



Peter Clifton & Associates

Consulting Hydrogeologists

A division of Saguaro Holdings Pty Ltd
ACN 073 231 295, ABN 33 216 640 980

Office: 11 Southport Street, LEEDERVILLE, WA 6007
Postal Address: PO Box 186, FLOREAT, WA 6014

Telephone: (08) 9388 9191
Facsimile: (08) 9388 7171

**2008 ANNUAL AUDIT
SEEPAGE AND GROUNDWATER MANAGEMENT PLAN
FIMISTON I AND FIMISTON II TAILINGS STORAGE FACILITIES**

Report prepared for:

Kalgoorlie Consolidated Gold Mines Pty Ltd
Private Mail Bag 27
Kalgoorlie WA 6433

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In association with: Peter O'Bryan & Associates
George, Orr and Associates (Australia)

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LIST OF ACRONYMS

mBGL	metres below ground level
CRG	Community Reference Group
DEC	Department of Environment and Conservation
DoW	Department of Water
EC	Electrical conductivity
KCGM	Kalgoorlie Consolidated Gold Mines Pty Ltd
LFA	Landscape Function Analysis
SGMP	Seepage and Groundwater Management Plan
SWL	Static water level
TDS	Total dissolved salts
TSF	Tailings Storage Facility
WAD	Weak Acid Dissociable
WPCC	Water Pollution Control Condition (referenced in DEC licences)

1 INTRODUCTION

1.1 Background

Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) manages the mining and ore processing operations at the Fimiston Open Pit (Kalgoorlie Super Pit) and Mt Charlotte Underground gold mines on behalf of joint owners Barrick Gold of Australia Ltd and Newmont Australia Limited.

Gold ore from KCGM's mining operations is processed at the Fimiston Mill which is located on the eastern side of the Fimiston Pit. Tailings generated by the Fimiston Mill are currently directed into the Fimiston I and Fimiston II Tailings Storage Facilities (TSF) (Figure 1).

KCGM has been managing seepage from the Fimiston I and Fimiston II TSFs into the underlying natural formations since the early 1990s by monitoring groundwater levels and hydrochemistry, and recovering a mixture of native groundwater and seepage using production bores and trenches (Figures 2 and 3). These groundwater production and monitoring facilities are known as KCGM's Eastern Borefield.

KCGM has prepared a Seepage and Groundwater Management Plan (SGMP) to oversee the planning and management activities associated with controlling groundwater around the Fimiston I and Fimiston II TSFs. This document was first released in September 2005, and annual audits of the SGMP were completed in 2006 and 2007. KCGM has revised the SGMP on the basis of comments from the Department of Environment and Conservation (DEC) and the annual audits. The current version of the SGMP was released in October 2007 (KCGM, 2007a).

Requirements for the environmental management of KCGM's Fimiston Mill and tailings storage operations are specified by the DEC in Licence 6420. This licence has been issued either annually or biannually to KCGM since October 1996, and the current licence is 6420/11. DEC Licence 6420/11 is valid for a two year period between 1 October 2006 and 30 September 2008.

Water Pollution Control Condition (WPCC) W12 in DEC Licence 6420/11 requires that KCGM implement the SGMP, and WPCC W13 requires that KCGM conduct an annual audit of the SGMP. Specific requirements of the audit are:

- Review KCGM's progress towards existing targets and milestones in the SGMP
- Review whether the objectives of the SGMP are being achieved, and if these objectives are still appropriate
- Include a statement of independence of the auditor

This report presents the audit of KCGM's Seepage and Groundwater Management Plan as required by DEC Licence 6420/11. Appendix A contains the required statement of independence of the auditor.

1.2 Scope of Audit

For reporting purposes, this audit applies to all activities conducted under the SGMP between 1 July 2007 and 30 June 2008. DEC Licence 6420/11 has applied to KCGM's operations during the entire audit period.

It is not within the scope of this audit to conduct a full review of groundwater monitoring data that have been collected as part of the SGMP. Data collected in the first half of this audit period (ie, July to December 2007) are reviewed and discussed in the 2007 annual report on groundwater monitoring data from the Eastern Borefield. Data collected during the second half of this audit period will be included in the 2008 annual monitoring data report.

Where appropriate, this audit will reference monitoring data presented and discussed in KCGM's quarterly reports prepared for the DEC.

1.3 Public Comment

As required by WPC 13(b) in DEC Licence 6420/11 a draft of this audit report was made available for public comment.

2 SGMP OBJECTIVES

The objectives of the SGMP as stated in Section 3 of KCGM (2007a) are:

"The primary objective of the SGMP is to operate, monitor and develop the Eastern Borefield so as to minimise environmental impact to the local habitat. This is particularly in relation to the prevention of harm to vegetation assemblages as a consequence of rising groundwater levels. The secondary objective of the SGMP is to ultimately restore groundwater levels to agreed targets based upon the historical groundwater levels for the region."

Audit Comment – SGMP Objectives

The primary objective of the SGMP recognises the vegetation assemblages in the vicinity of the Fimiston I and Fimiston II TSFs as the main environmental value that requires protection from the adverse effects of TSF seepage. The SGMP also recognises that in

order to protect vegetation, the water table must be maintained at a sufficient depth below the natural surface to avoid saturating the root zone (see Section 4 of KCGM, 2007a). The SGMP has stated minimum depths to the water table and trigger (action) levels of 4 m and 6 m.

The SGMP has as a secondary objective the reduction of groundwater levels to what are inferred to be “historic” groundwater levels, or those groundwater levels that occurred prior to the impacts of seepage from the Fimiston I and Fimiston II TSFs. The implicit assumption in this statement is that historically the water table in the vicinity of these TSFs was at a greater depth than either the 4 m or 6 m depths discussed in the previous paragraph. There is little doubt that this is a correct assumption.

The primary and secondary objectives of the SGMP are considered to be reasonable for the following reasons:

- The objective to protect the vegetation is overarching in the sense that it also ensures the soil profile is not degraded by excess salinity. The latter would be an undesirable impact that may cause loss of soil structure and erosion.*
- Reduction of groundwater levels to historic levels will require the removal of large volumes of groundwater from aquifer storage over time, and this process will recover a large proportion of the TSF seepage that has entered the aquifer.*
- In the post-closure setting when the TSFs have been decommissioned and their surfaces rehabilitated, groundwater levels will eventually reach an equilibrium somewhere near the historic levels and this will ensure the ongoing protection of the vegetation assemblages in the area.*

It is the auditor’s opinion that the dual objectives of protecting vegetation and reducing groundwater levels to historic levels are sufficient to allow the long-term health of the natural environment in the vicinity of the TSF to be protected. This opinion was also stated in the previous audit report (Peter Clifton & Associates, 2007).

One comment received from the DEC on the previous audit was a recommendation that KCGM conduct research into the depth of tree roots for eucalypt species in the vicinity of the Fimiston I and Fimiston II TSFs, and that this be discussed with KCGM’s Community Reference Group (CRG). KCGM has indicated that discussions with the CRG on this recommendation were planned for 2nd quarter 2008, however these discussions have been delayed until 3rd quarter 2008.

3 SGMP PERFORMANCE TARGETS

Performance targets in the SGMP are presented as either standards to be maintained, or tasks and the time frames over which they are to be completed. Standards cover items such as licence conditions and the specifications for new monitor or production bores.

