unknown reasons prior to the remediation, as shown in the remediation verification report. The zones were defined as (quoted in italics from the verification report with comments in plain text added):

Zone 1: No fibrolite (a brand of asbestos-cement) *or asbestos detected.*

Zone 2 :In general no fibrolite or pipe materials (presumably asbestos-cement pipe) *were found and only chrysotile* (white) *asbestos detected.* (Note that chrysotile asbestos is recognised as being a lower hazard than amosite asbestos by having a work place exposure standard ten times higher than that for amosite.)

Zone 3:An area where fibrolite and pipe materials were found and a mixture of chrysotile and amosite (brown) *asbestos was detected within these materials and the underlying soil.*

Zone 4: A pocket of asbestos was found at high concentrations (a "hotspot")

These remediation zones have been marked on PDP Figure 1 (Appendix 5). This shows the footprint of the existing power station in outline. It is apparent that the existing plant is predominantly in Zones 2 and 3, and the switchyard (not shown but located in the north east corner) is predominantly in Zone 1. The proposed locations of the new gas turbine generator and diesel tanks are shown in Figure 1.

A combination of information from the remediation validation report and other remediation information indicates the location of the proposed new plant has been remediated down to rock.

The remediation verification report reported remediation in the various zones to be:

Zones 1, 2 and 3 – removal of a minimum 100mm of surface material and isolated pockets of asbestos contaminated material, then placement of a minimum of 500mm of clean fill. In Zone 3 this work was undertaken outside the building footprint.

Zone 3 – within the building footprint, all asbestos contaminated material was removed down to rock "where directly overlain by heavily contaminated material".

Zone 4 – all asbestos contaminated material was removed down to rock, the rock cleaned and the area backfilled with clean material.

This suggests that only the area under the footprint of the plant was remediated, with the location of the proposed new gas turbine generator apparently falling outside the remediated area. However, information contained in two faxes reporting the site remediation show that, in reality, fill in Zones 2 and 3 was completely removed down to basalt rock within the building footprint, and removed down to basalt rock for extensive areas outside the building footprint. This is shown by drawing 13299-15 attached to a fax from T&T's Mike Judd to TransAlta, dated 25 September 1995, and a further drawing of the contours of the basalt exposed during remediation attached to a fax from Mike Judd to Delta Catalytic dated 26 September 1995. PDP Figure 1 (appendix 5), (a composite of the drawings conveyed in the second fax) shows the exposed basalt contours. It is apparent that, during the remediation, the basalt was exposed over the complete area where the proposed new machine is to be located and also over a considerable part of the south eastern corner of the site, where the diesel tanks and building are proposed.

It should be noted, however, that removal of fill in these areas does not guarantee absolute freedom from asbestos contamination. The verification report notes (p3):

"However, it should be stressed that the main aims of the remedial works were to remove the bulk of the asbestos contaminated material and cap residual contamination. As a consequence, some asbestos contamination is likely to remain on site in the form of isolated pockets of asbestos waste or asbestos fibres bound into natural soil material."

A handover letter from Richard Bane, Project Manager Southdown Cogeneration Project to Delta Catalytic of 20 Sept 1995 states that the site 'has now been fully remediated'. However, our interpretation of the available information is that the contamination treatment could not rule out traces of asbestos (refer section 4 below) in Zones 2 and 3 below the capping layer but that the treatment was deemed complete for normal construction procedures. Normal excavation is recommended but it would seem prudent to put into place a monitoring procedure during the excavation so that, should any contamination be encountered, appropriate excavation and dumping procedures be immediately enacted.

The contours of the exposed basalt show a depression within the area of the proposed new gas turbine generator, extending under the existing plant. This depression would have been backfilled and then the ground re-contoured as shown on drawing 13299-15 (attached as PDP Figure 2 (appendix 5)). The remediation specification allows surplus "clean" material from cut operations to be used for backfilling and re-contouring, with clean capping fill over the top. However, it is not clear how surplus material was determined to be clean (other than from the original contamination investigation), so it is possible that any backfill material recycled from elsewhere on the site may have asbestos material within it, although presumably at low concentrations.

5 Site Drainage Systems

5.1 Introduction

Several liquid run-off / wastewater streams are generated on the site. Site drainage is controlled via one of a number mechanisms as shown in the following table:

Run-Off Stream	Managed by:
Clean stormwater	Reticulated system and retention pond
Potentially oily (or dirty) stormwater	Bunded areas with manual valving or pump-out facility
Operational wastewater	Discharge to Watercare sewer
Sanitary wastewater	Discharge to Watercare sewer

Generally, separation of flows at source is employed on the site. This is an effective and appropriate management technique. System components appeared generally to be maintained in good condition. There is currently no re-use of run-off / wastewater streams generated on site.

5.2 Clean Stormwater

5.2.1 Definition

Stormwater run-off from buildings, paved areas and overland flow from grassed areas can be referred to as 'clean stormwater'.

5.2.2 Operation

Operation of site clean stormwater drainage system is partially documented in several documents sited as part of this investigation. These are as follows:

Document	Drainage Issues Covered
Generation Operations Procedure SD PP 3.003 Rev.1	Inspections and sampling of the stormwater silt retention pond
Stormwater and Sludge Management Plan 164-220 Hugo	• Erosion protection of open drains • Annual drain inspections

Johnson Drive: Tonkin & Taylor March 1999.	• Procedures in the event of asbestos contaminated soil being exposed

An obvious omission from the documentation appears to be the criteria and instructions for releasing the stormwater.

5.2.3 Stormwater Retention Pond

Runoff is collected in a piped system and bitumen lined swale drains and reticulated to a stormwater retention pond. The pond allows all stormwater to be monitored for contamination and allows particulate matter to settle out as a sludge on the bottom. The pond has been constructed on the western boundary of the site in what was the Zone 4 asbestos contaminated area (Fig 4). The pond is constructed in 2 cells with reticulated stormwater discharging into the upstream cell for pre-settlement before overflowing a low weir to the main, downstream cell. The cells are concrete lined. It is understood that the lining was installed after some minor asbestos traces were found in the early years of operation. The concreted storage area is approximately 550m^2. The downstream end of the pond terminates in a cut-off dam approximately 1.3m high. Of this, approximately 1m is live storage. The outlet from the dam is a valved, 100mm diameter uPVC pipe terminating in a fixed level, upstream decant pipe.

Photo 1: Stormwater Treatment Pond

The treatment functions of the pond are the settlement of particulate matter and the facility for oil absorption from the surface using a floating boom. As all inflows are contained until manually released.

