GOLD FIELDS

ST IVES GOLD MINE

Gold Mining Developments on Lake Lefroy – Beyond 2010: Response to Submissions to the Public Environmental Review

St Ives Gold Mining Company Pty Ltd

EPA Assessment No. 1809

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1 INTRODUCTION

St Ives Gold Mine (SIGM) proposes to develop further lake-based activities beyond 2010, including gold mining developments on Lake Lefroy and land-based activities which may influence Lake Lefroy (namely dewatering discharge to the lake surface). This proposal was presented in the Public Environmental Review (PER) entitled *Gold Mining Developments on Lake Lefroy – Beyond 2010* released for public comment on the 20th December 2010 for a period of 6 weeks, the review period ending on the 31st January 2011.

Submissions in relation to the Project have now been received by SIGM and a response to those submissions is presented in this document for consideration by the Office of the Environmental Projection Authority (OEPA) in its assessment and subsequent report and recommendations to the Minister for the Environment.

1.1 DOCUMENT PURPOSE AND STRUCTURE

The purpose of this document is to present a summary of the submissions and SIGM's response to those submissions. The submissions response is presented in two parts, those received from Government agencies and these from the general public. The original submissions are presented in Appendix A and information in relation to requests for information during the public review period is presented in Appendix B. The PER distribution list is provided as Appendix C. Supporting information is also provided where relevant.

2 AGENCY SUBMISSIONS

Submissions were received from the following Government Agencies: Department of Indigenous Affairs, Department of Environment and Conservation and Department of Water.

2.1 DEPARTMENT OF INDIGENOUS AFFAIRS

Submission: ***It is noted on page 296 of the PER that SIGM will liaise with relevant Aboriginal groups in order to determine whether further heritage surveys of the Riparian Zone are required. An assumption is made that as previous surveys have identified ethnographic values as being associated with nearby Jarramur Swamp and not Lake Lefroy that it is unlikely that the potential inundating of the Riparian Zone will pose a risk to sites of significance. While it is apparent that it is unlikely that sites of ethnographic significant will be identified SIGM should be aware that some Aboriginal heritage sites have significance only from an archaeological viewpoint. Should archaeological sites be identified in the potentially affected Riparian Zone then SIGM should be aware that a notice under section 18 of the Aboriginal Heritage Act 1972 (AHA) may still be required regardless of ethnographic significance of the sites.***

SIGM Response: SIGM is currently developing a scope of work with consultant archaeologists and the Widji Native Title Claimants in relation to surveys of the riparian zone of Lake Lefroy. Once confirmed the survey program will be supplied to the Goldfields Land and Sea Council (GLSC) for consideration by the Ngadju Native Title Claimants as per established protocols and standard

heritage agreements that are in place. SIGM has committed to this under Commitment 21 (Page 298 of the PER) and has also clearly demonstrated its understanding of the required process, including the requirement for Section 18 process, in the event sites of cultural heritage (be that ethnographic or archaeological) are identified (Page 296, PER). SIGM notes that the Department of Indigenous Affairs' submission has also recognised SIGM's understanding of these requirements under the Aboriginal Heritage Act.

Additional information on this and the approach of SIGM to managing Aboriginal Cultural Heritage is provided in the SIGM's *Aboriginal Cultural Heritage Management Plan (Lake Based)*, provided as TC2-13.

It should be noted that in relation to Central West Goldfields and Kalamaia Kabu(d)n groups, SIGM is liaising with the GLSC as to the status of the groups and assigned representation. At this stage no identified representation has been announced. SIGM will keep monitoring the situation and open up dialogue once the communication channels have been established.

2.2 DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Comments in relation to biodiversity conservation matters are noted and no further response is provided. SIGM thanks the Department for its commendation.

Submission: ***(In relation to TC1-14: Environmental Noise Impact Assessment for the Proposed Pistol Club). It is recommended that the proponent clarifies how and when the stockpile (for the Pistol Club development) will be constructed. Clarification with respect to the timing of the construction of the stockpile ie will the stockpile be completed by the conclusion of the construction phase (scenario 1); will the north and north-west portion of the stockpile be completed first to limit noise impact on receivers whilst the reminder of the stockpile is constructed. Clear delineation of the status of mine site as a construction site or operating mine has to be made.***

SIGM Response: SIGM undertook the noise study to determine the likely constraints that will be imposed on the Pistol Club open pit operation given the close proximity to Kambalda East. On current scheduling the Pistol Club operation is not scheduled until 2015, about mid-way through the anticipated 10 year look ahead presented as the Project.

The exact construction of the waste stockpile will be dependent on several factors including fleet selection and infill drilling which will determine any final changes to the pit design within the footprint presented. In addition to the requirements under Part IV of the Environmental Protection Act, the Pistol Club development will also be subject to a mining proposal under the Mining Act and Works Approval application under Part V of the Environmental Protection Act. Both of these instruments will contain further detail in relation to how the mining operation will be managed. Regardless of these requirements, the operation must be undertaken in accordance with the Environmental Protection (Noise) Regulations 1997 (Noise Regulations). Suffice to say there are further decision making processes to ensure the operation is undertaken in an acceptable manner.

Commitment 24 clearly states the intent of SIGM to develop a management plan in conjunction with the Shire of Coolgardie and the residents of Kambalda to ensure compliance with the Noise

Regulations and acceptance of the operation as a whole. Once agreed the management plan will be implemented. Table 13.1 (page 331) identifies that the plan will be developed in consultation with both the Shire of Coolgardie and DEC.

Submission*: (In relation to TC1-14: Environmental Noise Impact Assessment for the Proposed Pistol Club). It is recommended that the proponent submit a Noise Management Plan with respect to the construction phase of the project. Final approval of the Noise Management Plan would be at the discretion of the Shire of Coolgardie. The assessment indicates that in addition to day-time construction, night-time construction is planned (refer to Figure 9 – A weighted noise level contours for worst case night time operations on scenario 1). Whilst Regulation 13 of the Environmental Protection (Noise) Regulations 1997 states that the assigned levels do not apply to construction activities between 7 am and 7 pm Mon-Sat, if work is proposed "out of hours" a noise management plan must be submitted and approved by the Shire of Coolgardie.*

SIGM Response: Commitment 24 sates SIGM's intention to develop a management plan to ensure compliance with the Environmental Protection (Noise) Regulations. This will apply to the operation as a whole and not just the construction phase and will also address other issues such as vibration and dust. This will be undertaken in consultation with the Shire of Coolgardie and the residents of Kambalda.

Submission: *(In relation to TC1-14: Environmental Noise Impact Assessment for the Proposed Pistol Club). It is recommended that the proponent provides more information with respect to the practicability of the recommended/proposed noise control measures for predicted exceedance of assigned levels under modelled scenario 2. Exceedance of the assigned levels are predicted under scenario 2 and the consultant has recommended some noise control measures to achieve full compliance. Further clarification is needed as to whether these control measures are practicable and viable for the proponent. For example, the consultant has stated that dump trucks with a sound power level of less than 110dB(A) be used. This would indicate a smaller dump truck than those that have been used in the assessment – is using smaller dump trucks a viable option for the proponent? What dump trucks with a sound power level of less than 110 dB(A) are proposed. Another recommendation of the consultant is to half the number of dump trucks and excavators – again is this a viable option for the proponent.*

SIGM Response: The noise study has identified a number of measures to ensure compliance with the Noise Regulations. These measures include those mentioned above, such as a minimal fleet and reducing sound power levels to 110 dB(A) (for the CAT 785 dump trucks that would most likely be the equipment of choice and available for haulage), but also a restriction to day time operations only.