3.1 Standards

Standards are discussed in Section 2 of the SGMP, and include the following three items:

- Licence conditions
- Construction of monitor and production bores
- Collection and analysis of groundwater samples

3.1.1 Licence Conditions

Section 2.1 of the SGMP refers to the following licences:

- DEC Licence 6420/11
- Department of Water (DoW) Licence 66252(5)

3.1.1.1 DEC Licence Conditions

WPCC W12 in DEC Licence 6420/11 requires KCGM to implement the SGMP, and indicates that conditions in Licence 6420/11 have precedence over the contents of the SGMP in the case of any inconsistencies.

Specific conditions in DEC Licence 6420/11 referred to in the SGMP are as follows:

- Operate the Fimiston I and Fimiston II TSFs in line with Conditions W3 (freeboard), W4 (bundling of pipelines), W5, (visual inspections), W6 (stormwater diversion), W11 (groundwater monitoring), W12 and W13 (SGMP), and W14 (vegetation monitoring).
- Notify the DEC if the above conditions can not be met as soon as practicable.
- Prepare quarterly reports presenting the results of the monitoring program required by Condition W11.
- Prepare an Annual Environmental Report as required by Condition G2. This report is to include a discussion of the vegetation monitoring program required by Condition W14.

Audit Comment 1 – DEC Licence Conditions

DEC Licence 6420/11 requires that KCGM notify the DEC “as soon as practicable” after waste discharge is identified where the discharge has occurred as a result of an emergency, accident or malfunction, or extreme weather conditions, and such discharge has caused or is likely to cause pollution. This requirement is also stated in Section 72 of the Environmental Protection Act 1986.

Some of the particular conditions in DEC Licence 6420/1 require KCGM to notify the DEC within 24 hours of becoming aware that a condition has been breached. Condition W4 (bundling of pipelines) is one such condition, where notification of the DEC within 24 hours is required for spills of saline, alkaline, or cyanide liquids that escape from bundled areas where the volume of the spill is >5 kL.

The second dot point in the above list should be revised to reflect that some particular conditions in DEC Licence 6240/11 require the DEC to be notified within 24 hours of KCGM becoming aware of a condition being breached.

Particular details of the monitoring program outlined in WPCC W11 of DEC Licence 6420/11 are as follows:

- Collect samples every month from the groundwater production bores, Fimiston I North Trench, Fimiston II South Trench, Decant 1, and Decant 3, and analyse these samples for pH and electrical conductivity (EC)
- Collect samples annually from the groundwater production bores, Fimiston I North Trench, Fimiston II South Trench, Decant 1, and Decant 3, and submit these for analysis of total dissolved salts (TDS) concentration and cyanide concentrations [total, free, and Weak Acid Dissociable (WAD)]
- Measure and record static water levels (SWLs) in the groundwater monitor bores every three months
- Collect samples from the groundwater monitor bores every quarter and analyse these samples for pH, EC, a suite of trace elements (As, Cu, Fe, Hg, Zn), and cyanide concentrations (total, free, and WAD)
- Collect samples every month from a sub-set of twenty groundwater monitor bores, and submit these samples for analysis of pH, EC, a suite of trace elements (As, Cu, Fe, Hg, Zn), and cyanide concentrations (total, free, and WAD)

WPCC W11 in DEC Licence 6420/11 contains the following clauses:

“A minimum of 90% of all Production Bores around the facilities will be sampled during any quarterly period to allow for maintenance considerations.”

“This 90% minimum for monitoring frequencies does not include Production Bores PB F102, PB F103, PB F105, PB F106, PB F107, PB F108, PB F109, PB F110, PB F116, PB F117, PB F118, and PB F119 which are located within the TSF embankments and are often impacted by operation and maintenance of the facility. KCGM is to take all reasonable and practicable measures to maintain these bores, and will advise of their operational status within the reports required for this licence.”

Table 1 lists the conditions in DEC Licence 6420/11 that are referenced in the SGMP, and includes a column indicating whether KCGM has achieved the expected performance standards.

Audit Comment 2 – DEC Licence Conditions

During the audit period KCGM satisfied the requirements to operate the Fimiston I and Fimiston II TSFs in line with DEC Licence Conditions W3 (freeboard), W4 (bundling of pipelines), W5, (visual inspections), W6 (stormwater diversion), W11 (groundwater monitoring), W12 and W13 (SGMP), and W14 (vegetation monitoring).

All items in the groundwater monitoring program stated in Condition W11 have been completed as required. Note that of the 60 monitor bores in the quarterly sampling list, 7 have been dry for >3 years, and at least 4 others generally have <1 m of water in the casing which makes collecting a representative groundwater sample difficult.

KCGM submitted the required quarterly reports on monitoring data for the 3rd and 4th quarters of 2007, and 1st quarter of 2008, and is currently preparing the report for the 2nd quarter of 2008. KCGM submitted the required Annual Environmental Report (AER) to the DEC.

It is recommended that dry monitor bores, and monitor bores that do not contain sufficient water to allow sampling, not be removed from the sampling schedules. A determination should be made at the time of the scheduled sampling whether collection of a sample is possible, and bores that can not be sampled should be listed in the required quarterly and annual reports to the DEC.

Reportable Environmental Incidents are incidents that must be reported to state government departments under the terms and conditions in DEC Licence 6420/11.

Audit Comment – Reportable Environmental Incidents

No Reportable Environmental Incidents occurred during the audit period with the conditions or requirements of DEC Licence 6420/11 that are listed in Table 1.

3.1.1.2 DoW Licence Conditions

Specific conditions in DoW Licence 66252(5) that are listed in the SGMP are as follows:

- Operate the Eastern Borefield in accordance with conditions specified and the current Operating Strategy.
- Prepare annual reports on the groundwater monitoring data from the Eastern Borefield.

The Operating Strategy for the Eastern Borefield includes a groundwater monitoring program, and discusses general operational principles for the borefield. One objective discussed in the Operating Strategy is to maximise the groundwater production by the borefield, and this is one task of the SGMP. KCGM's progress towards meeting this objective during the audit period is discussed in Section 3.2.3. KCGM's compliance with monitoring and reporting requirements of the Operating Strategy is discussed below.

Audit Comment – Eastern Borefield Operating Strategy

The only monitoring required by the Operating Strategy for the Eastern Borefield that is in addition to the monitoring required by DEC Licence 6420/11 is the recording of groundwater production volumes every month from all operating production bores and trenches. KCGM has collected this information as required during the audit period.

The Operating Strategy requires a group of ten production bores to be sampled every three years for major component analysis. Sampling of these bores is next required in 2008.

As required, KCGM prepared and submitted the 2007 annual report on groundwater monitoring data from the Eastern Borefield.

3.1.2 Construction of Monitor and Production Bores

Section 2.2 of the SGMP refers to standards for the construction of monitor bores and production bores in the Eastern Borefield, and states that at a minimum, bores are to be constructed according to requirements specified by:

- The Department of Environment and Conservation
- National Minimum Bore Specification Committee – Minimum Construction Requirements for Water Bores in Australia (2nd edition, 2003)
- Department of Water Guideline No. 4 – Installation of Mine Site Groundwater Monitoring Bores

Audit Comment – Construction of Monitor and Production Bores

No new monitor or production bores were constructed in the Eastern Borefield during the audit period.