The retention pond is emptied by manually operating the valve and releasing flow to a gravity concrete pipe system that runs down to the nearby estuary. There is currently no facility for diversion of the settled stormwater into the site cooling water system.

The stormwater retention pond is in the bottom of a depression of 3 to 4 metre depth. Significant additional live storage volume could be obtained by raising the level of the downstream detention dam.

5.2.4 Contaminant Detection and Treatment

The documents referenced in section 5.2.2 above provide instructions for monitoring for asbestos contamination and what to do if it is encountered.

Oil contamination is assessed visually and an oil boom is available in the retention pond for absorbing any traces that come through to the pond. Any gross spills can be sucked off the pond without allowing any discharge out of the site.

5.3 Oily Water

The main potential sources of oily water are the gas turbine generators and the switch yard transformers.

The gas turbine generator housings are open to the elements. Each is sited on its own bund that drains rainwater and any oil drips / spills to a blind sump (Refer Section 6.3.1).

The transformers (Refer Section 6.3.3) have valved bunding operated in a similar manner to the stormwater retention pond.

5.4 Wastewater

Operational wastewater and site sanitary wastewaters are discharged to a WaterCare sewer that runs through the site. Further discussion on wastewater is beyond the scope of this report.

5.5 Disposal by Contractor

Any oil collected in blind sumps is removed off site by a contract 'sucker' truck.

6 Existing Hazardous Substance Management

6.1 Introduction

The existing Southdown power station operation requires a number of hazardous chemicals to be stored and used on site. These are principally used for machine lubrication, transformer cooling and for water treatment although a bowser of diesel fuel is also maintained for the site standby power generator. A schedule of existing hazardous substances is presented in Appendix 1. The existing hazardous substances are generally stored in bunded off areas within the building that houses the water treatment system and steam turbine. In addition the generators and transformers containing oil are independently bunded.

6.2 Documentation Reviewed

- Southdown Cogeneration AEE, July 1994 [include in references]
- Generation Operations Procedure SD PP 3.003 : Site Stormwater management
- Consent decision re: Application for Discretionary Activity Resource Consent at 202 Hugo Johnston Drive, Penrose to Connect the Southdown Cogeneration Plant to 220kV Overhead Transmission Lines and Store Transformer Oil.

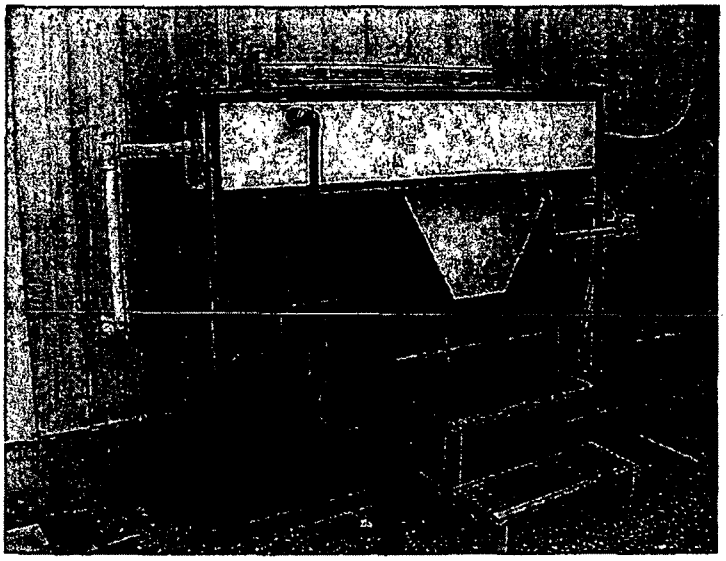
6.3 Existing Use and Storage Areas

6.3.1 Gas Turbine Generators

The existing gas turbines and their generator sets are all oil lubricated. Each combined set holds 12,492 *l* of lubricating oil. Each set is independently bunded. Rain water and oil leakage is directed to an oil separator sump. The water from the bottom is periodically pumped off for further treatment through a small lamella separator. The oil remaining in the main sump can only be removed using a suction device such as a septic tank cleaning truck.

Spare 200*l* drums of lubricating oil are stored in the water treatment building (Refer Section 6.3.8).

Photo 2: Lamella Oil Separator



6.3.2 Steam Turbine

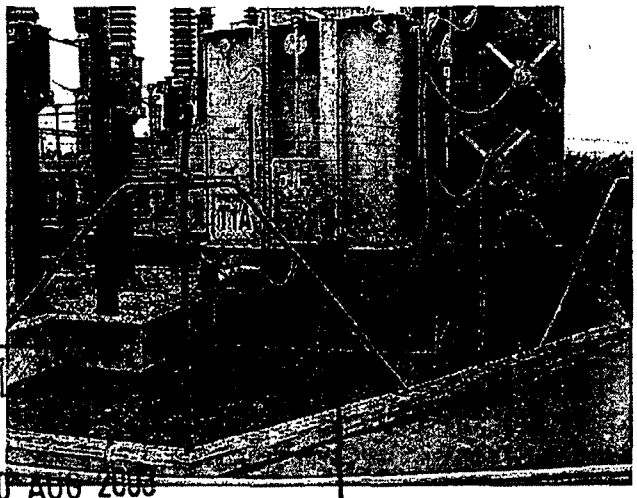
The existing steam turbine and generator set are oil lubricated. The combined set holds 16,000 *l* of lubricating oil.

Spare 200*l* drums of lubricating oil are stored in a bunded area beside the generator (refer Section 6.3.8 below).

6.3.3 Transformers

There are two transformers in the existing switchyard. These are located in a manually valved common concrete bunded area in the North east corner of the existing site. The transformers hold a combined total of 72,000 *l* of cooling oil.

Photo 3: Transformer Installations



6.3.4 Emergency Diesel Generator Facility

The emergency diesel generator is housed in the main building on site in a room between the steam turbine room and the control room. 1200*l* of diesel fuel is held in a steel bowser. This is provided with an integral steel bund.

6.3.5 *Gas Reception Area*

The gas reception area is located on the southern boundary of the site. This is in its own locked security compound. No gas is stored on site and the reticulation pipework is not classified as a hazardous facility.

6.3.6 *Hazardous Goods Store*

There is a small hazardous goods store located on the northern boundary of the site. This is a locked steel cubicle with dimensions of approximately 1.5 x 1.5 x 1.5m. The floor is located approximately 300mm above ground level. There are two shelves in the cubicle. The lower shelf has a very shallow spill tray.

A wide variety of paints and chemicals are held in the store. These are in a variety of states of use and the containers in a variety of states of repair. The uses of many of the chemicals were not obvious at the time of inspection and the operator was not aware of their uses besides the obvious such as paint, petrol and diesel. Details of the types and quantities of chemicals held are provided in Appendix 1.

