

(Preliminary) Ground and Surface Water Monitoring and Reporting Program

March, 2006

CSBP



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Contents

	Page Number
1. Introduction	1
1.1 General Objectives	1
1.2 Site Identification	2
1.3 Site History	2
2. Legislative Requirements	4
2.1 Ministerial Conditions	4
3. Water Monitoring Program	5
3.1 Monitoring Rationale	5
3.2 QA/QC	6
4. Groundwater Monitoring.....	7
4.1 General	7
4.2 Bore Locations	7
4.3 Monitoring Frequency and Duration	10
4.4 Analytical Methods	10
5. Bayswater Main Drain Monitoring.....	11
5.1 Objective	11
5.2 Monitoring Locations	11
5.3 Streamflow Monitoring	12
5.4 Monitoring Frequency and Duration	13
5.5 Chemical Analysis	13
5.6 Analytical Methods	13
5.7 BMD Sampling Procedure	14
6. Lime Dosing Plant	15
6.1 Objective	15
6.2 Monitoring Frequency and Duration	15
6.3 Chemical Analysis	16
6.4 Analytical Methods	16
6.5 Dosing Plant Sampling Procedure	16
7. Reporting Requirements & Contingency Measures	17
7.1 Internal Reporting	17
7.2 Annual Compliance Reporting	17
7.3 Responsiveness	17
8. Remediation and Monitoring End Points	21
9. References.....	22

Contents (continued)

Page Number

List of tables

Table 1.1: Key Characteristics of Remediation Project	2
Table 3.1: Groundwater Monitoring Plan	9
Table 3.2: Bayswater Main Drain Sampling Locations and Relationship to the Site	12
Table 3.3: Surface Water Monitoring Program	13
Table 3.4: Summary of Groundwater Assessment Activities	14
Table 3.5: Lime Dosing Plant Monitoring Program	16
Table 3.6: Reporting Requirements and Potential Management Responses	19

List of figures

Figure 3.1: Groundwater Bore Field, Former Cresco Site Bayswater	8
Figure 3.2: Drain Flux Monitoring Locations	12

List of appendices

Appendix A	Ministerial Statement of Conditions (No. 000691)
Appendix B	Preliminary Contingency Management Plan

1. Introduction

This Ground and Surface Water Monitoring and Reporting Program has been prepared by Parsons Brinckerhoff (PB) on behalf of CSBP in fulfilment of environmental management commitments as outlined in the *Final Remediation Works for the Former Cresco Site, Bayswater, Public Environmental Review* (PB, 2004). This Plan should be read in conjunction with the PER document, the EPA's Report and Recommendations (EPA Bulletin 1175) and the Ministerial Statement of approval (see Appendix A of this Plan).

This Plan has been prepared in light of the Department of Environment's (DoE) *Contaminated Sites Management Series* and, consistent with the Ministerial Conditions, will be submitted to the DoE for approval prior to the commencement of remediation works.

As detailed in the PER, the overall remediation of the site requires demolition of infrastructure and the removal/excavation of contaminated waste to enable redevelopment of the site consistent with its current zoning of industrial/commercial.

In addition to this Plan, specific waste handling, traffic, noise and dust management issues associated with the remediation activities have been addressed within the following documents:

- Traffic Management Plan (PR_13192RevE.doc);
- Noise and Vibration Management Plan (Herring Storer Acoustics);
- Waste Management Plan (PR_13226RevE.doc);
- Remediation and Validation Plan (PR2:14972 RevB.doc); and
- Dust Management Plan (PR_13230RevJ.doc).

1.1 General Objectives

This Ground and Surface Water Monitoring and Reporting Program includes management strategies to:

- ensure that the lime dosing system which is used to treat abstracted groundwater from the site is operated such that an acceptable level of contaminant removal efficiency is maintained (as specified in Condition 5-2);
- provide an early warning system for the purposes of detecting any 'pulse' of groundwater contamination that may be mobilised during ground disturbing activities (consistent with Condition 5-4 and 5-6);
- demonstrate that monitored natural attenuation is removing ammonia from the groundwater to acceptable levels by the time the groundwater intersects the Bayswater Main Drain (Condition 5-3);
- ensure the water entering the Bayswater Main Drain from the Bayswater site continues to represent a low risk to the Swan River ecosystem both during and after remedial activities (generally);

- Outline contingency measures in the event that the Ministerial Conditions as specified are not met (Condition 5-5).

1.2 Site Identification

A summary of the key characteristics for this Ground and Surface Water Monitoring and Reporting Program are provided in Table 1.1.

Table 1.1: Key Characteristics of Remediation Project

Element	Description
Volume of contaminated material:	Up to approximately 280 000m ³ of soil material containing heavy metals, fluoride compounds and acid generating compounds and other contaminants.
Remediation of soil contamination	Excavation and either removal to landfill.
Management of groundwater contamination	Abstract and treat groundwater to remove contaminants. Disposal of treated groundwater via infiltration onsite or direct discharge to the Bayswater Main Drain.
Remediation timeframe	Approximately 2 years.
Area for remediation	Approximately 37 hectares.
Infrastructure including buildings	Removed to suitable disposal sites.

1.3 Site History

The 37 hectare site was historically used for manufacturing superphosphate fertiliser, sulphuric acid, hydrochloric acid, and other small volume chemicals from 1928 to about 1990. The by-products and residues from these operations including iron oxide/pyrite cinders, and superphosphate den scrubber effluent (containing fluoride), were disposed of on-site in shallow ponds, in accordance with the standards of the day. Considerable volumes of waste material have been removed from the site over the years, but the cinders and groundwater impacts remain and are the major focus of the remediation project. The water and groundwater contaminants of concern included various heavy metals and fluoride, largely associated with acidic groundwater conditions. A number of analytes from monitor bores on site commonly exceed trigger values for agricultural/irrigation water use. A summary and review of the results of monitoring and an assessment of downstream potential impacts has been previously provided within the PER (PB 2004).