A number of studies have indicated that noise level reductions are possible on the CAT 785. A study in the UK by the North of England Institute of Mining and Mechanical Engineers in 2006 demonstrated a reduction of 13 dB, measured as a reduction of 93 – 80dB(A) at 10 metres from the noise source, as a result of muffler insulation. A noise and vibration assessment for Werris Creek Coal Pty Ltd (Spectrum Acoustics Pty Ltd, 2010) achieved noise reductions of 8 dB through equipment modifications. Based on a weighted sound power level of 116.2 dB(A) for the CAT 785 trucks as modelled, the achievement of a soundpower level of less than 110 dB(A) is achievable.

The future planning of the Pistol Club development will consider all of the above factors to develop an operational plan that demonstrates to the Shire of Coolgardie and the DEC that the operation can be managed in an acceptable manner, that is in compliance with the Noise Regulations and is accepted by the community at large.

Given the commitment to develop a management plan in consultation with the Shire of Coolgardie, the other permits required under both the Mining and Environmental Protection Acts and the fact that St Ives is committed to maintain its good relations with the Kambalda community at large, SIGM considers that development of the Pistol Club can be appropriately managed under other instruments to meet community expectations and legal requirements.

2.3 DEPARTMENT OF WATER

Submission: ***DoW advises that the Environmental Scoping Document does not discuss the inflow of water to the St Ives site from the Mt Morgan Borefield. Details of these activities should be discussed in the Public Environmental Review (PER).***

SIGM Response: As the Project does not require a change to the current usage of the Mt Morgan borefield water source, and that the PER relates solely to increased development on Lake Lefroy, the matter of the Mt Morgan borefield abstraction has not been addressed in the PER, other than a description of the source in Section 3.3.1. The PER listed the relevant instrument being GWL 171060 (see Appendix D).

The Project does not change the current abstraction rate and as such there is no change in licence required. Whilst the Project will extend the period of draw, the existing legislative instrument in place, GWL 171060, is valid to 16th September 2020. SIGM is required to report annually on the effects of the water abstraction for DoW's assessment. On-going draw is dependent on the Department being satisfied that the operation of the borefield is being managed on a sustainable basis. It should be noted that renewal of the Mt Morgan Borefield licence was based on hydrological modelling undertaken and presented to DoW. This study clearly indicated that the aquifer is capable of maintaining the current rate of abstraction for 20-25 years. In the event of increasing by 25% (80L/s to 100 L/s) modelling indicates that the period reduces to 15 years (see Appendix E).

In terms of the Morgan Borefield, SIGM considers that the existing, approved legal instrument in place is the appropriate mechanism for regulation. The reporting structure required of DoW is designed to assess on an annual basis the on-going use of this resource.

Submission: ***The proposal is located within the Goldfields Groundwater Area which is a proclaimed area under the Rights in Water and Irrigation Act (1914). There may be a requirement to obtain a licence for the use of groundwater, or to modify existing groundwater licences. The proponent should contact the DoW's Swan Avon Region Office on 6250 8000 to discuss water management options. This should be discussed in the PER.***

SIGM Response: SIGM has been in dialogue with the Swan Avon Region Office of DoW in relation to renewing its existing licence and extension of the abstraction volume to the proposed 30GL per annum pending assessment of the Project by OEPA.

This matter is discussed throughout the PER document. Section 1.5.2.4 clearly states that current mine dewatering is licensed under Groundwater Well Licence 62505 (6) and indicates that an increase in licence is being pursued subject to the Ministerial approval of the Project. Section 1.5.3.1 (summarising additional approvals) also states this. Section 3.3.2 describes the existing arrangements as part of Section 3 outlining existing facilities.

Section 10.3 provides a summary of the potential impacts on groundwater sources presented for the PER as detailed in *Hydrogeological Assessment for Beyond 2010 Project*, URS 2010 (and provided as TC1-5).

A renewal of licence 62505 was approved by DoW on the basis of the 2010 annual review (for the July 2009 – June 2010 reporting period) and revised operating strategy (see Appendix F and G) for an allocation of 24315000 kL (being the renewal of the existing allocation, see Appendix H). At the same time SIGM submitted an application to extend the licence to a total draw of 30GL per annum. Development of the operating strategy addressed a number of historical issues and the 2010 annual review demonstrated that existing operations have not had any significant impact on groundwater levels (as described in section 10.3 of the PER). The current licence is valid to 30th September 2012 with a decision on the increase in allocation to 30 GL pending the outcome of the Part IV process. This is reflected in the letter of approval accompanying GWL 62505 (see Appendix J).

As with the original assessment, SIGM considers that groundwater impacts can be effectively managed under the legislative processes and instruments of the *Rights in Water and Irrigation Act* and as such does not require the specific involvement of the EPA process, other than to satisfy itself that impacts to date or into the future have not and will not adversely affect the environmental values of the groundwater resource.

Submission*: Please note that this advice was also provide to the Environmental Protection Authority on 8 December 2009, and these comments have yet to be addressed in the Public Environmental Review.*

SIGM Response: Comments from DoW during preparation of the Environmental Scoping Document requested that SIGM discuss its processing water source and Project implications. As described above, the Project is not considered to impact on the borefield water source and as such has not been discussed in detail on the PER. The Scoping Document outlined this and provided a rationale as to why the borefield did not comprise part of the formal assessment process. Furthermore, the scoping document did include a summary and detailed the work to be done in relation to the environmental factor of groundwater (as it related to mine dewatering). This has been presented in the PER and discussed in outline above.

3 PUBLIC SUBMISSIONS

Submission: ***Our query is regarding the radioactive material that was buried by WMC on the lake. As we have been here for some time we know that this was an issue for the town during its return and placement. What provisions have been made to ensure that this is not disturbed.***

SIGM Response: SIGM can confirm that this issue relates to a historical event prior to the acquisition of the St Ives' leases by Gold Fields. In 1979, a shipment of scrap steel, sent the previous year by Western Mining Corporation (WMC) from the Kambalda Nickel Operations Plant via the scrap metal dealer Sims Consolidated Ltd (Sims) to the National Iron and Steel Mills Ltd, Singapore, was found to contain concentrations of the radioactive isotope, Caesium-137. It was suggested that the contamination could have come from the radioactive source of an Ohmart Density Gauge that had gone missing from the WMC facility in 1978.

Following discussions between the governments of Singapore and Australia, including the State Government of Western Australia, an agreement was made to return the waste material to Western Australia for disposal. In 1981, WMC applied to the Radiological Council for permission to dispose of the waste at the freehold site known as Ngalbain Location 68 (see Appendix K, figure titles Location context: Ngalbain Location 68 and Ngalbain Location 68). The site is located on E15/1040, held by Gold Fields, but the grant of this licence does not include any portion of Ngalbain Location 68 (being private land).

The material was packed into one hundred and ten (110), forty-four gallon drums which were placed into 5 shipping containers and transported from Singapore to the Port of Esperance, arriving in December 1981. From there, the containers were taken by road to the Site at Location 68. The shipping containers were placed into a concrete lined bunker (of dimensions 5.965m x 6.830m x 2.765m), breached and then filled with concrete. The bunker was covered with topsoil and revegetated.