Significant leakage was noted on the lower shelf. This looked to be predominantly paint. Chemical storage was disorderly and many chemicals were difficult to access. A purpose built facility with adequate spill containment and ventilation is recommended in future.

6.3.7 Water Treatment Plant

The water treatment plant is wholly indoors within the steam turbine building. sodium hydroxide (strong alkali) and sulphuric acid (strong acid) are stored in permanent fibre reinforced plastic bulk tanks. Each of these is contained within an undrained concrete bund. All other water treatment chemicals (refer inventory) are held in transportable pods complete with their own spill containment system.

6.3.8 *Oil Storage*

As discussed above, spare lubricating oil is currently stored on site in 200 *l* drums. Approximately 4158 *l* was held in 21 drums held in two separate areas within the steam turbine building when inspected. It is understood that normally, a total of six drums (1,200*l*) of spare oil is held. Each area is surrounded by a low concrete bund of sufficient height to contain a spill equating to more than one drum volume.

6.4 Spill Control System

Apart from some plastic, 20*l* containers of corrosion inhibitor, all chemical storage systems on the site are provided with spill facilities.

The spill containment provided in the hazardous goods store is regarded as inadequate and should be improved.

The existing transformers are provided with manually operated valves that are located within the locked transformer compounds. Operation must therefore be intentional.

All other spill containment facilities are un-valved and must be pumped or sucked out.

Two further lines of defence are provided in the stormwater management facility. First, the stormwater pond outlet is valved closed and is only released when the accumulated water is considered sufficiently clean. Secondly, oil booms can be floated across the stormwater pond to capture any floating oil substances.

6.5 Spill Handling Procedures

Standards and Procedures Bulletin No. 3.002 Environmental: Spill Handling Procedure (Ref 21) (Appendix 4) documents procedures for the management chemical spills and disposal of the resulting contaminated soils and sediments.

The procedures identify who will be responsible for management of a spill and provide relevant phone numbers for the fire service, ARC and companies qualified to handle any wastes that could be generated on site.

The procedures are aimed at substantially preventing the ingress of spilled substances into the site drainage system.

Safety precautions are detailed and the observer is referred to the Material Safety Data Sheets. However, the whereabouts of those sheets is not stipulated.

The whereabouts and content of the 'Emergency Spill Kit' are noted.

At the detailed design phase, the 'Spill Handling Procedure' should be updated to reflect the new volumes and nature of substances stored and used on site. It would be opportune to upgrade this to a comprehensive 'Emergency Response Plan' for the expanded operation. The Emergency Spill Kit will likely need to be upgraded for the same reason.

6.6 Chemicals Stored on Site

6.6.1 Chemical Inventory

An inventory of the chemicals held or proposed to be held on site is included in Appendix 1 of this report.

6.6.2 Dangerous Goods Licence

A dangerous goods licence is held for storage of diesel fuel for the site power standby generator.

7 Proposed Plant Expansion

7.1 Expansion Proposal

The expansion proposal involves installation of one new gas turbine generator package immediately to the south of the two existing machines. This machine is not within 30m of the site boundary or 100m of the Mean High Water Line.

Accompanying this will be two steel diesel storage tanks located between the cooling towers and the eastern boundary of the site. The storage tanks will be within 30m of the site boundary and within 100m of the estuary high water mark.

There will be an additional transformer with associated cooling oil storage. The transformer is not within 100m of the water but is within 30m of the site boundary

The new works will increase the amount of impervious area but are likely to reduce peak storm run-off due to the large amount of valved, bunded area to be created around the diesel storage tanks.

7.2 Foundation Requirements

7.2.1 Discussion

The proposal involves the addition of one gas turbine generator on the existing site in a position parallel and south of the existing gas turbine generators. The site plan also shows diesel tanks and a bunded area to the east of the existing site. No loading data has been provided for the proposed buildings and gas turbine generators.

The new generator on the existing site is in an area where the basalt is at approx 5 metres RL and the foundations are expected to be founded directly on this layer.

The proposed location for the diesel tanks is at the south east corner of the site. This location is between Zones 1 and 2 and is expected to be exposed rock with no contamination. The site has been disturbed in the past for the installation of a 724mm ID main trunk sewer with an invert depth of approximately 5 metres.

The status of the backfill is not known and will need to be investigated.

If Watercare permits construction over the sewer then they will require any new loads to be separately supported. It should be assumed that it will be necessary to construct a slab to span over the sewer for the extent of each tank to a width greater

than the cut in the basalt to replace the missing basalt and carry the loads onto firm bearing. This slab will be required to carry the additional loads of the tanks and their contents.

The bunded area is larger in plan than the tanks and it may be assumed that a reinforced concrete slab at grade would be adequate with only a modest increase in reinforcement to reduce the risk of cracking in the vicinity of the trench excavation for the existing sewer.

A motor control centre is proposed adjacent to the bunded area for the fuel tanks. This area has basalt near the surface and no problems are envisaged in founding directly on the basalt or on the engineered fill that might be present.

7.2.2 Recommendation

No major problems are envisaged in the foundations for the expansion of the power station site.

Further site investigations are required for specific design of the foundations prior to the design phase.

7.3 Contaminated Site – Implications for Further Development

The proposed location of a further gas turbine generator to the south of the existing gas turbine generators is within an area that has apparently been excavated down to basalt over the complete area. This is predominantly within Zone 3 with a small triangular area of Zone 2.

It is inferred from the remediation specification and remediation validation report that the areas of exposed basalt outside the building footprint were not cleaned completely before backfilling. There is a possibility, particularly within Zone 3, that the loose material at the soil/rock interface may contain asbestos which could become airborne during foundation cleaning operations prior to pouring concrete. It is common construction practice to remove any loose rock and soil and then waterblast the rock surface to ensure good bond between the concrete and rock.

While the earlier investigations identified risks associated with various contamination zones on the site, the 1995 remediation works and construction of the plant have now modified those risks. The risks from asbestos contamination are now interpreted as being, for the two zones of interest:

Zone 2 – a low risk from chrysotile asbestos if any of the original fill over the basalt still exists where work is contemplated and if that work is likely to cause disturbance of dry soil such that any asbestos fibres within the soil become airborne. It is inferred from the information

studied that little of the original fill will remain where the proposed machine, oil tank and motor control centre are to be sited.

Zone 3 – originally some potential risk from chrysotile and, more particularly, amosite asbestos fibres becoming airborne during excavation works if the soil was allowed to dry. It is inferred from the information studied that most of the Zone 3 soil has been removed from the area of the proposed new gas turbine generator, reducing any risk considerably. A minor residual risk may remain if any contaminated soil remains within undulations and crevices on the basalt surface. There is a potential for any asbestos that may remain to become airborne during final waterblasting preparation of the rock surface prior to placing of foundation concrete.