3.1.3 Collection and Analysis of Groundwater Samples

Section 2.3 of the SGMP refers to standards for collecting and analysing groundwater samples. These standards are also referenced in WPCC W11(b) and W11(c) of DEC Licence 6420/11. The requirements for sample collection and analysis are as follows:

- Groundwater samples collected within the scope of the SGMP are in accordance with Australian Standard 5667.1-1998
- Groundwater samples collected within the scope of the SGMP and subsequently submitted for laboratory analysis are to be analysed by a laboratory with current NATA Accreditation and in accordance with the current edition of “Standard Methods for Examination of Water and Wastewater – APHA-AWWA-WEF”

Audit Comment – Groundwater Sampling and Analysis

KCGM has engaged Gecko Environmental Monitoring and Sampling Services (Gecko) to collect groundwater samples from the Eastern Borefield monitor bores, production bores, trenches, and the Fimiston I and Fimiston II TSF decants. Gecko has advised the auditor that they have sampling procedures in place that are in accordance with

Australian Standard 5667.1-1998, and that these procedures are used when collecting samples at KCGM's Eastern Borefield.

KCGM engaged SGS Environmental Services (SGS) during 2007 and Australian Laboratory Services Pty Ltd (ALS) during 2008 to analyse samples of groundwater from the Eastern Borefield. Both laboratories have current NATA Accreditation (SGS accreditation number 2562; ALS accreditation number 825), and both laboratories have advised the auditor that water analyses are conducted according to the current edition of "Standard Methods for Examination of Water and Wastewater – APHA-AWWA-WEF".

3.2 Tasks

Sections 4, 5, 6 and 7 of the SGMP discuss several tasks to be completed, and the completion times. The following sections discuss the particular tasks and KCGM's progress towards their completion.

3.2.1 Groundwater Level Management

As indicated by the objectives of the SGMP groundwater level management is conducted for the dual purposes of minimising environmental impact, and in particular protecting vegetation from rising water tables, and also to restore groundwater levels to agreed targets based on historical groundwater levels. Groundwater levels in the vicinity of the Fimiston I and Fimiston II TSFs are managed basically by operating and monitoring the Eastern Borefield, and by minimising the size of the supernatant pool of water on top of the TSFs. Specific tasks in the SGMP for managing groundwater levels are:

- Establish historic groundwater level distribution
- Manage the size of the supernatant pools on top of the TSFs
- Operate the production bores in the Eastern Borefield
- Semi-continuous monitoring of groundwater levels
- Monitoring of groundwater level trends

KCGM defines the "Operational Area" of the TSFs to include the tailings footprint plus a halo around the perimeter of each facility. The halo has a maximum width of 100 m, or may be less where it is truncated by the boundary of the premises. The SGMP notes that the target minimum depth to groundwater of 4 m may not be achievable within the Operational Area of the TSFs.

Audit Comment – Concept of TSF Operational Area

In the previous audit it was stated that KCGM's selected maximum halo width of 100 m is considered to be reasonable because this area is highly disturbed and will eventually be rehabilitated when the TSFs have been closed. A greater width can not be justified as this would encroach on undisturbed areas where arguments to have water tables deeper than the minimum 4 m can be applied for the purpose of protecting the vegetation. A significantly smaller width for the halo is difficult to justify as this is very unlikely to improve groundwater management practices.

KCGM's use of the Operational Area concept to manage groundwater levels near the TSFs is still considered to be a reasonable approach. However it remains that it is not in KCGM's interests to have widespread shallow water tables in these areas as these could impact access to the TSFs and contribute to elevated water tables beyond the designated Operational Areas.

The following sections discuss the specific tasks in the SGMP for managing groundwater levels.

3.2.1.1 Estimation of Historic Groundwater Level Distribution

The first draft of the historic groundwater level report was prepared and released by KCGM in January 2006. This draft was revised after comments were received from the DEC, and a second draft of this report was prepared and released for public comment in May 2007. Comments from community members on this draft were received via the DEC in December 2007, and KCGM responded to these comments in January 2008. This document was accepted by the DEC in April 2008.

3.2.1.2 Management of TSF Supernatant Pool Size

During normal operations, water from the tailings slurry discharged on top of the Fimiston I and Fimiston II TSFs collects around decant points that are located towards the centre of each active cell. This water is subsequently removed by gravity drainage.

One task set by the SGMP is to minimise the area of the supernatant pools of water on the Fimiston I and Fimiston II TSFs. Minimising the size of these pools is desirable because this reduces downward seepage to the underlying natural formations.

Audit Comment – TSF Supernatant Pool Size

During the audit period, KCGM discharged tailings continuously to the Fimiston I TSF, and to the three cells of the Fimiston II TSF for periods of about three months each. Tailings disposal into the Fimiston I TSF will stop when the permitted height and capacity of the single cell is reached. The tailings deposition period is followed by a drying period, and when the tailings are sufficiently dry the walls of the TSF cell are then raised. Tailings deposition can then recommence when required.

KCGM states in the SGMP that the aim is to maintain the area of the supernatant pool of water on the active TSF cells at less than 15% of the cell areas. During periods of tailings deposition the areas of the supernatant pools is estimated by means of land surveys, usually at fortnightly intervals. Pool size is also monitored as part of the required visual inspections of the TSF facilities (WPPC W5 of DEC Licence 6520/11).

The SGMP notes that the size of a supernatant pool can increase after rainfall, in which case the pool area may exceed the target maximum value. The SGMP states that in this situation, water on top of the TSFs will be used for ore processing in preference to groundwater derived from KCGM's remote saline water borefields.

The areas of the TSF cells and corresponding 15% cell areas during the audit period were as follows:

TSF / Cell	Cell Area (ha)	15% of Cell Area (ha)
<i>Fimiston I</i>	<i>103 – 104</i>	<i>15.4 – 15.6</i>
<i>Fimiston II, A/B</i>	<i>113</i>	<i>16.9</i>
<i>Fimiston II, C</i>	<i>88 – 89</i>	<i>13.1 – 13.3</i>
<i>Fimiston II, D</i>	<i>91</i>	<i>13.6</i>

During the audit period the areas of the supernatant pools on the Fimiston I and Fimiston II TSFs were estimated by surveying on 58 occasions. The reported areas range between 1.6 ha and 9.1 ha on the Fimiston I TSF, and between 3.5 ha and 19.4 ha on the Fimiston II TSF. The median pool areas were 3.1 ha on the Fimiston I TSF, and 8.9 ha, 7.2 ha, and 6.2 ha on A/B, C, and D Paddocks of the Fimiston II TSF, respectively.

KCGM has indicated that on two occasions during the audit period the area of the supernatant pools exceeded the maximum target areas:

- The first instance occurred in September 2007 on D Paddock, Fimiston II TSF, shortly after the start of a deposition cycle which followed a normal drying period. On this occasion the estimated area of the supernatant pool was 13.8 ha (cf*

median pool area of 6.2 ha, and maximum target area of 13.6 ha). This was due to the contour of the surface of the dried tailings and the required height of the first overflow port of the decant tower which caused the initial pool size to be unusually large. At the subsequent fortnightly survey this pool area was 5.7 ha, which is less than the 15% target area for this cell.

- The second instance occurred on 22 February 2008 on A/B Paddock, Fimiston II TSF. During the preceding five days 60 mm of rainfall was recorded at the Kalgoorlie weather station. This also coincided with a shut down of the Fimiston Mill and reduced recovery of water from the TSF decants. The reported supernatant pool area at this time was 19.4 ha (cf median pool area of 8.9 ha and maximum target area of 16.9 ha). By the time of the subsequent fortnightly survey the area of the supernatant pool had fallen below the target maximum, and was 11.4 ha.*

This task of the SGMP is considered to have been satisfactorily completed during the audit period as there were no prolonged periods when supernatant pool areas exceeded target maximum areas. On the two occasions during the audit period when surveyed pool areas exceeded target maximum areas the pool areas were reduced below the targets by the time of the next fortnightly survey.