Groundwater flow from the site is generally towards the Swan River approximately 1.4 km to the south. Off-site migration of contaminants coincides with this direction and rapidly attenuates (decreasing by orders of magnitude) within a few hundred metres off-site. A portion of groundwater from the site intersects the Bayswater Main Drain (BMD) and ultimately enters the Swan River. A review of historical data has shown that with the exception of

aluminium, fluoride and zinc, the water quality at the Bayswater Main Drain outfall is currently considered to be 'low risk' for marine ecosystem protection. Aluminium, fluoride and zinc were therefore considered to be contaminants of concern associated with discharge of the BMD to the Swan River (PB 2004).

A Direct Toxicity Assessment was undertaken (PB 2005C) that has shown that prior to commencement of remediation activities, the BMD was not having an adverse impact upon locally-resident species in the Swan River. In all likelihood it would seem, given the historical industrial uses and age of the site, that water quality in the BMD has probably been progressively improving over the last 30 or so years to the point that the BMD inflows do not currently pose a significant risk to the protection of the Swan River ecosystem. The PER concluded that implementation of the outlined soil and groundwater remediation works was likely to significantly reduce the likelihood of potential adverse impacts in the future.

To further limit the potential for offsite groundwater impacts, CSBP has installed a lime dosing plant to remove heavy metals from groundwater abstracted via 33 interception bores which lie across the south-west corner of the site (approved under Part IV of the *Environmental Protection Act 1986*). CSBP has been undertaking performance monitoring and adjustments to the dosing regime during the commissioning period to optimise the operational, mechanical and chemical performance of the plant. The plant became operational in October 2004 and has been effective by neutralising the pH of the acidic groundwater with a removal efficiency of 73% for fluoride and 96% for both aluminium and zinc (the principal contaminants of concern identified within the PER).

CSBP has previously considered the potential for the exposure of pyritic cinders during ground-disturbing activities to result in increased oxidation, chemical solubility and contaminant mobilisation and for a 'slug' or pulse of groundwater contaminants to occur. Surveillance monitoring of onsite groundwater quality will therefore be undertaken to detect the onset of this impact and to gauge the effectiveness of groundwater interception and treatment during and following remediation of the site.

2. Legislative Requirements

2.1 Ministerial Conditions

CSBP will undertake all aspects of the remediation project in accordance with the Conditions set down by the Minister for the Environment; Science in the Ministerial Statement titled “Final Remediation Works for the Former Cresco Site, Bayswater (Assessment Number 1477)”. This EMP addresses Ministerial Condition 5.1. The Ministerial Conditions have been reproduced and presented in Appendix A of this Plan.

Monitoring and reporting requirements relating to the management of soil validation sampling have been included in a separate Remediation Validation Plan (PB, 2005a). Dust monitoring, reporting and management measures have also been included in a separate Dust Management Plan (PB, 2005b). This Plan therefore focuses on surface and groundwater monitoring and reporting requirements outlined in the Ministerial Conditions.

3. Water Monitoring Program

The sampling and analysis procedures outlined in this Plan have been prepared in accordance with the following:

National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999);

- the Australian Standard for Sampling of Groundwater (AS/NZS 5667.11:1998);
- the Contaminated Sites Management Series (DoE); and
- The National Water Quality Management Strategy (ANZECC/ARMCANZ, 2000).

3.1 Monitoring Rationale

Relevant components of the remediation strategy approved by the Minister (and outlined in the PER) include the following:

- reduce the potential for further groundwater impacts to occur by undertaking the proposed remediation of the identified areas of the site;
- develop risk-based trigger values for groundwater assessment using an ecological risk assessment framework;
- allow groundwater impacts to naturally attenuate (within specified parameters);
- conduct ongoing groundwater monitoring for a period of approximately 2 years after soil remediation activities, to confirm that the concentration and extent of groundwater impacts remain below risk-based trigger values; and
- Operate the groundwater recovery and treatment system, located near the south west boundary of the site, during remediation activities.

It has been fully recognised within the PER that groundwater beneath the site will not be suitable for irrigation following remediation of the site and that memorials on relevant land titles will be established in recognition of this fact.

This Ground and Surface Water Monitoring and Reporting Program have been prepared with integration of surface and groundwater monitoring requirements in order to meet compliance testing against the Ministerial Conditions. The groundwater and surface water monitoring systems have been integrated to provide information relating to the interaction between on-site remediation activities, groundwater conditions (on and off site), groundwater treatment and impacts upon the quality of water inflowing to the river.

3.2 QA/QC

Water quality samples will be collected and labelled with a unique identifier that can be related to the surveyed sample location (see Table 3.1) and preserved according to relevant Australian Standard (AS/NZS 5667.11:1998).

All analytical chemistry will be undertaken by a NATA accredited laboratory (for low level detection).

Chain of custody documentation indicating the sampling date, sample identification, container size, medium, preservative and analysis required will be submitted along with the samples for laboratory analysis.

- Water duplicate samples (blind) will be submitted to the primary laboratory at a rate of one in every ten primary water samples (1:10)
- Triplicate samples will be forwarded to a third party laboratory one in every twenty primary water samples (1:20)

Primary, duplicate and triplicate samples will be analysed to ensure the relative percentage difference (RPD) is acceptable. Acceptable RPDs include 20% for samples with concentrations greater than 10 times the detection limit and 50% for samples with concentrations less than 10 times the detection limit. If RPDs are found to be outside this range further investigation will be undertaken as to the possible cause and nature of this variation (including a possible inter-laboratory comparison and/or inclusion of a standard solution of known concentration).

4. Groundwater Monitoring

4.1 General

Groundwater monitoring of on-site and off-site bores provide an early warning system of any impending impacts upon the receiving BMD (and hence river). The monitoring system also provides feedback in terms of the effectiveness of the groundwater interception and lime dosing system employed on the site.

4.2 Bore Locations

Monitoring of 12 onsite and 23 offsite bores will be undertaken as outlined in Figure 3.1. The bores have been grouped and colour-coded to identify the basis for their monitoring. These include perimeter (green), down-gradient (orange), onsite (red) and natural attenuation (blue) bores.