Preliminary geotechnical work by Opus International Consultants indicates the possibility of founding structures directly on the underlying basalt lava flow, or on engineered fill on top of the basalt. Assuming that the "clean" fill placed over areas where basalt was exposed during the remediation work is free of asbestos fibres, then no particular precautions would need to be taken during removal of that fill for foundations.

Given the uncertainties associated with extent of asbestos contamination at the surface of the basalt, precautions to guard against the possibility of any asbestos fibres becoming airborne for the 150mm of fill immediately above the basalt and for final cleaning of the rock surface are considered prudent. The usual means of preventing fibres becoming airborne is to ensure the soil is kept moist. However, final waterblasting may cause fibres to become airborne regardless of the waterspray, therefore personnel should wear appropriate respirator protection. These precautions may be able to be dispensed with if sampling and testing of the soil overlying the basalt, undertaken as the foundation is exposed, shows the soil to be free of asbestos. The excavation and testing work could be planned and scheduled such that very little delay, if any, would be imposed by this testing.

There is perhaps a minor risk of the "clean" fill containing minor asbestos contamination if soil was used from "clean" areas elsewhere on the site, as provided for in the specification. It would be prudent to carry out a small amount of investigation of the fill to confirm or otherwise the absence of asbestos.

Overall, any residual contamination should not impose any particular constraints to the foundation design and risks during the construction works should be readily managed.

7.4 Stormwater

7.4.1 Introduction

The expansion proposal involves work entirely within the existing site, serviced by an existing reticulation and stormwater retention pond. Therefore, any increases in runoff rate or volume will be due entirely to the increase in impervious area of the site.

7.4.2 Stormwater Design Rainfall Event

ARC require hydrological analysis of up to five rainfall events when determining systems requirements. These are 2, 10, 100(possibly) (ARI[1]), 34.5mm (design storm for erosion control) and 1/3 of the 2 year ARI event. The analysis is undertaken in accordance with ARC TP108 (as referenced in TP10 (2003)). The 2, 10 and 100 year events are analysed both pre and post development while the latter two are based on the post development condition only. Factoring to the particular site 'time of concentration' and surface characteristics is undertaken using empirical methods within TP108.

Hydrological results are summarised in Table 7.1

Table 7.1: Comparison of Results (TP108 Method)

Phase	WQV*	2 year	10 year	20 year	100 year	EDV**
Current Site						
Peak Flow Rate	0.03	0.21	0.41	0.48	0.66	0.05
Runoff Volume	158	986	1955	2363	3200	253
Post Expansion						
Peak Flow Rate	0.09	0.28	0.48	0.55	0.71	0.12
Runoff Volume	435	1465	2438	2827	3607	585

*WQV = Water Quality Volume. This is equivalent to 33% of the volume of the 2year ARI, 24hour rainfall event. Half this volume is required as permanent dead storage.

** EDV = Extended Detention Volume which equates to the volume of a 34.5mm rainfall event in Auckland

These are peak flow rates into the on site detention pond. Outflows are at a rate fixed by the fixed diameter inlet manifold which is opened manually only by an operator after visual inspection.

A crosscheck on hydrology was undertaken using the rational method, which is known to be more conservative than the TP108 methodology. The Rational Method check confirmed that the TP108 results are of the correct order.

Although the proposed expansion will result in an increase in impervious area (assumed to 100% impervious), it will also result in a net decrease in the effective catchment area of the site for storm routing purposes. This is because of the very significant areas of 'blind' bunding provided for the diesel storage tanks and under the gas turbine generators. These bunded areas are assessed after a storm event and the water discharged manually by plant operators.

[1] Average Recurrence Interval

The present catchment area is 2.25ha (1.21 ha impervious and 1.04ha pervious). The post development catchment is 1.95ha (1.61ha & 0.34 ha) with an additional 0.22ha impervious area holding bunded stormwater.

For the WQV [2], 2, 10 and 20 year events, there will be an increase in run-off rate from the site. This is considered to be adequately managed by the existing site stormwater reticulation. Significant proportions of storm flows could be eliminated by routing 'clean stormwater' from the new works directly into the cooling water system (e.g from building spouting systems).

7.4.3 Capacity of Existing Retention Pond

The existing stormwater retention pond has an area of approximately 550m^2 (on the concrete line). However, as the sides are gently sloped, the area will be significantly more at the level of the downstream dam. With 1m of live storage, the holding capacity is approximately 550 m^3.

The pond live storage depth required to retain the post development WQV is 0.5m. If it is assumed that bunded storage is emptied to the stormwater reticulation prior to discharge of stored storm run-off, the volume required increases by 76 m^3 (the additional 0.22 ha x the 34.5mm WQV rainfall depth) or 138mm depth in the pond.

Approximately 40% of the 24 hour, 2 year ARI storm volume can be retained in the pond as live storage. Above this, there will be overflows direct to the discharge pipe out of the site. It is estimated that 100% of the 1 hour, 50 year ARI storm can be retained. This is the more critical event in terms of instantaneous flow rates for / from the site.

The retention pond is located less than 100m from the mean high tide line of the adjacent estuary. The retention pond discharges into a concrete pipe stormwater sewer that discharges direct to the estuary. Therefore, pre vs post development flow rates discharging from the pond under 2 and 10 year storm flow conditions are not an issue in this case and the EDV does not have to be considered.

It is concluded that the existing storage is adequate for the proposed site expansion project.

7.5 Hazardous Substances

7.5.1 General

Given the daily requirements for fuel, lubricating oil and bulk chemicals, additional bulk storage capacity will be required as result of the generating plant expansion. The exact hazardous substance requirement will not be known until plant purchase and water treatment decisions have been finalised.

A Hazardous Facility Screening Procedure (HFSP) has been conducted using a best guess of the likely additions to existing substances held on site and assuming the existing facility is currently compliant with hazardous substances regulations. As yet, environmental risk profiles have not been established by the Environmental Risk Management Authority, (ERMA) (for the purposes of the HFSP) for many of the chemicals on site so it is not possible to make the HFSP comprehensive. However, most of these substances are held in quantities of 20*l* or less. An HFSP classification was available for one of these substances (benzoyl peroxide) with Hazard ratings of 'High' for both Fire/Explosion and Environment. This produced effects ratios of 0.00 to 0.01 indicating that similarly hazardous substances in similar quantities or less will also produce insignificant effects ratios.