Following encapsulation, the site was surrounded by a fence and signs were posted to limit trespass. A radiological survey was conducted by an officer of the State X-Ray Laboratory who determined that the presence of the material at the site "had no measurable effect on background radiation in the area." Two groundwater monitoring wells were installed in order to facilitate future monitoring of potential impacts to the environment.

The submitters have acknowledged that in fact their recollection of the location does in fact match with Location 68 and not the lake as indicated in the original submission.

The site is currently under management by BHPBilliton Nickel West. Further details can be obtained from BHP Billiton Nickel West Stainless Steel Materials (contact Martin Smith, Manager – Environment (08) 6274 1232).

Appendix A

Copies of original submissions received

WRD106114

Department of Water
Government of Western Australia

Your ref: A348220
Enquiries: James Mackintosh
Tel 6250 8043

Opened by Department of Environment & Conservation Corporate Information Services Atrium

14 JAN 2011

For the Office of the Environmental Protection Authority

Environmental Protection Authority
Locked Bag 33, Cloisters Square
PERTH WA 6850

Attention: Nyomi Bowers

Dear Ms Bowers

RE: GOLD MINING DEVELOPMENTS ON LAKE LEFROY – BEYOND 2010 – ASSESSMENT NO: 1809 – LEVEL OF ASSESSMENT: PUBLIC ENVIRONMENTAL REVIEW

Thank you for the above referral. The Department of Water (DoW) has reviewed the Scoping Document for the Public Environmental Review (PER) for the above proposal and provides the following advice:

- DoW advises that the Environmental Scoping Document does not discuss the inflow of water to the St Ives site from the- Mt Morgan Bore Field. Details of these activities should be discussed in the Public Environmental Review (PER)

- The proposal is located within the Goldfields Groundwater Area which is a proclaimed area under the *Rights in Water and Irrigation Act (1914)*. There may be a requirement to obtain a licence for the use of groundwater, or to modify existing groundwater licences. The proponent should contact the DoW's Swan Avon Region office on 6250 8000 to discuss water management options. This should be discussed within the PER.

Please note that this advice was also provided to the Environmental Protection Authority on 8 December 2009, and these comments have yet to be addressed in the Public Environmental Review.

If you wish to discuss the matter further, please contact James Mackintosh on 6250 8043.

Yours sincerely,

James Mackintosh
A/Program Manager
Land Use Planning
Swan Avon Region

13 January 2011

SCANNED

Swan Avon Region
7 Ellam Street Victoria Park Western Australia 6100
Telephone (08) 6250 8000 Facsimile (08) 6250 8050
www.water.wa.gov.au

Government of Western Australia
Department of Indigenous Affairs

ENQUIRIES : Simon Keenan - Ph 9235 8132

OUR REF: 10/0732

YOUR REF: A348220

COPY

Mr Colin Murray
Director - Assessment and Compliance Services
Office of the Environmental Protection Authority
Locked Bag 33
Cloisters Square
PERTH WA 6850

Attention: Nyomi Bowers

Dear Mr Murray

PUBLIC ENVIRONMENTAL REVIEW ASSESSMENT 1809 - GOLD MINING DEVELOPMENTS ON LAKE LEFROY BEYOND 2000

Thank you for your letter of 20 December 2010 seeking comment upon the Public Environmental Review for the project Gold Mining Developments on Lake Lefroy – Beyond 2010. I have reviewed the document and offer the following comment.

It is noted on page 296 of the PER that SIGM will liaise with relevant Aboriginal groups in order to determine whether further heritage surveys of the Riparian Zone are required. An assumption is made that as previous surveys have identified ethnographic values as being associated with nearby Jarramur Swamp and not Lake Lefroy that it is unlikely that the potential inundation of the Riparian Zone will pose a risk to sites of significance. While it is apparent that it is unlikely that sites of ethnographic significance will be identified SIGM should be aware that some Aboriginal heritage sites have significance only from an archaeological viewpoint. Should archaeological sites be identified in the potentially affected Riparian Zone then SIGM should be aware that a notice under section 18 of the *Aboriginal Heritage Act 1972* (AHA) may still be required regardless of ethnographic significance associated with the sites.

However, SIGM have demonstrated its awareness of the section 18 process and will seek advice directly from the Department of Indigenous Affairs should it become

1st Floor, 197 St Georges Terrace Perth, Western Australia 6000
PO Box 7770, Cloisters Square Perth, Western Australia 6850
Telephone (08) 9235 8000 Facsimile (08) 9235 8088
www.dia.wa.gov.au
wa.gov.au

apparent that section 18 consent is required. I have reviewed the commitments relating to Aboriginal Heritage and am satisfied that if implemented SIGM will be able to effectively manage Aboriginal heritage within its area of operations and surrounds.

Please contact me on 9235 8132 or at simon.keenan@dia.wa.gov.au should you have queries relating to this letter.

Yours sincerely

S Keenan

Simon Keenan
A/Manager Heritage Advice South

23 December 2010

cc – Peter Bayliss
Manager Environment
St Ives Gold Mine
PO Box 359
KAMBALDA WEST WA 6444

Government of Western Australia
Department of Environment and Conservation

Your ref: A348220
Our ref: 2009/006961-1 CEO 1325/10
Enquiries: Mark Whiteley
Phone: 9219 8889
Fax 9334 0140.
Email: mark.whiteley@dec.wa.gov.au

DEPA2010/63
786343
Nyomi Bowers
CSA

The Chairman
Environmental Protection Authority
Level 8 The Atrium
168 St Georges Terrace
PERTH WA 6850

Attention: Nyomi Bowers

GOLD MINING DEVELOPMENTS ON LAKE LEFROY - BEYOND 2010 PUBLIC ENVIRONMENTAL REVIEW (ASSESSMENT NO. 1809)

I refer to Mr Colin Murray's letter of 20 December 2010 to the Department of Environment and Conservation's (DEC) Mr Norm Caporn inviting comments on the Public Environmental Review (PER) for Gold Mining Developments on Lake Lefroy - Beyond 2010 Project.

The attached advice is provided in relation to matters relating to environmental regulation (Attachment 1).

For matters related to biodiversity conservation values, DEC commends the proponent for the level of consultation conducted during the assessment process and the quality of the PER document. Following consideration of the PER, DEC considers that the risk to biodiversity conservation values is adequately addressed and has no further comments in this regard.