The up-gradient bores (purple) have historically been monitored but are to be excluded from the remediation monitoring because they show low levels of contamination (with respect to the contaminants of concern) and negligible up-gradient inflow. These bores will be capped and locked to maintain bore integrity in case they are required in the future.

A Global Positioning System (GPS) co-ordinate has been assigned to all bores and recorded in PB's monitoring records.

Figure 3.1: Groundwater Bore Field, Former Cresco Site Bayswater.

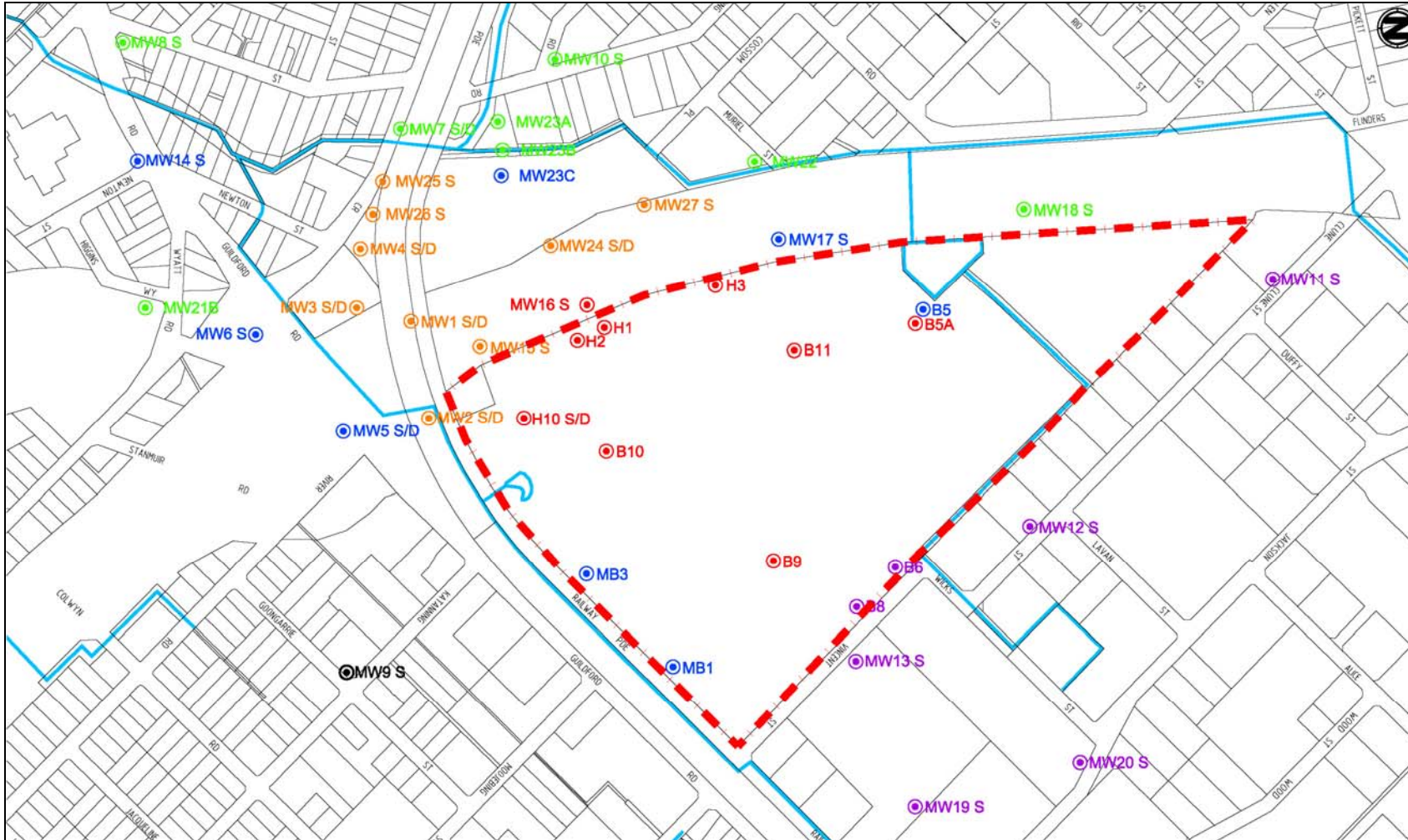


Table 3.1: Groundwater Monitoring Plan

Monitoring Aim	Bores	Monitoring Frequency		Analytes
		During Soil Remediation	Post- Soil Remediation	
Extent and limits of impacts (perimeter bores)	MW5S, MW6S, MW7S, MW8S, MW10S, MW14S, MW18S, MW21, MW22, MW23A, MW23B, MW23C	Quarterly	Quarterly	Physicals: pH, EC TDS; Nutrients: NH ₃ -N, NO ₃ -N, N and P-Total; Metals: Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sn, V, Zn; Anions: SO ₄ and F
Down -gradient impacts	MW1S, MW2S, MW4S, MW3S, MW15S, MW17S, MW24S, MW25S, MW26S, MW27S	Monthly		
Onsite impacts	B5, B5A, B9, B10, B11, H1, H2, H3, H10, MB1, MB3,	Monthly		
Verify natural attenuation of ammonia	MB1, MB3, B5, MW5S, MW6S, MW14S, MW17S, MW23C	Quarterly		
Up-gradient impacts	B6, B8, MW11S, MW12S, MW13S, MW19S, MW20S	No monitoring required		

4.3 Monitoring Frequency and Duration

Sampling of bores will be undertaken on a monthly basis during ground-disturbing remediation activities and on a quarterly basis for the duration of the project. This sampling regime closely follows that previously undertaken to determine baseline conditions prior to remediation and will be continued for at least 2 years following the completion of remediation (as defined under Condition-5-8).

4.4 Analytical Methods

Each bore is sampled for metals, nutrients, major anions, general parameters (Table 3.1) analysed at low levels of detection to allow assessment against the relevant ANZECC/ARMCANZ (2000) trigger values.