The HFSP for the current proposal yields Effects Ratios greater than 2 in all categories (Fire / Explosion, Human health, Environment). For Business Zone 6, this makes the proposal a discretionary activity. A risk assessment has been undertaken for substances where the combined quantities of the existing and future proposed activities produces an effects ratio of greater than two.

It will be possible to share some hazardous substances storage facilities around the site e.g. water treatment. This should be maximised but it may result in the need for more frequent delivery of hazardous substances (e.g bulk sulphuric acid).

While most hazardous substances storage and spill containment around the site is well designed and built, the small dangerous goods store does not appear adequate for spill containment purposes and some consideration should be given to upgrading it or replacement, especially if further substances are going to be added to the current stock held there.

7.5.2 Diesel Fuel

It is proposed to construct two 20m diameter by 15m high mild steel storage tanks for diesel to fuel the new gas turbine generator. The stored volume of 9,424m^3 represents approximately 30 days fuel storage for 1 gas turbine generator operating full time.

A single bund, containing a gross volume of 6,067 m^3 is required to provide spill containment. This represents 110% of the volume of a tank plus the volume of non-failed tanks contained beneath the coping level of the bund. Because of the confined nature of the proposed storage site, it will be necessary to construct the bunds in concrete with vertical concrete walls.

The HFSP is dominated by diesel fuel storage. The results dictate that, for planning purposes, a full risk assessment needs to be carried out. While the risk of spillage is

easily mitigated (but at considerable expense), risks such as that of fire adjacent to the site boundary need to be considered in more depth.

The bunding area available is 2274m^2. The bund volume above requires the construction of 2.7m high concrete walls. It is intended that, on the western side, these bund walls will be common with the ancillary buildings to be built as part of the expansion project. Fluid level indication will preferably be via a prominently located, full height structural glass window. Alternatively, a large external site glass may be acceptable. Site management procedures would require the bund to be checked daily for water or oil build up. A manually valved sump would be provided to facilitate drainage and this could be packed with an oil sorbing product to remove trace amounts of fuel oil from stormwater during release to the stormwater system.

It is proposed that the diesel fuel storage on site will be filled via road tankers. Because of the relatively large number of such vehicle unloading operations, it is advisable to provide a purpose built unloading facility. This should incorporate its own tanker bund for collection of any gross spills and should be under cover to minimise the potential for stormwater contamination. Appropriate valving and tank level indication would be provided in the bunded area. Final configuration will be confirmed with the fuel supply company at the time of detailed design.

7.5.3 Lubricating Oil

With one new gas turbine generator on site, a best guess is that the volume of spare, lubricating oil held on site will increase by 50%. The expansion proposal includes the provision of a purpose built storage shed for the lubricating oil.

7.5.4 Water Treatment

Additional water treatment capacity is likely to be required on the site to provide the necessary high purity water for the new gas turbine generator. It is our understanding that the facilities are likely to include a reverse osmosis plant and pH correction facility. Duplicate bulk storage facilities for caustic soda and sulphuric acid may need to be allowed for. Additional 20*l* plastic containers of water additives such as corrosion inhibitor will also be required. Should the number of these increase significantly, a separate bunded storage area should be provided for them.

7.5.5 Risk Assessment

A risk assessment was undertaken based on the AS/NZS 4360:1999 (NZS 4360) process of risk management and tailored specifically to meet the needs of the power station. Assessments were undertaken on all hazardous substances with a HFSP Quantity Ratio (or "Effects Ratio" in the terms of the District Plan) in excess of 2 (two) i.e. diesel, oil, caustic soda and sulphuric acid.

Risk identification was approached in a methodical way to ensure all significant activities within the power station site were identified and the risks flowing from these activities defined. To assist this process a work breakdown structure was produced to separate the hazardous substances into a series of defined sources or elements. This provided a logical framework for identification and helps to ensure significant risks are not over-looked.

Risks were considered under the following sources/elements:

- **Function/Activity 1 - Diesel Fuel**
  - **Fuel tanks leaking**
  - **Fuel tank filling**
  - **Fuel tank rupture**
  - **Fuel tank fire**
- **Function/Activity 2 - Lubricating and Generator Oils**
  - **Delivery and unloading**
  - **Handling and transportation**
  - **Storage**
  - **Dispensing of oil into tank or generator**
- **Function/Activity 3 - Transformer Oils**
  - *Storage of oil*
  - **Other risks**
- **Function/Activity 4 - Caustic Soda and Sulphuric Acid**
  - **Delivery and unloading of materials**
  - **Storage of materials**

In order to provide a prioritisation for the identified risks each one was rated with a likelihood of the event occurring, and a consequence, or potential impact of the event should it occur. The tables shown in Table 1 of the report in Appendix 2 represented an effective way to assess and rate the identified risks. Consequence levels were assessed to reflect the context of the project while likelihood descriptions remained as defined in NZS 4360.

Priority was assigned using the criteria matrix referred to in Table 2 of the report in Appendix 2. Each risk was prioritised by comparing the scores for consequence and likelihood against the risk criteria matrix, which ranks risks against 6 defined classes or sets, i.e. Negligible, Low, Moderate, High, Very High and Extreme.

In general, all risks prioritised as "high, very high or extreme" require due diligence and appropriate care. Risks prioritised as moderate, low and negligible ranked risks must be regularly monitored to ensure these risks do not move to a higher ranking as the project develops.

8 Management Plan Requirements for the Expansion Project and Expanded Plant

8.1 General

Management planning will be required for the following, some of which are already covered by existing plans for the site:

- Long Term Site Management - Contamination issues (Ref 5);
- Site Stormwater and residual Sludge (Ref 2)& 6) ;
- Environmental Management Plan (in accordance with 'Proposed Auckland Regional Plan: Air, Land and Water Oct 2001 S5.5.20a);
- Hazardous substances transport and storage (can be incorporated in the Environmental Management Plan above)

8.2 Contamination Issues

A long-term site management plan, written for Vector Limited in 1999 (Ref 5), is currently in force on the site. The plan is intended to maintain the integrity of the current capping layer and to control any excavation works on the site. It is a requirement of that plan that a project-specific plan should be written for any excavation activities on the site. An issue is how stringent the precautions should be to guard against what is probably no more than minor residual contamination.

The 1999 plan refers to an earlier May 1995 "Management Plan for Asbestos Decontamination Activities and Long Term Site Management Plan", prepared for the remediation of the site prior to construction of the power station. It is arguable that the 1995 plan (not sighted but presumed to be similar to the December 1994 draft) is more onerous than is required to manage any residual asbestos hazard on the site that might be encountered during the relatively small amount of earthworks required for the proposed extensions.