Keiran McNamara
DIRECTOR GENERAL

24 January 2011

Att

ATTACHMENT 1

Department of Environment and Conservation

Document Review Comments Sheet

Reviewer: Environmental Services	
Document Title: TC1-14: Environmental Noise Impact Assessment for the Proposed Pistol Club Pit at St Ives Gold Mine (forming part of the Technical Compendium to the Gold Mining developments on Lake Lefroy Beyond 2010 PER)	
Document Revision:	
Date of Review: 14 January 2011	

Item No.	Section No.	Reviewer Comment / Recommendations	Proponent Response
1	4.3	**Recommendation:** *That the proponent clarifies how and when the stockpile will be constructed.* **Discussion:** Clarification is required with respect to the timing of the construction of the stockpile i.e. will the stockpile be completed by the conclusion of the construction phase (scenario 1); will the north and north-west portion of the stockpile be completed first to limit noise impact on receivers whilst the remainder of the stockpile is constructed. Clear delineation of the status of mine site as a construction site or as an operating mine has to be made.	
2	5.1	**Recommendation:** *That the proponent submit a Noise Management Plan with respect to the construction phase of the project. Final approval of the Noise Management Plan would be at the discretion of the Shire of Coolgardie.*	

Item No.	Section No.	Reviewer Comment / Recommendations	Proponent Response
		Discussion: The assessment indicates that in addition to day-time construction, night-time construction is planned (refer to Figure 9 – A-weighted noise level contours for worst-case night-time operations of scenario 1). Whilst Regulation 13 of the *Environmental Protection (Noise) Regulations 1997* states that the assigned levels do not apply to construction activities between 7am and 7pm Mon-Sat; if work is proposed 'out of hours' a noise management plan must be submitted and approved by the Shire of Coolgardie.	
3	7	**Recommendation:** *That the proponent provides more information with respect to the practicability of the recommended/proposed noise control measures for predicted exceedances of assigned levels under modeled scenario 2.* **Discussion:** Exceedences of the assigned levels are predicted under scenario 2, and the consultant has recommended some noise control measures to achieve full compliance. Further clarification is needed as to whether these control measures are practicable and viable for the proponent. For example; the consultant has stated that dump trucks with a sound power level of less than 110dB(A) be used. This would indicate a smaller dump truck than those that have been used in the assessment – is using smaller dump trucks a viable option for the proponent? What dump trucks with a sound power level of less than 110dB(A) are proposed? Another recommendation of the consultant is to half the number of dump trucks and excavators – again, is this a viable option for the proponent?	

Peter Bayliss

From: Marilyn Ward
Sent: Thursday, 27 January 2011 3:57 PM
To: Peter Bayliss
Subject: FW: Lake based evelopments

Feedback from the PER

M...

-----Original Message-----
From: Mary van der Swaagh [mailto:tmvanderswaagh@westnet.com.au]
Sent: Thursday, 27 January 2011 12:23 PM
To: Marilyn Ward
Subject: Lake based evelopments

Thank you so much for dropping the information package over to us. One of our queries is regarding the radioactive material that was buried by WMC on the lake. As we have been here for some time we know that this was an issue for the town during its return and placement. what provisions have been made to ensure that this is not disturbed?
Regards,
Mary van der Swaagh
tmvanderswaagh@westnet.com.au

Appendix B

List of requested information during the public review period

PER Request Log						
Date of request	**Date of issue**	**#**	**Format**	**Individual**	**Organisation**	**Address**
issued without request	15/12/2010	1	Exec summary	Andy Mussell	URS	Hyatt Centre, Perth, WA
issued without request	15/12/2010	1	Exec summary	Wendy Gilbert	Goldfields Land and Sea Council	PO Box 3058, Adelaide Terrace, EAST Perth, WA , 6832
15/12/2010	15/12/2010	5	Exec summary	Ngadju NT Claimants	Ngadju NT Claim Group	Goldfields Land and Sea Council Kalgoorlie Office
22/12/2010	22/12/2010	1	PER only	R Butler	na	18 Kalamunda Road, South Guildford, WA, 6055
22/12/2010	22/12/2010	1	Full hard copy	Steve Aiman	na	229 MacDonald Street, Kalgoorlie
4/01/2011	4/01/2011	1	Exec summary	Andrea Kirchner	na	48 Shaw Street, Kalgoorlie
4/01/2011	4/01/2011	1	Exec summary	Marilyn Ward	na	c/o SIGM
7/01/2011	8/01/2011	1	Exec summary	Mary Van Der Swaagh	na	9 Clianthus Road, Kambalda
8/01/2011	3/01/2011	1	Full hard copy	Gil Burrows	na	PO Box 10438, Kalgoorlie
11/01/2011	12/01/2011	1	Exec summary	Bonny Nicholson	Minear Operations Ltd	Mitchell Operations, Wiggiemcalthe
11/01/2011	12/01/2011	1	Exec summary	Colin Woolard	Woolard Consulting Pty Ltd	PO Box 8068 Angelo Street, South Perth WA 6151
11/01/2011	12/01/2011	1	PER only	Rod Williams	na	PO Box 258, Kalgoorlie, WA, 6430
13/01/2011	13/01/2011	11	Exec summary	Numerous individuals during Kambalda public info session: Chris Jury Marg Donkin Peter Schwabe Marian Harrison Gerale Ken Sharpe Darren Wilson Dennis Wilson Dennis Hernandes Sharon McFarlane Tony Argus Kathy Lindup		
13/01/2011	14/01/2011	1	Exec summary	na	Hydrocarbon Remedial Services	PO Box 480, Joondalup DC, WA, 6919
15/01/2011	15/01/2011	1	PER only	G R Bersan	na	202 Barrington St, Spearwood, WA, 6163
24/01/2011	24/01/2011	1	Full hard copy	M Charlton	na	PO Box 55, Coolgardie, 6429

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Appendix C

PER Distribution List

Organisation/ Individual	Category	No. of hard copies	To	Attention
Conservation Council of WA	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia	Director	
Wilderness Society and GWW Consortium	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia		Peter Price
Wildflower Society of Western Australia	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia		Brian Moyle
Widji Native Title Claimant Group	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia		Jerome Frewen
Ngadju Native Title Claimant Group	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia	C/- Goldfields Land & Sea Council	Hans Bokeland
Mt Monger Station	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia	Brendan Jones	
Woolibar Station	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia	Nathaniel James	
Madoonia Downs Station	Free list	1 hard copy of PER and Annexures with CD only of Technical Compendia	Ned Shields	
Department of Environment and Conservation - Kalgoorlie	DMA	1 hard copy of PER and Annexures with CD only of Technical Compendia		David Pickles
Department of Environment and Conservation – Environmental Management Branch	DMA	1 hard copy of PER and Annexures with CD only of Technical Compendia		Sandra Thomas
Department of Mines and Petroleum - Kalgoorlie	DMA	1 hard copy of PER and Annexures with CD only of Technical Compendia		Nick Galton-Fenzi
Department of Indigenous Affairs - Perth	DMA	1 hard copy of PER and Annexures with CD only of Technical Compendia		Simon Keenan
Department of Water - Perth	DMA	1 hard copy of PER and Annexures with CD only of Technical Compendia		Kylie Lambert
Shire of Coolgardie	Free list	1 full copy	Chief Executive Officer	Matthew Scott
Kalgoorlie Library	Library	1 full copy		The Librarian
Kambalda Library	Library	1 full copy		The Librarian
State Library	Library	1 full hard copy and 2 hard copies of PER with CD only of Technical Compendia		The Librarian

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Appendix D

Groundwater Licence 171060

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	St Ives Gold Mining Company Pty Ltd		
Description of Water Resource	Goldfields Palaeochannel - Palaeochannel	**Annual Water Entitlement**	4015000 kL
Location of Water Source	L15/147, L15/256, & L15/279 - Mt Morgan Borefield		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Mineral ore processing and other mining purposes	L15/147, L15/256, & L15/279 - Mt Morgan Borefield

Duration of Licence	From 20 September 2010 to 16 September 2020

This Licence is subject to the following terms, conditions and restrictions:

1 That should the licensee's draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn.

2 The annual water year for water taken under this licence is defined as 12:00 pm at 30 June to 12:00 pm at 30 June twelve months later.