3.2.1.3 Operation of Eastern Borefield Production Bores

Operation of the Eastern Borefield is necessary to control groundwater levels in the vicinity of the Fimiston I and Fimiston II TSFs and prevent unacceptable impacts to the main environmental value which is the vegetation assemblages.

KCGM has established a target in the SGMP of having at least 90% of the production bores in the Eastern Borefield operating during any calendar month. The SGMP does recognise that this target may not be achieved when there is a shut down of the Fimiston Mill and there is no demand for process water.

KCGM remotely monitors the status of the production bores in the Eastern Borefield, and effectively can assess in real time how many of the bores are pumping. Bores that are not operating are flagged for inspection to determine what maintenance is required to return them to service.

Audit Comment – Operation of Eastern Borefield Production Bores

During the audit period, the proportion of Eastern Borefield production bores that were operating during any calendar month ranged between 88% and 99%, and the average of the monthly statistics is 95%. KCGM achieved the 90% borefield utilisation target during eleven months of the audit period.

Production bore utilisation fell below the 90% target in November 2007 due to scheduled maintenance on a major water storage tank (Southern Surge Tank). KCGM informed the DEC of this work and the possible impact this may have on borefield utilisation.

The non-achievement of the 90% borefield utilisation target in one month of the audit period is not considered to be detrimental to the overall performance of the borefield and long-term objectives of the SGMP.

KCGM commissioned five production bores on the north east side of the Fimiston II TSF during the 4th quarter of 2007, and six production bores on the north side of the Fimiston I TSF during the 1st quarter 2008. Total groundwater production by the Eastern Borefield during the audit period was 2,838 ML, which is ~10% greater than the production during the previous audit period. This is positive for the general objectives of the SGMP.

3.2.1.4 Semi-Continuous Monitoring of Groundwater Levels

KCGM installed groundwater level sensors and logging equipment in five monitor bores within the Eastern Borefield. The intent is to monitor groundwater levels at a frequency that is greater than can be achieved using manual measurement methods, and identify possible responses of groundwater levels to cyclic tailings deposition and rainfall events.

The SGMP indicates that data are to be presented in the quarterly reports required by WPCC W11 of DEC Licence 6420/11, and the annual reviews of groundwater monitoring which includes data collected to 31 December.

Audit Comment – Semi-Continuous Monitoring of Groundwater Levels

KCGM first installed the water level sensors and loggers in five monitor bores in the Eastern Borefield in January 2006. Several equipment problems were encountered soon after installation, and some sensors rapidly corroded in the saline groundwater. An issue with the venting of the pressure transducers was identified during the first audit, and this

was subsequently corrected. Problems with the sensors and loggers have continued to occur, and many of instruments have been returned to the manufacturer for repair.

Data from the pressure sensors and loggers have been presented in the quarterly reports to the DEC as required, and these reports have noted when equipment issues have occurred. Data have also been presented and discussed in the annual monitoring reviews for 2006 and 2007.

While the sensors and loggers have not proven to be reliable for long-term groundwater level monitoring, some have produced records for >1 month and these are useful for examining trends over shorter time frames. In addition, many of the sensors have produced results which appear to drift over time and can be difficult to interpret without corroborating manual groundwater level measurements.

None of the data from the pressure sensors and loggers has indicated a need to alter the groundwater management strategy at the Fimiston I and Fimiston II TSFs.

It would be useful if all data from these installations were reviewed in the context of the objective of this exercise, and a decision then made on how best to proceed with this component of the monitoring program.

3.2.1.5 Management Decisions Based on Groundwater Level Trends

Section 4.5 of the SGMP explains KCGM's management strategy for groundwater levels and groundwater level trends in the vicinity of the Fimiston I and Fimiston II TSFs. Decisions on whether to increase the "pumping capacity" (ie, groundwater extraction rates) are based on the depth to the water table and groundwater level trend. The criteria used are as follows:

Groundwater Level and Trend	Action
Groundwater level less than 4 mBGL (below ground level) with rising or stable trend	Increase pumping capacity within two quarters
Groundwater level between 4 mBGL and 6 mBGL, with rising trend	Increase pumping capacity within three quarters
Groundwater level greater than 6 mBGL, with rising trend	Extrapolate trend, and increase pumping capacity in sufficient time to maintain groundwater level greater than 6 mBGL

The SGMP indicates KCGM examines groundwater levels and trends for comparison with the above criteria at the time of preparation of the quarterly reports. The general objective is to increase the pumping capacity of the Eastern Borefield to achieve groundwater levels of >6 mBGL outside the Operational Area of the TSFs. The concept of the TSF Operational Area is discussed in Section 3.2.1.

Audit Comment – Groundwater Level Trends

KCGM's quarterly reports on groundwater monitoring data for the last two quarters of 2007 and first quarter of 2008 list monitor bores where the depth to the water table might lead to decisions to increase pumping capacity according to criteria in the above table. With one exception, all of these bores are close to the TSFs and are within the defined Operational Area.

Shallow groundwater levels (~4 mBGL) have occurred for a few years in one bore (MB F22) located adjacent to a catch pit near the Fimiston Mill. This bore is in a highly disturbed area and near a waste rock dump. Groundwater level trends in the nearest monitor bores to MB F22 indicate that the shallow water table at MB F22 is probably localised, and for this reason is not of major concern. There also does not appear to be any impact to natural vegetation as a consequence of the high water table at MB F22.

Contour plans of changes in groundwater levels presented in previous annual reviews indicate groundwater levels in the broader floodway area between the TSFs and southwest of the Fimiston II TSF have fallen slightly (~1 m – 2 m) since 2002 in response to ongoing operation of the Eastern Borefield. However groundwater levels in this area in particular may increase rapidly in response to widespread natural recharge from an extreme rainfall event. Groundwater level hydrographs from monitor bores in the central part of the floodway indicate groundwater levels can rise by up to 2 m after flooding occurs.

KCGM's management criteria indicate that the pumping capacity of the Eastern Borefield will be increased within two or three quarters on the basis of groundwater levels and trends. This concept is reasonable from the perspective that groundwater levels tend to change slowly, and the proposed timeframes should generally be sufficient to allow appropriate action to be taken. However it is not in KCGM's interests to allow groundwater levels to increase unchecked in areas where the water table is >6 mBGL as this will prolong the overall pumping effort required to achieve the historical groundwater level targets. This last point does not need to be explicitly recognised in the SGMP.

The SGMP notes that decisions to increase the number of production bores in the Eastern Borefield will be based on groundwater level trends in monitor bores and the

objective of achieving water table depths >6 m outside the Operational Area. As noted in previous audits, there may be situations where increasing the pumping capacity can be achieved by upgrading existing infrastructure, such as pumps and pipelines. This needs to be acknowledged in the SGMP, as the successful operation of the Eastern Borefield relies on the integration of all associated infrastructure.

3.2.2 Groundwater Quality Management

The hydrochemistry of groundwater samples from the monitor bores and production bores of the Eastern Borefield are being monitored according to schedules in DEC Licence 6420/11 and DoW Licence 66252(5) – see Sections 3.1.1.1 and 3.1.1.2 of this report.

3.2.2.1 Monitoring

Section 5.1 of the SGMP discusses the hydrochemical monitoring program for monitor bores that was introduced when the SGMP was implemented in October 2005.