It is recommended that discussions be held with the Occupation Health and Safety Service of the Department of Labour (OSH) on their requirements prior to and during preparation of the project-specific management plan. It is of note that the remediation validation report for the 1995 work reported that the air monitoring failed to detect, with one exception, any airborne asbestos fibres in excess of the detection limit. The detection limit was 10% of the workplace standards for amosite asbestos (note that the detection limit was only 1% of the Chrysotile standard), indicating that any airborne asbestos hazard was well within the required standard. It is also of note that OSH and the Auckland health authorities now have a considerably greater knowledge of the risk of soil-bound asbestos, and management of those risks, as a result of the extensive investigation and remediation work carried out recently in the Flat Bush area of Manukau City. An expert review of the Flat Bush

investigations for Manukau City[3] concluded, based on overseas research, that there was unlikely to be measurable airborne asbestos generated during soil disturbance activities (e.g. from generation of dense dust clouds during development work) from low-level soil contamination. The Southdown information reviewed for this report suggests a similar conclusion could be drawn for the proposed extension works. It is possible that given the Flat Bush experience, OSH (and the Auckland City Council) would allow an approach to risk management commensurate with the scale of the excavation and likely low hazard for the area of the extensions, rather than require the full requirements of the earlier management plan.

8.3 Site Stormwater Management

A 'Stormwater and Sludge Management Plan', written for Vector Ltd in 1999, is in force for the site. The purpose of this plan is to "ensure that the collection and disposal of stormwater and/or sludge from the site does not result in asbestos exposure or migration". For erosion control, the plan refers back to the 'Long Term Site Management Plan'. The plan calls for annual inspection of drains and for appropriate disposal or testing then appropriate disposal if necessary of any sludges carried into the storm drains. Contingency measures are described for managing areas of disturbed ground and sludges derived therefrom.

In addition, Generation Operations Procedure Number SD PP 3.003 details procedures for Daily, Monthly and six monthly checks on the stormwater retention and treatment pond. Examples of testing by Dowdell & Associates Ltd are included. Daily visual checks are required of the surface of the stormwater pond and any floating oil boom that might be fitted. Monthly checks are required on the discharge snorkel (blockage or damage) and for weed growth and general pond site maintenance. Six monthly sampling and testing for asbestos contamination in the sediment retained on the bottom of the stormwater treatment pond. Analysis to be by Dowdell & Associates. Remedial actions are defined for the case in which asbestos fibres are found. The procedure omits the annual drain check stipulated by the Stormwater and Sludge Management Plan. It would be handy to have all requirements summarised in one document. And, although it might seem simplistic, the procedure does not stipulate either when retained water must be released from the stormwater pond or what minimum level must be retained when a discharge is made.

It is recommended that these amendments be made.

The proposed activities are unlikely to lead to necessary changes to stormwater management procedures.

[3] *Flat Bush Asbestos Investigations, A Review of the Survey Conducted by Manukau Consultants, Including Evaluation of the Potential Health Risk Posed by the Asbestos Contamination and the Draft Risk Categorisation*, Alan Rogers OH&S Pty. Ltd, October1999

8.4 Environmental Management Plan

A proposed Environmental Management Plan (EMP) is appended to this report in accordance with 'Proposed Auckland Regional Plan: Air, Land and Water Oct 2001 S5.5.20(a).

The EMP reports on matters listed as conditions for Rule 5.5.16 of the 'Proposed Auckland Regional Plan: Air, Land and Water'.

The EMP identifies specific chemical substances held on site and sets out the methods to be used to ensure they avoid contacting stormwater run-off or the method more separation from retained stormwater.

The EMP identifies appropriate auditing requirements to ensure performance of all components of the EMP.

Specifically, the issues covered are asbestos contamination, stormwater, sludge, storage and delivery of hazardous substances. Although the former two are covered by existing, separate documents, it is probably appropriate that the requirements are amalgamated into a single document so that all appropriate issues are covered by a single document. The finalised Environmental Management Plan produced for the site should have the existing reports appended. All existing operational procedures and those new ones produced in response to the plan should also be appended.

9 Conclusions and Recommendations

9.1 Foundations

No major problems are envisaged in the foundations for the construction of an additional gas turbine generator on this site.

Further site investigations are required for specific design of the foundations prior to the design phase.

9.2 Site Contamination

Review of available information indicates that substantial remediation of asbestos-contaminated soil has occurred on the existing power station site. Asbestos-contaminated fill was removed down to basalt rock over much of the site, including the area of the proposed new gas turbine generator to the south of the existing plant, and the location of the new diesel tanks and motor control centre in the south east corner of the site. The excavated area was backfilled with clean fill, some of which may have come from elsewhere on the site. Some residual asbestos contamination may exist in crevices in the surface of the basalt.

In general it is expected that any residual contamination will be small and therefore pose a low risk. The contamination should not, therefore, impose any particular constraints to the

foundation design of the proposed expansion. Residual risks during the construction works should be readily managed.

There is some uncertainty with respect to the source of backfill material and whether it is truly free of asbestos. A small amount of investigation of the fill would be of benefit to planning the work, and may allow a lower level of risk-management during the work. Alternatively, risk management action could be tailored to what is found from soil sampling as foundation excavation approaches the basalt.

Management of the residual risk requires the writing of a project-specific management plan. It is recommended that OSH be consulted prior to and during the preparation of this plan. A lower level of risk management than was adopted during the 1995 remediation works should be possible.

9.3 Hazardous Substances

Fuel storage requirements dominate the results of a Hazardous Facility Screening Procedure undertaken for the proposed expansion. Substantial bunding and discharge management facilities will be put in place to manage any risk of gross discharge to the site or surrounding environment. Likewise, all operating machines and transformers are provided with their own bunded storage allowing managed separation of dripped or spilt oil and treatment of the captured water.

Site management procedures, and particularly spill management procedures will need to be amended accordingly to cater for the additional volumes of oil and chemicals stored on site and the introduction of a large volume of diesel storage.

9.4 Stormwater

Existing site stormwater management facilities are adequate to manage the modified stormwater discharge profile due to the proposed development. The new fuel storage bunding area will intercept a large amount of direct rainfall, which will not be contributing to peak run-off flows. These captured flows will need to be released in conjunction with management of discharges from the existing stormwater treatment pond.

10 Limitations

This report has been prepared on the basis of the listed documents and by inferring likely ground, climatic and operating conditions. Ground conditions have been assumed to be unchanged since completion of the 1995 work. The information has been taken on good faith, but the ground conditions cannot be guaranteed.

This report has been prepared for Mighty River Power Limited for the purposes described in the report. The information contained in the report should not be used by parties not associated with the project nor for any other purpose.