All bore samples will be labelled with a unique identifier that can be related to the date of the sample, bore location and screened depth (some bores are paired for the purposes of sampling both the shallow and deeper aquifer).

5. Bayswater Main Drain Monitoring

5.1 Objective

Monitoring of water quality in the Bayswater Main Drain (BMD) has previously been used in association with a direct toxicity assessment (DTA) to demonstrate that the pre-remediation (baseline) water quality conditions in the BMD do not have a significant impact upon the Swan River ecosystem (PB, 2005c, 2005d). Accordingly, the BMD will continue to be monitored for the purpose of tracking water quality during and post-remediation to verify that the Ministerial Conditions are being met (particularly with respect to aluminium, zinc and fluoride concentrations) and, more generally, to verify that there is no significant deterioration of water quality within the BMD during the remediation phase.

The BMD water quality data will be used to demonstrate that the pre and post remediation water quality conditions for fluoride, aluminium and/or zinc in the drain are not significantly different with 95% confidence, representing a suitable ecological endpoint and hence cessation of remediation of the site (as outlined in the PER).

5.2 Monitoring Locations

Monitoring of the broader drainage network in the vicinity of the site will be undertaken during site remediation to aid interpretation of the BMD data and to determine the source of any exceedances of the Ministerial Conditions should these become evident.

Monitoring will continue to be undertaken at representative locations along the BMD and are summarised in Table 3.2 and presented in Figure 3.2.

Table 3.2: Bayswater Main Drain Sampling Locations and Relationship to the Site

BMD Monitoring Point	Easting	Northing	Reference to the site
Mooney Street	39 8184	646 8632	Upstream
Wicks Street	39 8328	646 8618	Downstream
BMD North	39 8194	646 8076	Downstream
BMD West	39 8138	646 8052	Tributary
BMD Gauge Station	39 8052	646 7426	Downstream
King William	39 7990	646 7310	Tributary
BMD Outfall	39 8473	646 6714	Swan River Outfall

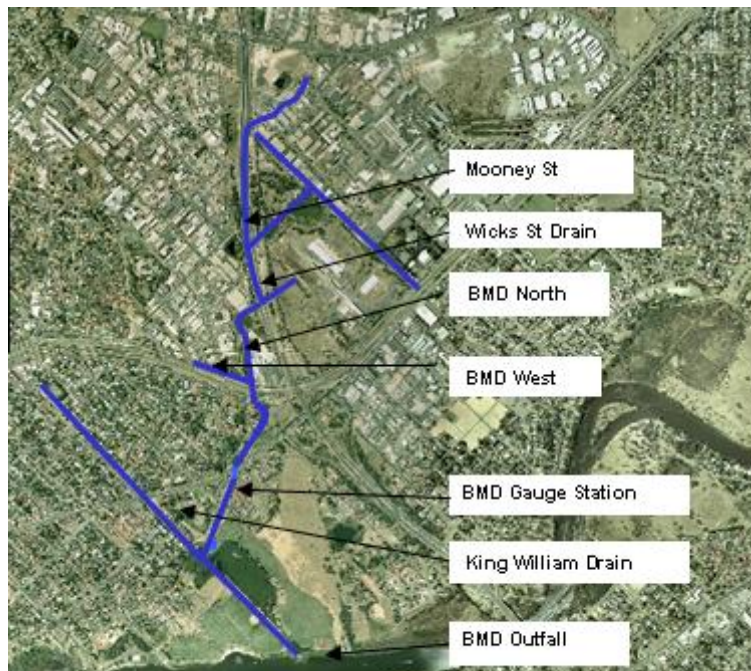


Figure 3.2: Drain Flux Monitoring Locations

5.3 Streamflow Monitoring

The Ministerial Conditions refer to ‘flow-weighted’ concentrations for a number of contaminants of concern. In order to meet this reporting requirement it should be noted that CSBP will be dependent to some extent upon the availability of the streamflow record for the BMD Gauge Station being available from the Department of Environment.

Notwithstanding the above, CSBP will undertake ‘snapshot’ instantaneous streamflow measurements at various points within the regional surface drainage network to coincide with water quality sampling events. This will enable CSBP to maintain a high level of responsiveness and the capability to interpret concentration data (with respect to instantaneous contaminant loads and flow-weighting) throughout the local drainage network should the gauge station record

be faulty, require re-calibration (stage/discharge rating) or be otherwise unavailable at the time of reporting.

5.4 Monitoring Frequency and Duration

Water quality sampling and instantaneous flow measurements of the sample sites shown below in Table 3.4 will be undertaken on a monthly basis during ground-disturbing activities and on a quarterly basis thereafter for the duration of the project (for a minimum of 2 years after conclusion of soil remediation).

This sampling regime includes the measurement of instantaneous streamflow by CSBP (for instantaneous contaminant loading calculations) and follows the existing sampling regime which has been used to establish the pre-remediation baseline conditions (PB, 2005d).

5.5 Chemical Analysis

Consistent with the requirements of the Ministerial Conditions, this Plan stipulates surface water quality sampling sites, the frequency and duration of sampling and the analytes to be reported. The monitoring program is summarised in Table 3.3.

Table 3.3: Surface Water Monitoring Program

Monitoring Site	Monitoring Frequency			Analytes
	Pre-remediation	Remediation	Post Remediation	
		During Soil Remediation	At least 2 years Post Soil Remediation	
Mooney St Wicks St BMD North BMD West BMD Gauge King William BMG Outfall	All Quarterly	All Monthly	All Quarterly	Flow measurement Fluoride, pH, EC, TDS; NH3-N, NO3-N, Total N, Total P, SO4, Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sn, V, Zn

Note: Chemical of concern, as identified in the PER, are in bold text

5.6 Analytical Methods

Each surface water sampling site within the drainage network is to be sampled and analysed for metals, nutrients, pH and major cations and anions as detailed in Table 3.4. A low level of detection will be specified for chemical analysis to enable reporting against trigger values (particularly with regard to low trigger value concentrations associated with aluminium and zinc).

All samples will be labelled with a unique identifier that can be related to the surveyed sample location.