3 The licensee must install a cumulative water meter of a type approved under the Rights in Water and Irrigation (Approved Meters) Order 2009 to each water draw point under this licence.

4 The licensee must ensure the installed meter(s) accuracy is maintained to within plus or minus 5% of the volume metered, in field conditions.

5 The licensee must not, in any water year, take more water than the annual water entitlement specified in this licence.

6 The licensee must notify the Department of Water in writing of any water meter malfunction within seven days of the malfunction being noticed.

7 The licensee must obtain authorisation from the Department of Water before removing, replacing or interfering with any meter required under this licence.

8 The licensee must submit to the Department of Water the recorded meter readings and the volume of water taken within the water year by 7 July each year.

9 The licensee shall comply with the commitments or requirements of the operating strategy, as prepared by the licensee and approved by the Department of Water on 2 September 2010 including any modifications to the strategy as approved during the term of the licence.

10 Should the monitoring at any time indicate a need for prompt action to prevent or reduce the effect of the licensee's draw on the underground resource, the licensee shall immediately report this to the Department of Water and advise the corrective measures proposed.

11 Approval by the Department of Water is to be obtained prior to the construction of additional and replacement wells and the modification or refurbishment of existing wells.

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

This Licence is subject to the following terms, conditions and restrictions:

12 Following consultation with the Licensee, the Department may modify or direct the Licensee to modify the Operating Strategy at any time.

13 The meter(s) must be installed in accordance with the provisions of the document entitled "Guidelines for Water Meter Installation 2009" by 31 October, 2010.

14 The licensee must take and record the reading from each meter required under this licence at the beginning and another at the end of the water year defined on this licence.

End of terms, conditions and restrictions

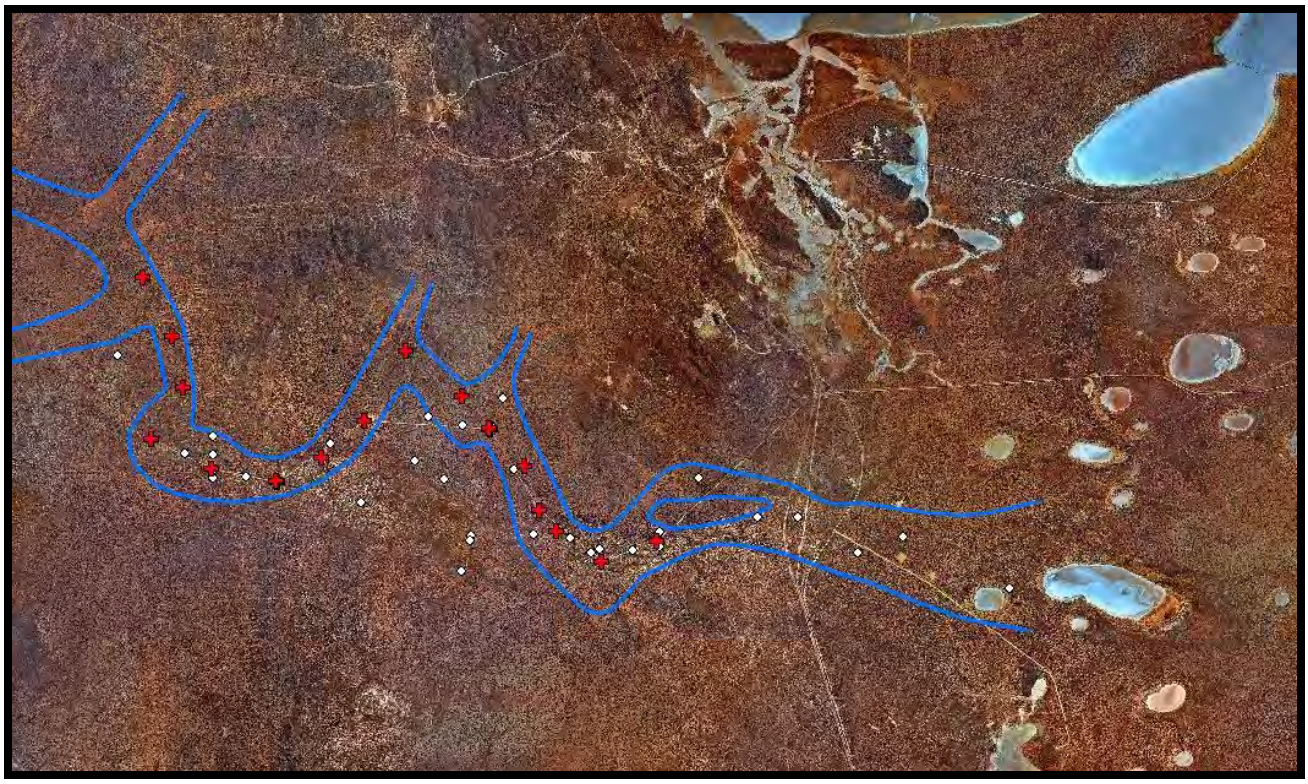
Appendix E

Groundwater Modelling Report Mt Morgan Borefield

THORPE
GROUNDWATER & ENVIRONMENTAL SERVICES PTY
ACN 091 124 29

REPORT No. T121 Rep. 1

NUMERICAL MODELLING OF THE PERFORMANCE OF THE MT MORGAN BOREFIELD, WIDGIEMOOLTHA FOR GOLD FIELDS AUSTRALIA LIMITED



CLIENT: GOLD FIELDS AUSTRALIA
REPORT: Rep. 1
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STATUS: FINAL

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1 INTRODUCTION

St Ives Gold Mining Pty Ltd (St Ives) owns and operates a borefield that supplies saline groundwater for the processing of gold-bearing ore at the St Ives mill, near Kambalda. The borefield is located at Mt Morgan, about 5 km south of Widgiemooltha and 35 km southwest of the St Ives mill (Fig. 1).

Groundwater in the Mt Morgan Borefield is extracted from a sequence of continental to marginal-marine sediments infilling a network of palaeovalleys that were incised into Pre-Cambrian bedrock during the mid-Tertiary (de Broekert 2002). Commonly known as "palaeochannels", these sediments typically form the major source of groundwater for mineral processing in the Eastern Goldfields region.

The borefield was established in early 1990 following an extensive exploration drilling programme that initially targeted anomalies generated by ground and airborne electromagnetic surveys (Forbes *et al.*, 1991). Eight production bores were drilled in the central (axial) part of the palaeovalley aquifer where the sediments are thickest and commonly most permeable. A further eight production bores were drilled in 2004 by Thorpe Groundwater and Environmental Services (TGES, 2004a), partly to reduce the development of groundwater mounds between the existing bores, and partly to extend the borefield in a westward, up-valley, direction.

In response to increased demand, extraction from the Mt Morgan Borefield has risen steadily from about 1 GL/yr (32 L/s) in its first year of operation to about 2.4 GL/yr (75 L/s) in 2008. Operation of the borefield is currently licensed under GWL59222(4) which permits an extraction rate of 4,015 GL/a (127 L/s). To check on the performance of the aquifer, extraction volumes (pumpages), water levels and water quality are recorded and analysed annually.