References

1) *Southdown Cogeneration AEE, July 1994*
2) *Generation Operations Procedure SD PP 3.003 : Site Stormwater management*
3) *Consent decision re: Application for Discretionary Activity Resource Consent at 202 Hugo Johnston Drive, Penrose to Connect the Southdown Cogeneration Plant to 220kV Overhead Transmission Lines and Store Transformer Oil.*
4) *Southdown Cogeneration Project, Erosion and Sediment Control and Contamination Mitigation Plan for Site Development,* Tonkin & Taylor, Reference 11967, September 1994.
5) *Vector Limited, Long term Site Management Plan, 164-220 Hugo Johnston Drive,* Tonkin & Taylor, Reference 17047, March 1999.
6) *Vector limited, Stormwater and Sludge Management Plan, 164-220 Hugo Johnston Drive,* Tonkin & Taylor, Reference 17047, March 1999.
7) *City of Auckland – District Plan – Isthmus Section* – Operative 1999
8) *ARC Technical Publication 10 (TP10)*
9) *ARC Technical Publication 108 (TP108)*
10) *Above Ground Bulk Tank Containment Systems – Environmental Guidelines for the Petroleum marketing Companies* – Ministry for the Environment: June 1995
11) *Flat Bush Asbestos Investigations, A Review of the Survey Conducted by Manukau Consultants, Including Evaluation of the Potential Health Risk Posed by the Asbestos Contamination and the Draft Risk Categorisation,* Alan Rogers OH&S Pty. Ltd, October 1999.
12) *Mercury Energy Southdown Development Site Contamination Assessment Report (Draft),* Reference 11967, November 1994
13) *Mercury Energy Limited, Assessment of Environmental Effects Relating to Decontamination Activities and Associated Earthworks.* Reference 11967, December 1994
14) *Mercury Energy Limited, Management Plan for Asbestos Decontamination Activities and Long Term Site Management (Draft for Comment).* Reference 11967, December 1994
15) *Southdown Cogeneration Station Site Remediation – Specification.* June 1995 *(The earthworks drawings referred to in the specification have not been seen.)*
16) *Delta Catalytic Engineering and Construction Ltd, Southdown Cogeneration Site, Geotechnical Investigation Report, (GIR),* Reference 13188, 31 August 1995
17) *Southdown Cogeneration Limited, Southdown Site Remediation Verification Report,* Reference 13934, December 1995.
18) An overview report on the total site development by R W Beck (Copy held on site)
19) *Proposed Auckland Regional Plan: Air, Land and Water October 2001*
20) *Land Use Planning Guide for Hazardous Facilities:* Ministry for the Environment, February 2002
21) *TransAlta Standards and Procedures Bulletin No. 3.002 Environmental: Spill Handling Procedure* 19 November 1997.
22) In addition, a number of letters and faxes and drawings were reviewed, as supplied by EMS in a letter of 5 July 2003, in particular a number of communications between T&T staff and clients or related parties giving details of the remediation works

APPENDICES

Appendix 1
Hazardous Substance Inventory and Hazardous Facility Screening Procedure Calculator

APPLICANT	Mighty River Power
CONTACT NAME	Lindsay Dempsey
POSTAL ADDRESS	
SITE ADDRESS	
PHONE NUMBER	
FAX NUMBER	
E-MAIL	
COMMENT	Diesel Fired Power Station Expansion

Ref No.	Substances on this site	CAS No	Effect Type	Hazard Rating	Base Quantity B t or m³	Substance Form	Distance to boundary less than 30 metres? YES NO	Adjacent to water? YES NO	Type of Activity A/Above B/Underground Use	Adjustment Factors F1	F2	F3	Product of Adjustment Factors	Adjusted Quantity A	Proposed Quantity P t or m³	Fire/ Explosion Quantity Ratio FQ	Human Health Quantity Ratio HQ	Environment Quantity Ratio EQ
																95.53	325.10	1054.95
1	Diesel	various	Fire/Explosion	Low	100	liquid	Y		A	1.0	1.0	1.0	1	100	9425.2	94.25		
			Human Health	Low	30					1.0	1.0	1.0	1	30			314.17	
			Environment	Medium	30			y		1.0	0.3	1.0	0.3	9				1047.24
2	Benzoyl Peroxide	94-36-0	Fire/Explosion	High	1	solid	N		A	3.0	3.0	1.0	9	9	0.02	0.00		
			Human Health	-	-													
			Environment	High	3			n		3.0	1.0	1.0	3	9				0.00
3	Sodium Hypochlorite	7681-52-9	Fire/Explosion	-	-	liquid	N		A						1.5			
			Human Health	Medium	10					1.0	1.0	1.0	1	10			0.15	
			Environment	High	3			n		1.0	1.0	1.0	1	3				0.50
4	Lubricating Oil	#N/A	Fire/Explosion	low	100	Liquid	n		a	1.0	3.0	1.0	3	300	60.172	0.20		
			Human Health	low	30					1.0	1.0	1.0	1	30			2.01	
			Environment	medium	30			n		1.0	1.0	1.0	1	30				2.01
5	Sodium Hydroxide	1310-73-2	Fire/Explosion	-	-	solid	n		a						11.2			
			Human Health	Medium	10					3.0	1.0	1.0	3	30			0.37	
			Environment	-	-			n										
6	Sulphuric Acid	7664-93-9	Fire/Explosion	-	-	liquid	n		a						4.8			
			Human Health	High	1					1.0	1.0	1.0	1	1			4.80	
			Environment	High	3			n		1.0	1.0	1.0	1	3				1.60
7	Transformer Cooling Oil	#N/A	Fire/Explosion	low	100	liquid	y		a	1.0	1.0	1.0	1	100	108	1.08		
			Human Health	low	30					1.0	1.0	1.0	1	30			3.60	
			Environment	medium	30			n		1.0	1.0	1.0	1	30				3.60
8			Fire/Explosion															
			Human Health															
			Environment															
9			Fire/Explosion															
			Human Health															
			Environment															
10			Fire/Explosion															
			Human Health															
			Environment															
	Total Quantity Ratios															95.53	325.10	1054.95