Audit Comment – Groundwater Quality Monitoring

KCGM has undertaken the required groundwater monitoring tasks during the audit period in accordance with the schedules in DEC Licence 6420/11 and DoW Licence 66252(5).

As required by the SGMP, these data were presented and discussed in the 2007 annual review of monitoring data. Hydrochemical monitoring data are also presented in the quarterly reports to the DEC.

The scope of hydrochemical monitoring conducted under the SGMP is greater than the scope which applied prior to the SGMP being implemented in October 2005. A suite of trace elements has been included in the monitoring program, and several bores are now being sampled at greater frequencies.

As indicated in the SGMP, the 2006 and 2007 annual reviews of monitoring data included an assessment of the efficacy of the expanded scope of groundwater monitoring that was introduced with the SGMP. Recommendations were included in those reviews to reduce the scope of the hydrochemical monitoring program, and KCGM needs to discuss these recommendations with the DEC.

While groundwater quality monitoring does not contribute much information to the management of groundwater levels and the protection of vegetation, spatial and temporal variations in groundwater chemistry provide useful information that contributes

to the larger understanding of how an aquifer behaves. The latter information is important in the context of the overall management of the Eastern Borefield and achievement of the longer-term objectives of the SGMP.

3.2.2.2 Groundwater Recovery

Section 5.2 of the SGMP discusses groundwater recovery for the purpose of managing groundwater quality.

Audit Comment – Groundwater Recovery

The SGMP notes that the recovery of groundwater for the purpose of managing hydrochemistry is secondary to the recovery of groundwater for the purpose of managing groundwater levels. The SGMP also notes that the presence of TSF seepage in some of the natural groundwater has not detracted from the beneficial use of this resource for mineral processing.

Both of these positions are considered reasonable, and there is no particular need to revise either position at this stage.

3.2.3 Vegetation Monitoring

KCGM completed a review of their vegetation monitoring program in 2005 as required by the first draft of the SGMP. After review and consultation on this document, including input from the DEC and KCGM's Community Reference Group, a revised vegetation monitoring program was developed by KCGM (KCGM, 2007b). This program has since been implemented by KCGM.

The methodology adopted for vegetation monitoring in 2007 and subsequent years is based on Landscape Function Analysis (LFA), and differs from the methodology used in previous years. The data from the 2007 vegetation monitoring survey form a baseline that will be used for comparison with subsequent data. Photographic monitoring at specific sites is conducted as part of LFA, and has also been conducted in previous years. These provide one means of assessing whether the health of vegetation is changing over time.

Under WPCC W14 of DEC Licence 6420/11, KCGM is required to undertake a vegetation survey at the Fimiston TSFs, and report the results of this survey in the Annual Environmental Report.

Audit Comment – Vegetation Monitoring

KCGM completed the required vegetation monitoring in 2007 according to the monitoring plan in place at that time. As required, the results of this survey were included in the 2007 Annual Environmental Report (KCGM, 2008). Photographic monitoring conducted as part of the survey indicated that the health of vegetation at the monitoring sites remained generally unchanged from conditions noted in the previous year when vegetation health was assessed to be good.

4 ASSESSMENT OF PROGRESS TOWARDS ACHIEVING SGMP OBJECTIVES

The objectives of the SGMP are listed in Section 2 of this report.

The primary objective of the SGMP is to minimise the environmental impacts of operating the Fimiston I and Fimiston II TSFs, and in particular prevent harm to vegetation assemblages. The secondary objective of the SGMP is to ultimately reduce groundwater levels to agreed targets based upon the historical groundwater levels for the region.

Audit Comment – Assessment of Progress Towards Achieving Objectives

As indicated by the vegetation survey discussed in the KCGM's 2007 Annual Environmental Report, the primary objective of protecting the vegetation assemblages in the vicinity of the Fimiston TSFs has been satisfactorily achieved, at least at the time of the survey. The auditor is not aware of any adverse impacts to vegetation that occurred during the remainder of the audit period.

Groundwater levels have changed slowly over the past few years in the floodway area between the TSFs and southwest of the Fimiston II TSF, and this is not unexpected. In the twelve month period to December 2007 water tables in this area were generally steady. During this same period water tables increased slightly around the Fimiston I TSF and on the western side of the Fimiston II TSF.

There are some areas near the TSF walls where shallow water tables occur, and in particular on the eastern side of the Fimiston II TSF and northern side of the Fimiston I TSF. Groundwater production in both these areas increased during the audit period with the commissioning of new production bores. Groundwater level trends in these areas should be monitored carefully to assess if sufficient pumping capacity has been established.

5 CONCLUSIONS

The main conclusions of this audit are as follows:

- The primary objective of the SGMP of protecting the vegetation assemblages in the area and the secondary objective of reducing groundwater levels to historic levels are considered reasonable, and provide appropriate direction for the management of seepage from the Fimiston I and Fimiston II TSFs. No changes to these objectives are recommended.
- During the audit period (1 July 2007 to 30 June 2008) the health of the vegetation assemblages in the area remained satisfactory, and groundwater levels in the broader floodway between the Fimiston TSFs and southwest of the Fimiston II TSF generally remained steady. Shallow water tables occur in some areas near the TSF walls, and in particular on the eastern side of the Fimiston II TSF and northern side of the Fimiston I TSF. KCGM commissioned new production bores in these areas during the audit period, and operating these bores should help reduce the high water tables. Ongoing monitoring of groundwater level trends in these areas should occur to assess if sufficient pumping capacity has been established.
- KCGM completed their groundwater monitoring obligations outlined in DEC Licence 6420/11 and DoW Licence 66252(5) during the audit period.
- Samples were not collected from some of the monitor bores included in the schedules because the bores were either dry or contained insufficient water to permit sampling. This will be an ongoing condition that is likely affect other monitor bores in the Eastern Borefield as groundwater levels in the area are lowered. It is recommended that monitor bores in this category not be removed from the sampling schedules. Rather, a determination should be made on a bore by bore basis during each sampling round whether collection of a sample is possible, and bores that can not be sampled should be listed in the required quarterly and annual reports to the DEC.
- During the audit period KCGM has conducted work required by all of the tasks listed in the SGMP. Particular tasks and work activities are as follows:
 - ◆ Develop estimate of historic groundwater level distribution: a revised draft report was released for public comment in May 2007. Comments from community members on this draft were received via the DEC in December 2007, and KCGM responded to these comments in January 2008. This document was accepted by the DEC in April 2008.
 - ◆ Maintain the area of the supernatant pools of water on top of the TSFs less than 15% of the active cell area: there were two occasions during the audit

period when the areas of the supernatant pools exceeded target maximum values. The first instance occurred in September 2007 on D Paddock, Fimiston II TSF, shortly after the start of a deposition cycle which followed a normal drying period. The second instance occurred in February 2008 on A/B Paddock, Fimiston II TSF, following 60 mm of rainfall, and at a time of reduced decant water recovery due to a shut down of the Fimiston Mill. On both occasions pool areas decreased to below the target maximum values by the time of the subsequent fortnightly survey.