For planning and licence renewal purposes, numerical modelling is periodically undertaken to predict the longevity of the groundwater resource under various conditions of extraction. The results of the last groundwater modelling exercise (TGES 2004b) indicated that the aquifer was capable of supporting an extract rate of about 12,300 kL/d (142 L/s) for at least 20 years. To provide an update of the potential performance of the Mt Morgan palaeovalley aquifer, St Ives commissioned Thorpe Groundwater and Environmental Services to establish and run another groundwater model using the latest available monitoring data, the results of which are presented in this report.

2 PHYSICAL SETTING

2.1 CLIMATE

The Kambalda–Widgiemooltha area has a continental, semi-arid climate. Average monthly rainfall for St Ives for the period of borefield operation (1991–2008) is shown in Table 1, and average monthly evaporation for Kalgoorlie for the period 1996–2009 is shown in Table 2. Table 3 shows the annual rainfall at St Ives for 1991–2008.

As can be seen in Table 1, apart from a relatively dry spell in September and October, rainfall is spread fairly evenly throughout the year. The rain is sourced from low-intensity frontal systems during the winter and high-intensity events during the summer. The latter mostly result from thunderstorms, but occasionally from the remnants of tropical cyclones, which have the capacity to deliver over 200 mm during a single event. This appears to have occurred during 1992, 1994, 1995, 1999 and 2000 (Table 3), resulting in the highest monthly average rainfalls for 1996–2009 occurring in February and March (Table 1).

Potential evaporation (Table 3) greatly exceeds rainfall during every month of the year. Thus, except for during the high-intensity summer rainfall events, the possibility for significant recharge to occur is limited.

Table 1 : Average Monthly Rainfall (mm), St Ives, 1991–2008

Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
24.9	46.3	38.1	20.3	22.6	21.7	20.5	20.7	13.3	10.6	20.3	23.9	283

Table 2 : Average Monthly Evaporation (mm), Kalgoorlie, 1966–2009

Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
390.6	337.9	243.6	174	111.6	78	86.8	117.8	174	257.3	309	375.1	2,882

Table 3 : Yearly Rainfall (mm), St Ives, 1991–2008

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
158	502	337	281	485	226	260	299	368	385	206	103	242	333	159	266	222	252

2.2 GEOLOGY AND HYDROGEOLOGY

The occurrence of groundwater at Mt Morgan is primarily controlled by topography and geology. Basement rocks in the area are of Archaean age and composed of highly folded and thrust-faulted, metamorphosed, mafic, ultramafic and minor meta-sedimentary rocks (collectively referred to as "greenstones") that have been intruded by two large granitic plutons – the Burra Monzogranite in the west and the Widgiemooltha Monzogranite in the east (Fig. 2). A thin zone of sand-rich metasediments occurs within the greenstone succession at its contact with the northeastern margin of the Widgiemooltha Monzogranite, and an east–west trending Proterozoic dolerite dyke has intruded the Archaean rocks in the north of the area.

Much of the Archaean basement is weathered with the depth of weathering being greatest over felsic (granitic) and meta-sedimentary rocks and least over mafic–ultramafic rocks, which therefore tend to form topographic lows and highs, respectively. Weathered granite reaches a maximum thickness of 95 m in MND1035 (nearby to bore MND1037, Fig. 2), but elsewhere is typically 20–50 m thick.

Incision of the Tertiary palaeovalley appears to have been strongly controlled by the structure of the underlying Pre-Cambrian bedrock. This is evidenced in the west of study area, where the palaeovalley follows the contact between ultramafic rocks and the Burra Monzogranite, and in the central part of the study area, where the palaeovalley follows the metasediments at the northeastern margin of the Widgiemooltha Monzogranite (Fig. 2).

Geological cross-sections, generated from over 20 transects of exploration drill holes, indicate that the palaeovalley typically has a depth of about 75 m and a width of 500 to 1,000 m. The outline of the palaeovalley aquifer and locations of the drilling transects are shown in Figure 2.

The base of the palaeovalley fill sequence typically comprises a thin, basal conglomerate overlain by about 30 m of poorly consolidated, medium- to coarse-grained quartz sand, locally interbedded with clayey sand and clay, which is commonly carbonaceous (lignitic). On account of its depth and coarse grain size, this forms the principal aquifer from which groundwater is drawn. Overlying the basal coarse sand sequence is a 20–25 m thick succession of fine- to medium-grained quartz sand, interbedded with sandy clay and clay. This is in turn overlain by about 25 m of green to grey plastic clay which is locally silicified and contains numerous lenses of iron-cemented quartz sand and ferruginous gravel, commonly referred to as "ferricrete". A thin layer of the Quaternary sediments, dominantly

composed of red sandy clay, blankets much of the land-surface including the palaeovalleys and their fills.

Fractures in Archaean bedrock are capable of supplying moderate supplies of saline to hypersaline groundwater, but the supply is commonly readily depleted owing to the limited storage capacity of the fractures. Much larger and more reliable supplies of groundwater are available from the Tertiary palaeovalley sediments, especially where these have been sourced from granitic terrain and are rich in quartz sand, as occurs at Mt Morgan.

The palaeovalley network at Mt Morgan has only been defined by exploratory drilling in its lower reaches, for a distance of about 20 km between bore DWT376 in the east and production bore 16 in the west (Fig. 2). Judging from size of the surface water catchment, which extends for a further 40 km to the west (Fig. 1), it is likely than numerous more palaeovalleys exist within the middle and upper reaches of the system, although these are unlikely to be as voluminous and sand-rich as at Mt Morgan.

Pumping test results for the first eight bores installed at Mt Morgan (Forbes *et al*., 1991) indicate that the average transmissivity (T) of the palaeovalley aquifer is about 530 m^2/d, which equates to a hydraulic conductivity (K) of about 12 m/d. Storativity values derived from the pumping tests were typically about 0.003, indicative of confined to semi-confined aquifer conditions. At that time the water table was still within the upper, clay-rich part of the palaeovalley sequence, which served to confine the deeper groundwater particularly in the lower reaches of the palaeovalley where the water table was shallowest. Owing to lowering of the water table by pumping, unconfined aquifer conditions now exist throughout the borefield area.

Groundwater salinity within the palaeovalley aquifer currently ranges from 32,000 to 53,000 mg/L Total Dissolved Solids (TDS), having remained more or less stable since commissioning of the borefield in 1991 (Aquaterra 2008). A wedge of hypersaline groundwater with a maximum salinity of about 100,000 mg/L TDS exists at the base of the palaeovalley aquifer in its easternmost section between monitoring bores DWT376 and DWT373 (Fig. 2). Bore 1 has not been pumped since 1991 in an attempt to prevent the wedge from migrating westwards and into the borefield. This appears to have been successful, although an increase in the salinity of water in Bore 2 from 34,700 mg/L in November 2000, to 60,000 mg/L in February 2008, suggests that migration of the hypersaline wedge may be occurring.

2.3 HISTORY OF EXTRACTION AND MONITORING

Schedules of the production and monitoring bores within the Mt Morgan Borefield are provided in Tables 4 and 5, respectively. Most of the production bores are cased with 200 mm NB PVC, with screened sections of slotted PVC or wire-wound stainless steel set within the lower part of the palaeovalley aquifer. Specific capacities for bores 1 to 8 range from about 100 to 800 kL/d/m (1.1 to 9.5 L/s/m), having increased substantially from when the bores were drilled owing to continued development (removal of fines around the screens) and the transition to unconfined aquifer conditions.