Appendix 2
Risk Assessment

Risk Register for Mighty River Power Project

Ref	The risk: what can go wrong or prevent us from achieving our desired objective / The opportunity: what things can assist us or help us to achieve our desired objective?	What are the existing controls	Qualitative Risk Analysis: Likelihood Descriptor	Qualitative Risk Analysis: Consequence Descriptor	Risk Priority	Proposed Mitigation
Function/Activity: 1 - Diesel Fuel						
1.1	**fuel tanks leak because**					
a	the pipes connecting to the tanks are hit by either people or vehicles	pipe connections will be protected at the filling point by bund walls preventing accidental tanker backing damage; also double non return valve on tank connections	unlikely	minor	Negligible	
b	the pumps or valves connecting to the tanks are hit by either people or vehicles		unlikely	minor	Negligible	
c	of a pump gasket blow out from human error		unlikely	minor	Negligible	
d	of a pump gasket blow out thro faulty parts		unlikely	minor	Negligible	
e	of earthquake	it is understood that the bund is designed to withstand an earthquake and that any potential rupturing of the tank will be contained within the bund	rare	major	Moderate	Appropriate bund design
f	[illegible] environment	regular maintenance and testing of joints and welds	rare	major	Moderate	Appropriate design detailing. Manual inspections
1.2	**diesel fuel tank filling**					
a	filling activity causes spillage because of delivery hose defects	fuel suppliers have their own internal quality controls and checks	unlikely	moderate	[illegible]	
b	filling activity causes spillage because pipe connections are incorrectly fitted by delivery driver	tankers have automatic shut off valves if too much fuel is taken; also there is a [illegible] tank connection base [illegible] significant seepage	unlikely	moderate	[illegible]	
c	over filling of tank through human error		rare	minor	Negligible	
d	tanks are filled with the wrong fuel	[illegible] diesel will reduce the specification of the fuel and will impact the running of the GTs but is unlikely to cause an environmental or health hazard	rare	minor	Negligible	
1.3	**diesel fuel tank rupture because of**					
a	lightening strike	lightening conductors attached and taller structures are more likely to be hit before tanks	rare	major	Moderate	
b	maintenance staff doing [illegible] damage [illegible]	site working procedures for maintenance works and staff training on safe working environments are undertaken	unlikely	moderate	[illegible]	
c	hit by [illegible]		rare	moderate	[illegible]	
d	failure of the integrity of the tanks [illegible]	regular testing regime of all joints and welds	rare	major	Moderate	
1.4	**diesel fuel tank fire because of**					
a	lightening strike	lightening conductors attached and taller structures are more likely to be hit before tanks	rare	severe	Moderate	
b	electrical fault	regular testing regimes of all electrical equipment	rare	severe	Moderate	
c	maintenance works in area for example gas cutting or sand blasting	site maintenance working procedures in place; staff are trained in understanding safe working environments	unlikely	severe	High	Hot working procedures; oil companies (who are likely to own the tanks) will also have their own working procedures; regular staff training for maintenance works; hazard identification for hot working
d	static electricity build up		rare	severe	Moderate	Appropriate earth bond detailing
e	pump fire [illegible]	regular testing regime of all bearings and other mechanical parts	rare	severe	Moderate	Appropriate pump location
f	explosion in gas turbine combustion zone. *Note: it is understood that it is difficult to ignite diesel in normal circumstances*		rare	severe	Moderate	
Function/Activity: 2 Lubricating and Generator Oil						
2.1	**delivery and unloading of oils**					
a	drum is dropped because of incorrect clamping		unlikely	moderate	[illegible]	
2.2	**handling and transporting of oils**	Spill contingency procedure and storm pond as back up.				
a	drums are dropped or spill because of transporting of [illegible] metal		moderate	moderate	Moderate	Appropriate handling procedures. Storm water retention system.
b	[illegible] forklift hits structure		unlikely	moderate	[illegible]	
c	transportation forklift hits another vehicle		rare	moderate	[illegible]	
2.3	**storage of oils**	bunding				
a	oils leak because of faulty drum		rare	moderate	[illegible]	
b	oils leak because of faulty [illegible]		rare	moderate	[illegible]	
c	oils leak because of malicious damage		rare	moderate	[illegible]	
2.4	**dispensing of oil into tank or generator by hand-pumping**					
a	spillage from drum occurs because tank is under pressure		likely	minor	[illegible]	
Function/Activity: 3 - Transformer Oil						
3.1	**storage of oil**	Regulation containment bunds				
a	oil contained within transformer leaks because of integrity of transformer	regular testing regimes undertaken	rare	minor	Negligible	
b	oil leaks because of rupture of transformer because of maintenance works (hit by cherry picker)	site maintenance working procedures in place; staff are trained in understanding safe working environments	unlikely	moderate	[illegible]	
c	oil leaks because of rupture of transformer because of earthquake		rare	severe	Moderate	
d	oil leaks because of rupture of transformer because of hit by [illegible]		rare	minor	Negligible	
e	oil leaks because of rupture of transformer because of lightening strike		rare	severe	Moderate	Adequate bunding & blast walls
3.2	**other risks**					

Ref	The risk: what can go wrong or prevent us from achieving our desired objective? The opportunity: what things can assist us or help us to achieve our desired objective?	What are the existing controls	Qualitative Risk Analysis: Likelihood Descriptor	Qualitative Risk Analysis: Consequence Descriptor	Risk Priority	Proposed Mitigation
a	fire occurs through internal fault (similar to Huntly incident)		unlikely	major	High	regular testing regime in place; regular oil analysis undertaken which helps to identify faults protection devices tested safety trip mechanisms for electric faults; thermography surveys of electrical devices Bucholtz alarm / protection device
b	mobile plant failure during oil purification / recirculating oil		unlikely	minor	Negligible	

Function/Activity: 4 - Caustic Soda & Sulphuric Acid

Ref	The risk	What are the existing controls	Likelihood Descriptor	Consequence Descriptor	Risk Priority	Proposed Mitigation
4.1	delivery and unloading of materials	Regulation containment bunds				
a	accident / incident of delivery reversing around / on site road with tight corners	delivery vehicle / site staff assistance during operation	rare	severe	Moderate	One way traffic management system
b	filling activity causes spillage because pipe connections are incorrectly fitted		unlikely	severe	High	set site procedures including safety and protection equipment and clothing; delivery area taped off to prevent accidental access to area first aid training and showering facilities
c	over filling of tanks through human error		unlikely	moderate	[illegible]	
d	incorrect materials put into storage tank	operational risk - resultant material would become neutral and inert, would have an affect on the running of the plant	unlikely	minor	Negligible	
4.2	storage of materials					
a	leakage of tanks through failure of integrity	regular testing regime undertaken	rare	severe	Moderate	Daily inspections, annual tests.

Date of Risk Review August 13, 2003

Compiled by: Neil Beattie

Contributors:

Noel Kuttight (EMS)

Tony Dennehy (Mighty River Power)

Counts:

Extreme	0
Very High	0
High	3
Moderate	14
Low	13
Negligible	10
Total	40