All samples will be collected and preserved according to relevant *Australian Standards* (AS/NZS 5667.11:1998).

All analytical chemistry will be undertaken by an appropriately accredited NATA laboratory (for low level detection).

5.7 BMD Sampling Procedure

Surface water sampling will be conducted in accordance with Table 3.4.

Activity	Details
Sampling method	A laboratory supplied sample bottle will be dipped by hand 5 cm below the water surface to obtain a drain water sample.
Sample preservation	Samples will be collected in laboratory supplied sample bottles and immediately stored in an insulated chest chilled with ice bricks until transit to the laboratory. Samples will be sent to a NATA laboratory and analysed within the holding times specified by the laboratory.

6. Lime Dosing Plant

6.1 Objective

A groundwater interception borefield was established in 2004 across the south west corner of the site to abstract groundwater that may otherwise enter the BMD downstream of the site. The field was installed as an added precaution in the event that soil disturbing activities associated with the remediation of the site causes accelerated, albeit short term, mobilisation of metal contaminants.

Water abstracted from this field quality is subsequently fed to a lime dosing plant which was commissioned in 2004. Tailwater from the plant is re-infiltrated back onto the site to permit natural attenuation processes within the groundwater to reduce ammonia concentrations prior to its accession to the BMD.

The objective of monitoring of tailwater from the lime dosing plant is to demonstrate compliance with the Ministerial Conditions such that:

- Removal efficiency of aluminium and zinc remains greater than 90% (calculated on a monthly basis);
- The monthly flow-weighted mean concentration of aluminium in tail water remains less than 5mg/L;
- The monthly flow-weighted mean concentration of zinc in tail water from the lime dosing remains less than 0.5mg/L;
- The monthly flow-weighted mean pH in tail water from the lime dosing remains between 7 and 9.

Residual concentrations of ammonia associated with discharge from the lime dosing plant is addressed within the groundwater section of this Plan (as the fate and significance of this discharge is dependent upon satisfactory monitored natural groundwater attenuation).

6.2 Monitoring Frequency and Duration

Water quality sampling of the tail water from the lime dosing plant will continue to be undertaken on a weekly basis. Tailwater discharge from the plant is currently metered and will be used to calculate the flow-weighted mean concentrations stipulated within the Ministerial Conditions.

6.3 Chemical Analysis

Concentrations of aluminium, zinc, fluoride and pH will be measured weekly and reported quarterly. Cumulative contaminant removal efficiencies will also summed and reported on a quarterly basis. This makes allowance for minor breakdowns and fluctuations in groundwater quality and dosing levels, however over the reporting period these factors should not adversely effect the overall effectiveness of the plant.

It is worth noting that the lime dosing plant is also equipped with continuous pH monitoring and telemetry. If the pH range of the tailwater ranges <7 or >9 then discharge from the plant is ceased and the plant manager is alerted remotely.

Table 3.5: Lime Dosing Plant Monitoring Program

Monitoring Site	Monitoring Frequency			Analytes
	Pre-remediation	Remediation	Post Remediation	
		During Soil Remediation	At least 2 years Post Soil Remediation	
Lime dosing plant tail water	Weekly	Weekly	Weekly	Fluoride , pH, EC; NH3-N , Total N, Total P, Al , As, Cd, Co, Cr, Cu , Fe, Mn, Mo, Ni, Pb, V, Zn

Note: Chemicals of concern, as identified in the PER, are in bold text

6.4 Analytical Methods

As specified in section 5.6.

6.5 Dosing Plant Sampling Procedure

As specified in section 5.7.

7. Reporting Requirements & Contingency Measures

7.1 Internal Reporting

Internal reports will be prepared after each sampling event to verify compliance with the Ministerial Conditions. Results will be compared against the stipulated Ministerial Conditions. In the event that the specified concentration of analyte is exceeded, further investigation will be undertaken to determine the nature and origin of the exceedance.

7.2 Annual Compliance Reporting

CSBP will prepare and submit written reports to the DoE on an annual basis which summarises and interprets the results of the monitoring and provides recommended management responses, as appropriate.

Annual compliance reporting will meet the requirements of the *Reporting of Site Assessments* (DoE, 2001) guideline and provide the following information:

- Description of the works undertaken and associated methodology groundwater and drain water investigations;
- All analytical data obtained during the validation sampling program;
- Evidence of compliance with the conditions and commitments;
- Performance of the environmental management plans and programs.
- Documentation required by the chain of custody arrangements; and
- Any certificates or approvals obtained during the completion of works.

The annual compliance report will be approved by an auditor (accredited under the Compliance Auditor Accreditation Scheme) in accordance with the Ministerial Conditions. Once approved, the annual Progress and Compliance Report will be made publicly available on CSBP's website (www.csbp.com.au).

7.3 Responsiveness

Consistent with Condition 5-5 of the Ministerial Conditions, CSBP will notify the Department of Environment within 72 hours of becoming aware of any of the following:

- Removal efficiency of the lime dosing plant falling below 90% for aluminium and zinc (cumulative efficiency over a monthly period and reported quarterly);
- The monthly flow-weighted mean concentration of aluminium in tail water from the lime dosing exceeding 5mg/L;
- The monthly flow-weighted mean concentration of zinc in tail water from the lime dosing exceeding 0.5mg/L;

- The monthly flow-weighted mean pH in tail water from the lime dosing varying outside the range of 7 to 9;
- The average attenuation rate of ammonia in groundwater falling below 0.001 per day (calculated on a quarterly basis);
- The monthly flow-weighted mean concentration of ammonia in surface water at the BMD Gauge Station exceeding 0.91mg/L; and
- The monthly flow-weighted mean concentration of fluoride in surface water at the BMD Gauge Station exceeding 1.6 mg/L.