Annual pumpages for the bores in the Mt Morgan Borefield are listed in Table 6, and plotted as a function of three groups, representing the eastern, central and western parts of the borefield, in Figure 3. The data for the period 1991–1995 were sourced from Appendix C in Gerrard and Haselgrove (1998), whereas the data for 1996–2008 were supplied by the St Ives mill (B. Cameron, pers. comm., May 2009).

Three periods of broadly similar extraction can be recognised in Figure 3. The first extends between 1991 and 2000 during which pumping increased from about 1 to 1.5 GL/a, and low pumpages were recorded in 1992, 1995 and 2000 as a result of very high summer rainfalls in those years (Table 3). Presumably surface water sources were exploited in preference to groundwater in the wet years because of their much lower salinity. The second phase of borefield operation, spanning from 2001 to 2004, saw a minor increase in total extraction to about 1.8 GL/a. The last phase, beginning in 2005, represents a sharp increase in total pumpage to about 2.4 GL/a, resulting from commissioning of the eight new production bores drilled in 2004 (TGES, 2004a). Through all periods of operation, pumpage has been least in the eastern part of the borefield so as to prevent mobilisation of the salt wedge, and most in the central part of the borefield, probably owing to the high specific capacity of bore 5 in particular.

Measurements of water levels are currently restricted to 11 monitoring bores, although at least 43 monitoring bores have been installed in total, most of which were used during test-pumping of the production bores in 1990 and during first few years of borefield operation (Table 5). Water levels have declined steadily as a result of extraction, with the greatest drawdowns occurring in the central part of the borefield. Water levels for the 11 key monitoring bores, selected according to the length of record and lithological position, were used in calibration of the model and are discussed further in Section 3.2.

Table 4 : Schedule of Production Bores

Bore	Alias	Drill Date	mE (MGA)	mN (MGA)	TOC* RL (mAHD)	Depth (mbgl)	Top screen (mbgl)	Bottom screen (mbgl)	Top screen (mAHD)	Bottom screen (mAHD)	Screen type^	Casing diam. (mm)	Initial SWL (mbtc)	Initial SWL (mAHD)	Initial Salinity (mg/L)	Status
1	DWT390	Mar 90	364936	6508321	305.29	71	6.0	66.0	299.3	239.3	PVC/SS	200	9.40	295.89		not used
2	DWT403	Apr 90	364025	6507978	307.22	70	9.0	69.0	298.2	238.2	PVC	200	11.50	295.72		operational
3	MND1175	Apr 90	362978	6508828	310.00	70	18.0	67.0	292.0	243.0	PVC/SS	200	14.20	295.80		replaced
3(r)	MND1175	Apr 98	362989	6508825	310.00	70	18.0	67.0	292.0	243.0	PVC/SS	200	NR			operational
4	MND1190	Jun 90	362162	6510175	319.28	83	18.0	77.0	301.3	242.3	PVC/SS	200	17.00	302.28		replaced
4(r)	MND1190	Mar 03	362155	6510181	319.28	80	58.0	79.0	261.3	240.3	SS	200	NR			operational
5	MND1220	Jun 90	360073	6510299	315.60	69	11.0	63.0	304.6	252.6	PVC/SS	200	13.90	301.70		operational
6	MND1177	May 90	358641	6509297	315.52	70	18.0	66.0	297.5	249.5	PVC/SS	200	15.00	300.52		replaced
6(r)	MND1867	Nov 03	358621	6509321	315.46	70	44.0	68.0	271.5	247.5	SS,	200	34.83	280.36		operational
7	MND1176	May 90	357550	6509507	315.67	72	14.0	68.0	301.7	247.7	PVC/SS	200	16.00	299.67		operational
8	MND1178	May 90	356545	6509996	316.37	71	16.0	70.0	300.4	246.4	PVC/SS	200	16.80	299.57		operational
9	MND1868	Dec 03	363263	6508479	306.51	73	36.8	72.8	269.7	233.7	SS	200	24.58	281.93		operational
10	MND1869	Dec 03	362734	6509553	317.19	71	44.0	68.0	273.2	249.2	SS	200	36.61	280.58		operational
11	MND1870	Nov 03	361712	6510710	320.87	81	44.0	80.0	276.9	240.9	SS	200	43.32	277.55		operational
12	MND1822	2004	360772	6511474	329.19	84	64.0	82.0	265.2	247.2	SS	200	49.92	279.27		operational
13	MND1827	2004	359361	6509704	311.80	72	50.0	71.0	261.8	240.8	SS	200	33.09	278.71		operational
14	MND1843	2004	357065	6510862	326.26	78	56.0	77.0	270.3	249.3	SS	200	41.63	284.63		operational
15	MND1854	2004	356894	6511708	332.08	69	47.0	68.0	285.1	264.1	SS	200	43.14	288.94		operational
16	MND1861	2004	356400	6512680	334.03	79	54.0	78.0	280.0	256.0	SS	200	42.70	291.33		operational

* TOC = top of casing, SS = stainless steel wire-wound screens

Table 5 : Schedule of Monitoring Bores

Bore	Date	mE (MGA)	mN (MGA)	Ground RL (mAHD)	Depth (mbgl)	Top screen (mbgl)	Bottom screen (mbgl)	Top screen (mAHD)	Bottom screen (mAHD)	Diameter (mm)	Initial SWL (mbtc)	Initial SWL (mAHD)	Trigger level for 80 L/sec supply scenario (mAHD)	Status*
DWT376	Mar 90	370783	6507515	298.30	72	18	58	280	240	80	5.00	293.40	**NA**	monitored
DWT455	Jul 90	365627	6509349	312.70	71	24	70	289	243	50	17.50	295.30	**281**	monitored
DWT373	Feb 90	364966	6508452	305.37	67	24	54	281	251	80	9.19	296.28	**278**	monitored
DWT497	Aug 91	364522	6508149	305.40	23	?	?			36				not monit.
WID4617	Aug 01	364523	6508146	305.40	24	6	24	299	281	50	14.10	291.44	**277**	monitored
MND1871	Dec 03	363836	6508108	304.17	73	48	72	256	232	50	20.45	284.42	**275**	monitored
MND1237	Aug 91	362552	6509495	315.16	60	18	60	297	255	40	*21.90*	*293.37*	**269**	not monit.
MND1238	Aug 91	361395	6509339	311.95	53	18	53	294	259	40	13.90	298.05		monitored
MND1872	Dec 03	361713	6510216	317.61	73	48	72	270	246	50	33.57	284.74	**267**	monitored
MND1240	Aug 91	361134	6510372	316.59	38	18	38	299	279	40	20.00	296.73	**270**	monitored
MND1241	Feb 91	359515	6509930	312.68	59	18	38	295	275	?	23.00	289.50		not monit.
WID4616	Aug 01	359513	6509931	312.68	57	15	57	298	256	50	28.30	284.79	**262**	monitored
MND1243	Sep. 91	357092	6509749	316.88	38	18	38	299	279	40	19.00	297.88	**269**	monitored
MND1244		355967	6511376	321.02	20	18	20	303	301		20.09	301.29		not monit.
WID4615	Aug 01	355967	6511376	321.02	56	8	56	313	265	50	23.00	298.61	**296**	monitored
DWT391	Mar 09	369011	6508385	299.00	61	18	58	281	241	80	5.60	293.40		not monit.
DWT371	Feb 90	364969	6508225	304.50	64	12	59	293	246	80	9.70	294.80		not monit.
DWT372	Feb 90	364962	6508321	305.30	72	18	66	287	239	80	5.60	*299.70*		not monit.
DWT374	Mar 90	363979	6508174	304.20	66	18	60	286	244	80	6.80	297.40		not monit.
DWT404	Jun 90	364010	6507980	307.30	70	14	68	293	239	50	11.30	296.00		not monit.