- ◆ At least 90% of production bores in the Eastern Borefield to be operating over any full calendar month: the proportion of production bores operating each month during the audit period ranged between 88% and 99%, and averaged 95% for the whole year. The non-achievement of the 90% target occurred in November 2007, and was due to some production bores being shut down to allow maintenance on a major water storage tank (Southern Surge Tank). The non-achievement of the 90% borefield utilisation target in one month of the audit period is not considered to be detrimental to the overall performance of the borefield and long-term objectives of the SGMP.
- ◆ Install five groundwater level sensors and logging units in selected monitor bores: these units were installed in January 2006. Problems with the sensors and loggers have continued to occur, and many of the instruments have been returned to the manufacturer for repair. It would be useful if all data from these installations were reviewed in the context of the objective of this exercise, and a decision then made on how best to proceed with this component of the monitoring program.
- ◆ Monitor groundwater level trends to determine where increased groundwater pumping is required: this information has been collected and presented in the quarterly reports to the DEC. The SGMP defines the Operational Area of the TSFs as the tailings footprint plus a halo of maximum width 100 m around the perimeter of each facility, and indicates that achieving water tables >4 mBGL in this area may be difficult. The SGMP allows shallow water tables < 6 mBGL to occur within the Operational Area of the TSFs without triggering the need for increasing groundwater pumping capacities. This is considered a reasonable proposition, however it is noted that it is not within KCGM's interest to have shallow water tables in these areas.
- ◆ Monitor groundwater quality: as noted above, groundwater chemistry has been monitored in accordance with schedules in DEC Licence 6420/11 and DoW Licence 66252(5) during the audit period. With the introduction of the SGMP in October 2005 the scope of the hydrochemical monitoring was

increased to include a suite of trace elements, and the frequency of sampling monitor bores was increased. The efficacy of collecting the additional data was assessed in the 2006 and 2007 annual reviews of monitoring data for the Eastern Borefield. Recommendations were included in these documents to reduce the scope of the hydrochemical monitoring program, and KCGM needs to discuss these recommendations with the DEC.

- ◆ Vegetation monitoring: vegetation monitoring was conducted as required during the audit period, and results included in the 2007 Annual Environmental Report. The survey concluded the health of the vegetation in the surveyed areas was good. KCGM completed a review of their vegetation monitoring program in 2005 as required by the first draft of the SGMP. This review was finalised in early 2007 after consultation with the DEC and KCGM's Community Reference Group. KCGM has since implemented the revised vegetation monitoring program.

Peter Clifton & Associates

P M Clifton
Director

REFERENCES

KCGM, 2007a, "Fimiston Operations Seepage and Groundwater Management Plan", prepared by Kalgoorlie Consolidated Gold Mines Pty Ltd, October 2007.

KCGM, 2007b, "Revised Vegetation Monitoring Programme, Fimiston Tailings Storage Facilities", prepared by Kalgoorlie Consolidated Gold Mines Pty Ltd, March 2007.

KCGM, 2008, "2007 Annual Environment Report", prepared by Kalgoorlie Consolidated Gold Mines Pty Ltd, March 2008.

Peter Clifton & Associates, 2007, "2007 Annual Audit, Seepage and Groundwater Management Plan, Fimiston I and Fimiston II Tailings Storage Facilities", consultant report prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd, 9505_R70, August 2007.

Table 1: Audit of Particular Conditions in DEC Licence 6420/11 Referenced in the SGMP

DEC Licence 6420/11 Condition	Requirement for Fimiston I & Fimiston II TSFs and/or Eastern Borefield	Audit Comments
W3 Freeboard	Maintain minimum operational freeboard of 300 mm on TSFs	<i>KCGM has determined freeboard depths on operational cells of the Fimiston I and Fimiston II TSFs by means of survey at least twice per month during the audit period. The results of all surveys indicate the minimum 300 mm freeboard criterion has been satisfied. The minimum surveyed freeboard during the audit period was 1.9 m at D Paddock, Fimiston II TSF in December 2007.</i>
W4 Pipeline bunds	Bunding of pipelines between the Fimiston Mill and Fimiston I & II TSFs	<i>KCGM inspects pipeline bunds at least once per shift during visual inspections of the TSFs as required by Condition W5. Any issues with pipeline bunds are recorded on the visual inspection log for subsequent action. No reportable environmental incidents associated with Condition W4 occurred during the audit period.</i>
W5 Visual inspections	Visual inspection of: (i) tailings delivery lines, (ii) return water lines, (iii) tailings deposition, (iv) ponding on the surface of the TSFs, (v) internal embankment freeboard, and (vi) external walls of TSFs. Inspections to be conducted at least every six hours. Results to be recorded in a log book and signed by the person conducting the inspection.	<i>KCGM conducts the required visual inspections at the Fimiston I and Fimiston II TSFs generally every three hours. During the audit period these inspections were conducted at least every six hours as required. Results of inspections are recorded on log sheets, and signed by the person conducting the inspection and the Shift Supervisor. No reportable environmental incidents associated with Condition W5 occurred during the audit period.</i>

continued...

Table 1 (cont): Audit of Particular Conditions in DEC Licence 6420/11 Referenced in the SGMP

DEC Licence 6420/11 Condition	Requirement for Fimiston I & Fimiston II TSFs and/or Eastern Borefield	Audit Comments
W6 Stormwater diversion	Diversion of stormwater runoff away from TSFs.	<i>KCGM made provision for stormwater diversion at the Fimiston I and Fimiston II TSFs during the initial design of these facilities. Drains have been constructed on the down-stream side of these TSFs to divert surface water runoff. No reportable environmental incidents associated with Condition W6 occurred during the audit period.</i>
W11 Groundwater monitoring	This condition requires KCGM to analyse groundwater samples from the production and monitor bores and measure static water levels in monitor bores according to a given schedule.	<p><i>The extent that KCGM has completed the required sampling and monitoring is as follows:</i></p> <ul style="list-style-type: none"> <i>• Monthly sampling of production bores, trenches (Fimiston I North, Fimiston II South), and TSF decants, and analysis for pH and EC – completed, and 90% sampling criterion for production bore sampling satisfied for all quarters during the audit period (>96% during all quarters). Limited sampling of trenches during audit period due to small flows.</i> <i>• Annual sampling of production bores, trenches (Fimiston I North, Fimiston II South), and TSF decants, and analysis for TDS and cyanide concentrations – completed, and 90% sampling criterion for production bore sampling satisfied (>97% sampled); TSF decants and specified trenches have been sampled at least once during the audit period.</i> <p><i>(continued...)</i></p>