Table 3.6: Reporting Requirements and Potential Management Responses

Sample Location	Compliance Target	Potential Management Responses	Reporting to DoE
Groundwater bores(see figure 3.1)	Condition 5-3 (1) The average natural attenuation rate constant (k) of ammonia remains above 0.001 per day	Response to exceedence may include: Interception and re-infiltration of groundwater onsite (re-circulation) Possible relocation of the lime dosing infiltration basin to increase attenuation pathway to the Bayswater Main Drain to achieve natural attenuation target Possible augmentation of groundwater nitrification/denitrification through addition of organic carbon	Annual reporting for not less than 2 years following the completion of soil remediation activities (Condition 5-8) At completion of remediation (Condition 5-7) Within 72 hours of becoming aware of non-compliance with this Condition
BMD Gauge Station	Condition 5-3 (2) The flow-weighted mean concentration of ammonia remains below 0.91 mg/L	Response to exceedence may include: Investigate and report upon the source, nature and significance of the exceedance and/or likely impacts on the Swan River. Possible relocation of the lime dosing infiltration basin to increase attenuation pathway to the Bayswater Main Drain to achieve natural attenuation target	Annual reporting for not less than 2 years following the completion of soil remediation activities (Condition 5-8) At completion of remediation (Condition 5-7) Within 72 hours of becoming aware of non-compliance with this Condition
BMD Gauge Station	Condition 5-5 The flow-weighted mean concentration of fluoride concentration should not exceed 1.6mg/L	Response to exceedence may include: Investigate and report upon the source, nature and significance of the exceedance and likely impacts on the Swan River Review the bioavailability of fluoride with respect to a revised trigger value and potential impacts upon the Swan River environment	Annual reporting for not less than 2 years following the completion of soil remediation activities (Condition 5-8) At completion of remediation (Condition 5-7) Within 72 hours of becoming aware of non-compliance with this Condition
BMD Gauge Station	Condition 5-4 The monthly flow-weighted mean fluoride concentration remains below 2.0mg/L	Management Response to exceedence may include: Investigate and report upon the nature and significance of the exceedance and likely impacts on the Swan River Review the bioavailability of fluoride and significance with respect to the revised trigger value (PB, 2005c) and potential impacts upon the river	Annual reporting for not less than 2 years following the completion of soil remediation activities (Condition 5-8) At completion of remediation (Condition 5-7) Within 72 hours of becoming aware of non-compliance with this Condition
Lime Dosing Plant	Condition 5-2 (1) The removal efficiency of aluminium and zinc	Management Response to exceedence may include: Onsite recirculation of tail water to prevent direct discharge to	Annual reporting for not less than 2 years following the completion of soil remediation activities (Condition 5-8)

Sample Location	Compliance Target	Potential Management Responses	Reporting to DoE
	remains >90% Condition 5-2 (2) The monthly flow-weighted mean concentration of aluminium in tail water remains <5mg/L Condition 5-2 (3) The monthly flow-weighted mean concentration of zinc in tail water remains <0.5mg/L Condition 5-2 (4) The monthly flow-weighted mean pH of the tail water is between 7 and 9	the Bayswater Main Drain Interception and re-infiltration of groundwater onsite (re-circulation) Ceasing abstraction The treatment of groundwater through a Permeable Reactive Barrier, or similar method, between the site and Bayswater Main Drain	At completion of remediation (Condition 5-7) Within 72 hours of becoming aware of non-compliance with this Condition

8. Remediation and Monitoring End Points

Groundwater and surface water monitoring will be undertaken in accordance with Table 3.1 and Table 3.3, respectively and continue for no less than 2 years following completion of remediation (as defined under Condition 5-7).

Completion of site remediation will be deemed to have been achieved when the following endpoint conditions have been achieved:

- Fluoride, aluminium and zinc flow-weighted mean concentrations at the BMD Gauge Station are no greater than pre-remediation (background) levels, with a 95% certainty (where 'pre-remediation' is defined as being the dataset obtained during 2003-2004); and;
- Until soil contamination levels achieve the criteria for commercial/industrial land use, being the Health Investigative Level 'F' according to the National Environmental Protection Measure (NEPC, 1999) as discussed in the remediation and validation plan (that is, to 3m depth below final grade).

It is worth noting that a summary of the pre-remediation (baseline) water quality conditions has been previously compiled (PB, 2005e) for the purposes of appraising the mean flow-weighted concentrations of fluoride, aluminium and zinc at the Bayswater Main Drain in accordance with Condition 5-7.

9. References

AS/NZS 5667.1:1998 Water Quality-Sampling-Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples
APHA, 20th Edition 1998, Standard Methods for the Examination of Water and Wastewater

PB (2004) Final Remediation Works for the Former Cresco Site, Bayswater, Public Environmental Review, September 2004.

PB (2005a) Remediation and Validation Plan, prepared for CSBP, September 2005.

PB (2005b) Dust Management Plan, prepared for CSBP, September 2005.

PB (2005c) The CSBP Ecotoxicity Project: Direct Toxicity Assessment Using Resident Species January – May 2005.

PB (2005d) Bayswater Main Drain Contaminant Flux Investigation 2003-2005.

PB (2005e) CSBP Bayswater Remediation Support CD.

Appendix A

Ministerial Statement of Conditions
(Statement No. 000691)



RECEIVED
6/10/05

GOVERNMENT OF WESTERN AUSTRALIA

OFFICE OF THE MINISTER FOR THE ENVIRONMENT; SCIENCE

Cameron Schuster
Manager, Environment & Manufacturing Support
CSBP Limited
PO Box 345
KWINANA WA 6966

Dear Mr Schuster

**FINAL REMEDIATION WORKS FOR THE FORMER CRESCO SITE,
BAYSWATER (Assessment No. 1477)**

The Minister for the Environment has issued a statement that the above proposal may be implemented subject to the conditions and procedures contained in that statement (copy attached).

The statement does not remove requirements for you to obtain other statutory approvals. Additionally, please note the duties of a proponent provided for in section 47 of the *Environmental Protection Act 1986*.

As proponent you have the right to appeal against the conditions and procedures, as well as the schedule 1 description of the proposal, in the statement within fourteen days of the date of publication.

Following that period and determination of any appeal, and at the request of the Minister, I will advise the decision-making authorities that they may exercise their decision-making powers.

At the request of the Minister, I will issue that advice earlier on receiving written confirmation that you waive your right of appeal against anything in the statement.

Yours sincerely

Darren Walsh
APPEALS CONVENOR

Att

05 OCT 2005



MINISTER FOR THE ENVIRONMENT; SCIENCE

Statement No.

000681

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

**FINAL REMEDIATION WORKS FOR THE FORMER CRESCO SITE,
BAYSWATER**

Proposal: Remediation of the former Cresco site, which is the land bounded by Tonkin Highway and Railway Parade in the City of Bayswater (Figure 1), involving treatment of soil and groundwater and removal of infrastructure, so that it is suitable for future commercial/industrial use, as summarised in schedule 1 of this statement.

Proponent: CSBP Limited.

Proponent Address: PO Box 345
KWINANA WA 6966

Assessment Number: 1477

Report of the Environmental Protection Authority: Bulletin 1175

The proposal referred to above may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 Subject to the conditions and procedures of this statement, the proponent shall not implement the proposal except in accordance with the description in the Public Environmental Review, September 2004, as summarised in schedule 1 of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act*

Published on

8 5 OCT 2005

1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

- 2-2 If the proponent wishes to relinquish the nomination, the proponent shall notify the Environmental Protection Authority, as required under section 38(5a), and provide: 1) a letter or a copy of this statement, including any future amendments, endorsed by the proposed proponent that the proposal will be carried out in accordance with this statement, 2) the person or title responsible for, and the contact details of, the proposed proponent, and, 3) documentation on the capability of the proposed proponent to implement the proposal and fulfil the conditions and procedures of this statement.
- 2-3 The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.

3 Commencement and Time Limit of Approval

- 3-1 The proponent shall substantially commence the implementation of the proposal within five years of the date of this statement or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

- 3-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 3-1.

The application shall demonstrate that:

1. the environmental factors in EPA Bulletin 1175 have not changed significantly;
2. new, significant, environmental issues have not arisen; and
3. all relevant government authorities and stakeholders have been consulted.

4 Compliance Auditing

- 4-1 The proposal shall not be implemented other than in accordance with an audit program prepared to the requirements of the Minister for the Environment on advice of the Department of Environment. The audit program shall set out the requirements of the conditions, procedures and commitments, the timing for meeting the requirements and a reporting schedule to:

1. provide verifiable evidence of compliance with the conditions, procedures and commitments;
2. describe the current status of the implementation of the proposal;
3. review the performance and, if necessary, update the environmental management plans or programs required by the conditions, procedures and commitments.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environment is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5 Remediation program

Monitoring program

- 5-1 The proponent shall prepare a Preliminary Ground and Surface Water Monitoring Program by 15 October 2005, based upon the current monitoring program, and shall implement the Program immediately. This Preliminary Water Monitoring Program shall be finalised and approved by the Department of Environment by 31 October 2005 and shall be implemented during the remediation program until the Department of Environment authorises the cessation of monitoring as per condition 5-8.

Lime Dosing Performance

- 5-2 During the remediation, the proponent shall operate the lime dosing plant such that all of the following targets are achieved:
1. the removal efficiency of aluminium and zinc from pumped groundwater remains greater than 90 percent;
 2. the monthly, flow-weighted, mean concentration of aluminium in the tail water is less than 5 mg/L;
 3. the monthly, flow-weighted, mean concentration of zinc in the tail water is less than 0.5 mg/L; and
 4. the monthly, flow-weighted, mean pH of the tail water is between 7 and 9.

Ammonia

- 5-3 During the remediation, the proponent shall monitor in accord with the Environmental Monitoring Plan required by condition 5-1, the natural attenuation of ammonia to demonstrate:
1. that the average attenuation rate constant remains above 0.001 per day; and

2. the flow weighted mean concentration of ammonia in surface water at the Bayswater Main Drain Gauge Station remains below 0.91mg/L.

Fluoride

- 5-4 During the remediation, the proponent shall monitor the concentration of fluoride in the water at the Bayswater Main Drain Gauge Station to demonstrate that the monthly flow weighted mean concentration of fluoride remains below 2.0 mg/L.

Contingency Plan

- 5-5 The proponent shall prepare a Preliminary Contingency Plan by 15 October 2005 outlining measures which will be implemented should the requirements of condition 5-2 be not met in any period, or if the flow weighted mean concentration of fluoride exceeds 1.6mg/L. This Preliminary Contingency Plan shall be finalised and approved by the Department of Environment prior to 31 October 2005.

The Plan shall include, but not be limited to, the following contingency measures:

1. onsite recirculation of tailwater from the lime dosing plant to prevent direct discharge to the Bayswater Main Drain; and/or
2. interception and re-infiltration of groundwater on-site;
3. ceasing abstraction; and
4. the treatment of groundwater through a permeable reactive barrier, or similar method, between the site and the Bayswater Main Drain.

Validation

- 5-6 The proponent shall continue to actively remediate the site and conduct validation testing of the soils until the contamination levels achieve the criteria for commercial/industrial land use levels, being the Health Investigation Level 'F', according to the National Environmental Protection Measure (National Environmental Protection Council 1999).

Completion of remediation

- 5-7 The proponent shall continue to actively remediate the site and test the water quality until the monthly flow weighted mean concentrations of fluoride, aluminium and zinc at the Bayswater Main Drain Gauge Station are no greater than background levels, with a 95% certainty, where background levels are defined as the pre-remediation, flow weighted, mean concentrations of fluoride, aluminium and zinc in the Bayswater Main Drain and its tributaries during 2003-2004.

Monitoring period

5-8 The proponent shall continue to monitor groundwater quality for not less than two years following the fulfilment of the requirements of conditions 5-6 and 5-7, and until the Department of Environment authorises the cessation of monitoring.

Memorials on land titles

5-8 The proponent shall provide notification to all prospective owners or lessees of the property, following remediation, of any residual contamination in groundwater beneath the site. This notification shall include the type and extent of the contamination, and any resulting restrictions, or actions required, such as further sampling and laboratory analysis of groundwater to ensure that it is suitable for intended use. This notification is to be provided in a format such that it can be provided to any subsequent owners or lessees.