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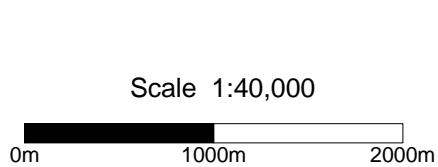
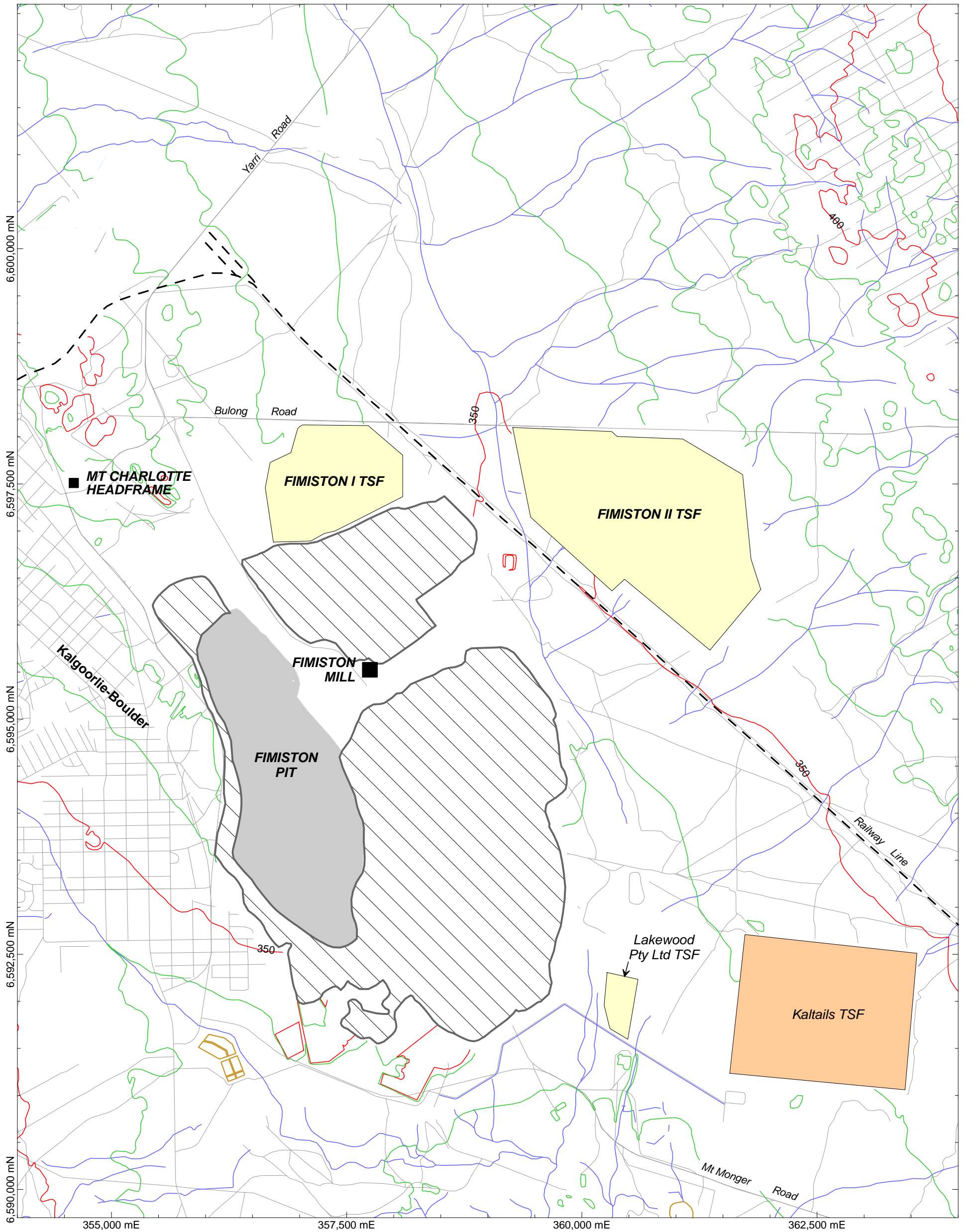
Table 1 (cont): Audit of Particular Conditions in DEC Licence 6420/11 Referenced in the SGMP

DEC Licence 6420/11 Condition	Requirement for Fimiston I & Fimiston II TSFs and/or Eastern Borefield	Audit Comments
W11 Groundwater monitoring (continued)		<ul style="list-style-type: none"> • Quarterly recording of SWL in monitor bores – completed fully during each quarter of the audit period; SWL recorded more than once per quarter in many of the monitor bores. • Quarterly sampling of monitor bores, and analysis for pH, EC, TDS, cyanide, and trace element concentrations – completed for each quarter of the audit period where bores contained sufficient water to allow sampling (47 to 53 of the 60 bores in this list sampled). • Monthly sampling of 20 monitor bores, and analysis for TDS, cyanide, and trace element concentrations – completed for all months of the audit period.
W14 Vegetation monitoring	Complete a specified vegetation survey and report results in the Annual Environmental Report.	<p>Vegetation monitoring was completed in 2007 as required, and results were presented in KCGM's Annual Environmental Report for 2007 (KCGM, 2008).</p> <p>No recommendations for groundwater management at the Fimiston I and Fimiston II TSFs, or for the SGMP, resulted from the 2007 vegetation survey.</p>

continued...

Table 1 (cont): Audit of Particular Conditions in DEC Licence 6420/11 Referenced in the SGMP

DEC Licence 6420/11 Condition	Requirement for Fimiston I & Fimiston II TSFs and/or Eastern Borefield	Audit Comments
W11 Quarterly reports	WPCC W11(d) requires KCGM to prepare reports on the results of the groundwater monitoring program in WPCC W11(a) and submit these to the Director, DEC, each quarter.	<i>KCGM prepared and submitted the required quarterly reports during the last half of 2007 and first quarter of 2008. The quarterly report for the second quarter of 2008 (April to June) was in preparation at the time of this audit. This quarterly report is due to be submitted to the DEC by 15 August 2008.</i>
G2 Annual Environmental Report	KCGM is required to prepare an Annual Environmental Report that provides and overview of monitoring data and other data required by Licence 6420/11, and submit this report by 31 March.	<i>KCGM prepared and submitted the 2007 Annual Environmental Report for DEC Licence 6420/11 as required (KCGM, 2008).</i>