6 Dust management

6-1 The proponent shall not undertake remediation activities that have the potential to create dust other than in accordance with a Dust Management Plan prepared to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Health.

The Dust Management Plan shall set out measures for all of the following:

1. the assessment of the potential for health risk;
2. the control of dust generation during remediation activities;
3. the implementation of an ambient air quality monitoring programme;
4. a process for managing public queries and complaints; and
5. a process for reporting the results and interpretation of the dust control measures, and for reviewing the performance and, if necessary, implementing improvements of the dust control measures.

6-2 The proponent shall make the Dust Management Plan required by condition 6-1 publicly available during the remediation activities.

Procedures

1. The proponent shall prepare and implement a Noise Management Plan in accordance with Regulation 13 of the *Environmental Protection (Noise) Regulations 1997*, on the advice of the City of Bayswater.

Notes

1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the

Environmental Protection Authority will provide that advice to the Department of Environment for the preparation of written notice to the proponent.

2. The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment.
3. Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment.
4. The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment over the fulfilment of the requirements of the conditions.

Judy Edwards

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

05 OCT 2005

Schedule 1

The Proposal (Assessment Number 1477)

The proposal is for the remediation of the former Cresco site, which is the land bounded by Tonkin Highway and Railway Parade in the City of Bayswater (Figure 1), involving the excavation and disposal/treatment of soil, and the abstraction and treatment of groundwater and the removal of buildings and associated infrastructure.

Table 1: Key Proposal Characteristics

Element	Description
Volume of contaminated soil material.	Approximately 280,000 cubic metres of soil material containing heavy metals, fluoride compounds and acid generating compounds and other contaminants.
Remediation of soil contamination:	Excavation and either removal to landfill or treatment and reuse onsite.
Management of groundwater contamination:	Abstract and treat groundwater to remove contaminants. Disposal of treated groundwater via infiltration onsite or direct discharge to the Bayswater Main Drain.
Remediation time frame:	Approximately 5 years.
Area for remediation	Approximately 37 hectares
Infrastructure, including buildings	Removed to suitable disposal sites.

Figure 1. Location of site

Appendix B

Preliminary Contingency Management Plan

Preliminary Contingency Management Plan

The following contingency measures have been identified in the unlikely event that the performance targets outlined in the Ministerial Statement of Conditions (No. 000691) are not met.

The measures reflect the most likely management options. However, the nature, source and cause of any such exceedence would, in the natural course of proceedings, need to be properly investigated before determining which of these measures, or indeed any alternative measures, would be the most appropriate to employ.

In a practical sense, any pending or actual exceedence will trigger an investigation and report, including a recommended contingency response, to be submitted to the Department of the Environment for further consideration.

Notwithstanding the above, CSBP will notify the Department of Environment within 72 hours of becoming aware of an exceedence of the Ministerial Conditions.

The following provides a summary of the relevant Ministerial Conditions and the prospective contingency response/s to be considered more fully (based upon further investigation at the time).

Contingency measures include, but are not limited to, the following:

1. Groundwater

Condition 5-3 (1)

The average natural attenuation rate constant (k) of ammonia remains above 0.001 per day

Should the above requirement not be met, then one or more of the following contingency measures may be implemented:

1. Interception and re-infiltration of groundwater onsite (re-circulation)
2. Relocation of the lime dosing infiltration basin to increase the length of the attenuation pathway to the Bayswater Main Drain in order to achieve the natural attenuation target
3. Possible augmentation of groundwater nitrification/denitrification through the addition of a suitable source of organic carbon.

2. Bayswater Main Drain Gauge Station

Condition 5-3 (2)

The flow-weighted mean concentration of ammonia remains below 0.91 mg/L

Should the above requirement not be met, then the following contingency measure may be implemented:

1. Possible relocation of the lime dosing infiltration basin to increase the natural attenuation pathway to the Bayswater Main Drain to achieve natural attenuation target

Condition 5-5

The flow-weighted mean concentration of fluoride concentration should not exceed 1.6mg/L

Should the above requirement not be met, then the following contingency measure may be implemented:

1. Review the bioavailability of fluoride with respect to a revised trigger value and potential impacts upon the Swan River environment. There is strong evidence to suggest that the bioavailability and/or toxicity of fluoride in estuarine ecosystems is greatly diminished (PB, 2005c). Further investigation would be required to appraise the likelihood of adverse impacts arising from such an exceedence.

3. Lime Dosing Plant

Condition 5-2 (1)

The removal efficiency of aluminium and zinc remains >90%

Condition 5-2 (2)

The monthly flow-weighted mean concentration of aluminium in tail water remains <5mg/L

Condition 5-2 (3)

The monthly flow-weighted mean concentration of zinc in tail water remains <0.5mg/L

Condition 5-2 (4)

The monthly flow-weighted mean pH of the tail water is between 7 and 9

Should one or more of the above requirements not be met then the following contingency measure/s may be further considered:

1. Onsite recirculation of tail water to prevent any direct discharge to the Bayswater Main Drain
2. Interception and re-infiltration of groundwater onsite (re-circulation)
3. Ceasing groundwater abstraction
4. The treatment of groundwater through a Permeable Reactive Barrier, or similar method, to be installed between the site and Bayswater Main Drain

It is worth noting also that the lime dosing plant is currently equipped with real time logging of pH such that if the pH falls to less than 7 or rises above 9 then the pump feeding groundwater into the dosing plant (from the storage tank) is switched off. This effectively prevents the discharge of tail water from the plant that does not meet the specified pH requirement. In addition, the telemetry system automatically notifies the plant operator that the dosing plant has been shutdown (providing 24 hr surveillance).

Any longer term failure of the lime dosing plant is most likely to arise from a deliberate act of vandalism, which has been a problem given the remoteness of the site. However, the abstraction pumps and dosing plant are now both housed in secure compounds (electric fence and monitored alarms).