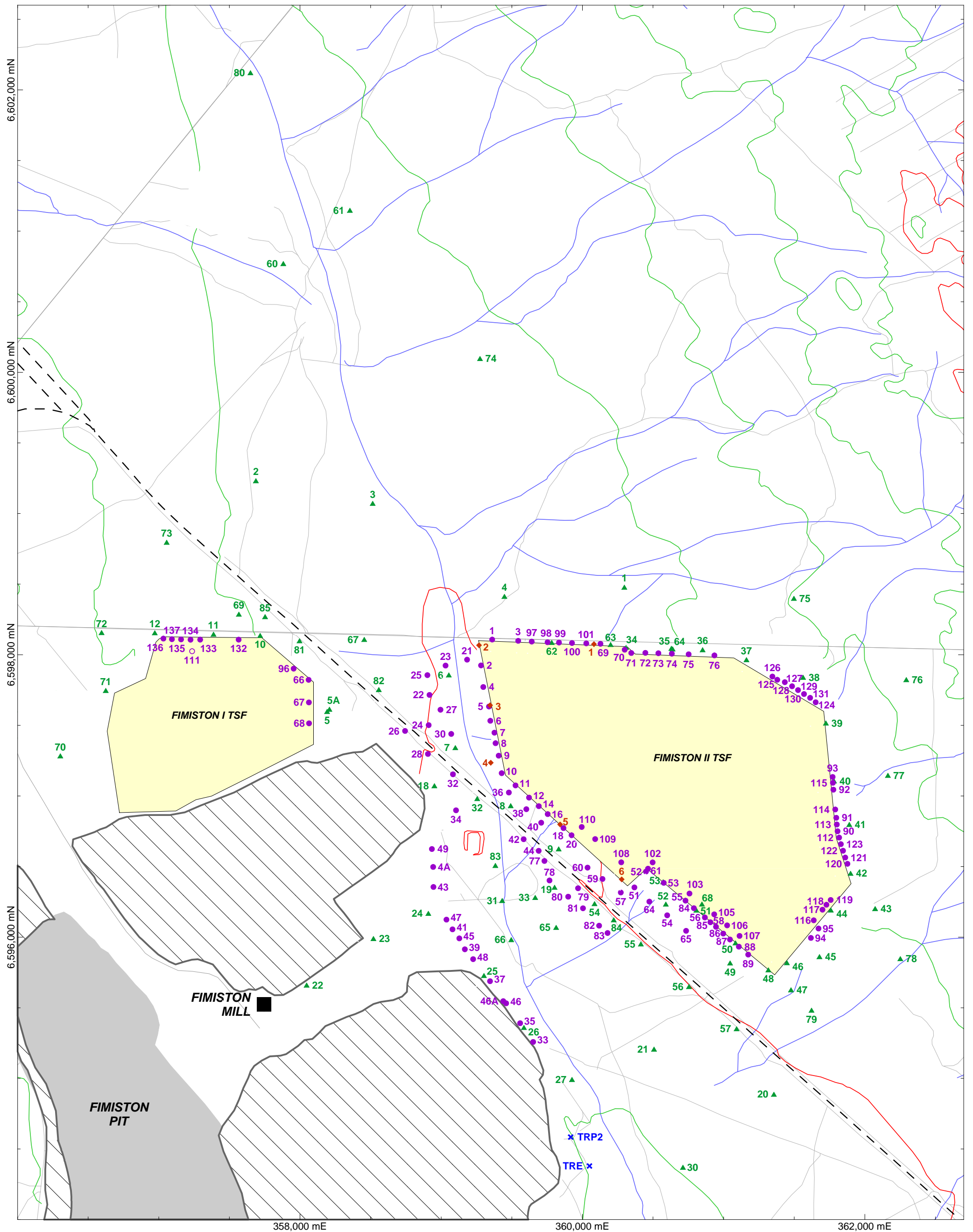


- Active Tailings Storage Facility
- Closed Tailings Storage Facility
- Waste rock dump (Dec 2006)

Grid coordinates: MGA94, Zone 51

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KCGM infrastructure from KCGM Survey Department

FIGURE 1.
Location of KCGM Fimiston Operations and Tailings Storage Facilities



Scale 1:25,000



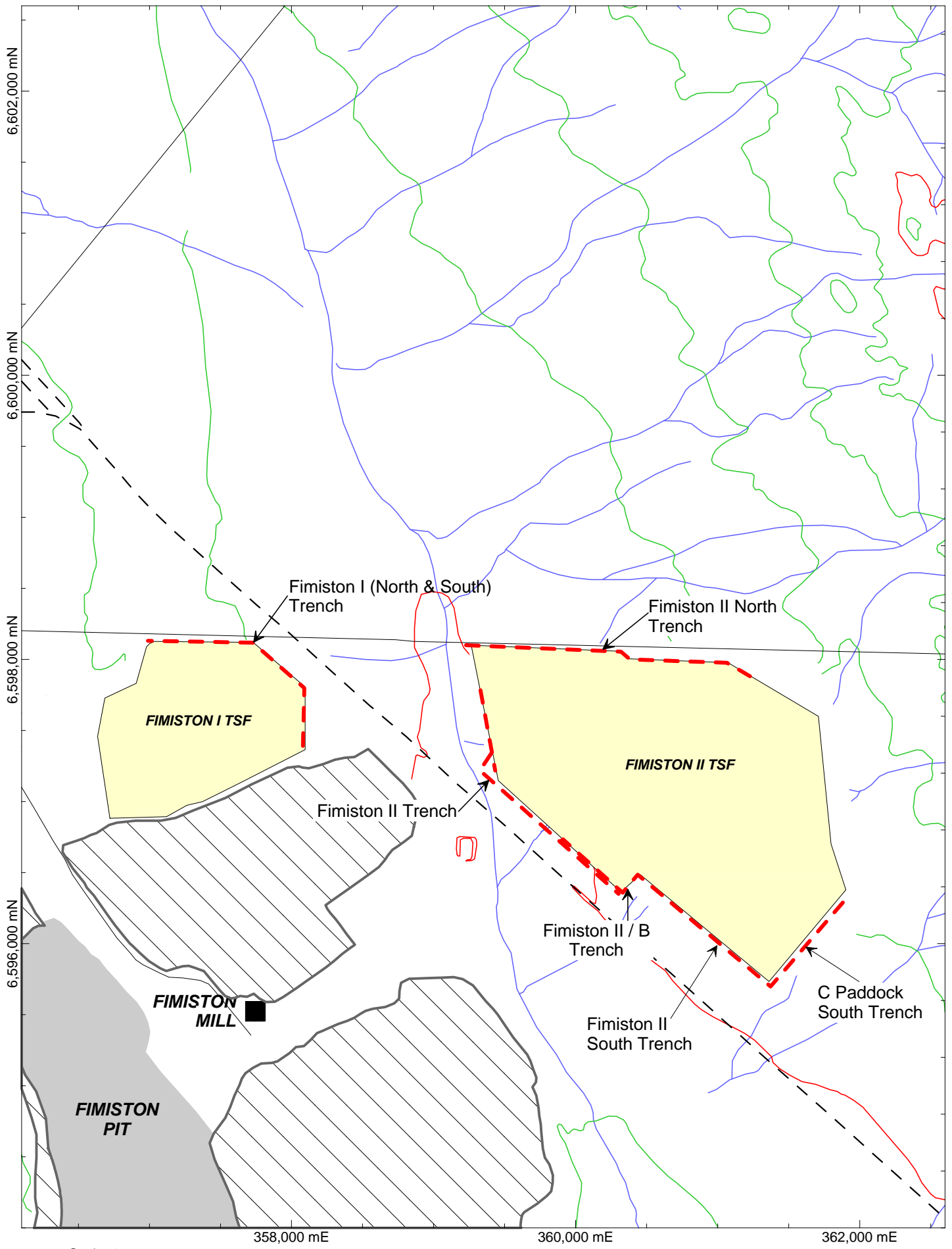
Grid coordinates: MGA94, Zone 51

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- Production Bore, "PB F" series
- "PB F" series bore, not equipped
- ▲ Monitor Bore, "MB F" series
- ◆ Monitor Bore, "NTD" series
- ✕ Monitor Bore, other
- ▨ Waste rock dump (Dec 2006)

FIGURE 2

Eastern Borefield
 Production and Monitor Bore Location Plan



Scale 1:35,000
 0m 500m 1000m
 Grid coordinates: MGA94, Zone 51

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FIGURE 3
 Eastern Borefield
 Seepage Interception Trench Location Plan

APPENDIX A
STATEMENT OF INDEPENDENCE OF AUDITOR

Statement of Independence of Peter Clifton & Associates in the Matter of the 2008 Audit of KCGM's Seepage and Groundwater Management Plan

This audit of KCGM's Seepage and Groundwater Management Plan has been conducted by Mr Peter Clifton of Peter Clifton & Associates, a Perth based hydrogeological consulting practice providing services primarily to the mining industry in Australia. Mr Clifton has degrees in geology from the University of Western Australia, and a degree in hydrology and water resources from the University of Arizona. Mr Clifton has more than 25 years of work experience in the United States of America and Australia, and established Peter Clifton & Associates in 1994.

Both Peter Clifton and Peter Clifton & Associates are independent of Kalgoorlie Consolidated Gold Mines Pty Ltd, and the joint owners of the mining operations managed by KCGM – Barrick Gold of Australia Ltd and Newmont Australia Limited. Both Peter Clifton and Peter Clifton & Associates have no financial interests and have never had any financial interests in KCGM, Barrick Gold of Australia Ltd, or Newmont Australia Limited.

Peter Clifton & Associates has provided hydrogeological advice and services to KCGM in the past on a commercial basis according to accepted professional practices. No benefits from KCGM, other than professional fees, will be realised by Peter Clifton & Associates as a result of conducting this audit.