Bore	Date	mE (MGA)	mN (MGA)	Ground RL (mAHD)	Depth (mbgl)	Top screen (mbgl)	Bottom screen (mbgl)	Top screen (mAHD)	Bottom screen (mAHD)	Diameter (mm)	Initial SWL (mbtc)	Initial SWL (mAHD)	Trigger level for 80 L/sec supply scenario (mAHD)	Status*
MND1040	Mar 90	362891	6508413	308.10	71	18	70	290	238	80	7.50	300.60		not monit.
MND1192	Jun 90	362989	6508823	310.00	73	18	69	292	241	50	14.00	296.00		not monit.
MND1191	Jun 90	362154	6510173	319.30	83	18	82	301	237	80	17.00	302.30		not monit.
MND1221	Jun 90	360082	6510298	315.50	67	18	66	298	250	50	14.80	300.70		not monit.
MND1041	Mar 90	360016	6508949	313.10	74	18	72	295	241	80	14.80	298.30		not monit.
MND1039	Mar 90	358649	6509302	315.50	73	24	72	292	244	80	15.10	300.40		not monit.
MND1194	Mar 90	357561	6509509	315.60	71	17	71	299	245	50	16.00	299.60		not monit.
MND1038	Apr 90	357542	6509459	315.70	66	18	66	298	250	80	15.70	300.00		not monit.
MND1193	Jun 90	356557	6509995	316.30	71	17	71	299	245	50	16.30	300.00		not monit.
MND1035	Jan 90	361838	6508399	310.12	23		20		290	80	14.40	295.72		blocked
MND1036	Feb 90	361823	6508321	309.86	30		20		290	80	14.50	295.36		not monit.
MND1037	1990	361683	6507802	310.00	50		20		290	50				not monit.
MND1180	1990	362174	6510227	319.30	63		23		296	50				not monit.
MND1181	1990	362374	6510668	322.50	55		21		302	50				not monit.
MND1055	1990	357562	6509360	315.70	77		21		295	50				blocked
MND1115	1990	357559	6509746	315.00	71		21		294	50				blocked
MND1117	1990	357557	6510049	317.50	61		22		296	50				blocked
DWT493	Sept 91	368269	6508117	300	48									not monit.
DWT494	Aug 91	367265	6508708	301	65									not monit.
DWT496	Aug 91	366592	6508705	303	60	18	59	285	244	36				not monit.
DWT498	Aug 91	363496	6508349	305	60	18	60	287	245	36				not monit.
MND1239	Aug 91	360909	6509644	312	16		16		296	36				not monit.
MND1242	Aug 91	358109	6509382	315	48	18	38	297	277	36				not monit.

Table 6 : Annual Borefield Production (kL), 1991–2008

Year	Bore 1	Bore 2	Bore 3	Bore 4	Bore 5	Bore 6	Bore 7	Bore 8	Bore 9	Bore 10	Bore 11	Bore 12	Bore 13	Bore 14	Bore 15	Bore 16	TOTAL
1991	49,299	48,847	221,567	137,388	187,532	176,006	125,358	72,271	0	0	0	0	0	0	0	0	1,018,268
1992	0	13,134	103,709	30,684	121,350	99,459	25,060	7,864	0	0	0	0	0	0	0	0	401,260
1993	0	50,495	159,192	83,600	173,304	122,524	129,592	44,333	0	0	0	0	0	0	0	0	763,040
1994	0	62,956	268,668	177,916	223,284	213,912	225,382	88,952	0	0	0	0	0	0	0	0	1,261,070
1995	0	26,811	57,207	91,894	101,794	4,323	3,910	21,248	0	0	0	0	0	0	0	0	307,187
1996	0	136,646	297,442	127,227	361,607	334,626	108,481	72,220	0	0	0	0	0	0	0	0	1,438,249
1997	0	131,179	245,503	293,636	257,516	301,657	244,371	41,812	0	0	0	0	0	0	0	0	1,515,674
1998	0	1	31,135	374,268	554,008	393,902	179,542	10,020	0	0	0	0	0	0	0	0	1,542,876
1999	0	1	391,914	193,384	428,725	63,529	222,694	32	0	0	0	0	0	0	0	0	1,300,279
2000	0	0	136,155	143,293	269,234	192,547	136,969	438	0	0	0	0	0	0	0	0	878,636
2001	0	0	312,961	916,357	201,345	216,066	159,057	4,388	0	0	0	0	0	0	0	0	1,810,174
2002	0	0	271,920	173,269	153,512	414,472	503,558	19,300	0	0	0	0	0	0	0	0	1,536,031
2003	0	11,270	284,877	249,226	355,579	431,397	506,201	16,344	0	0	0	0	0	0	0	0	1,854,894
2004	0	178,365	149,522	341,217	204,162	249,499	344,065	67,385	709	8,049	530	8,436	10,060	8,280	9,761	78	1,580,118
2005	0	112,649	115,325	27,863	335,038	237,804	398,294	22,998	89,284	127,063	70,259	234,188	180,925	158,729	244,850	20,460	2,375,729
2006	0	11,896	187,607	254,718	228,740	58,290	326,728	89,231	105,399	139,900	136,213	138,189	146,534	139,586	91,453	64,319	2,118,803
2007	0	30,712	310,020	305,670	348,913	162,918	325,966	165,761	248,550	132,710	53,435	97,885	121,639	16,533	97,182	11,217	2,429,111
2008	0	1,669	282,617	218,018	254,003	224,976	340,118	161,777	166,280	18,589	205,183	25,058	291,898	164,508	23,129	1	2,377,824
Tot. 1991-2003	49,299	481,340	2,782,250	2,992,142	3,388,790	2,964,420	2,570,175	399,222	0	0	0	0	0	0	0	0	
Tot. 2004-2008		335,291	1,045,091	1,147,486	1,370,856	933,487	1,735,171	507,152	610,222	426,311	465,620	503,756	751,056	487,636	466,375	96,075	
Prop. 1991-2003 (%)	0.3	3.1	17.8	19.1	21.7	19.0	16.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Prop. 2004-2008 (%)		3.1	9.6	10.5	12.6	8.6	15.9	4.7	5.6	3.9	4.3	4.6	6.9	4.5	4.3	0.9	
Av. 1991-2008		45,368	212,630	229,979	264,425	216,550	239,186	50,354	122,044	85,262	93,124	100,751	150,211	97,527	93,275	19,215	
Max. 1991-2008		178,365	391,914	916,357	554,008	431,397	506,201	165,761	248,550	139,900	205,183	234,188	291,898	164,508	244,850	64,319	
Min. 1991-2008		0	31,135	27,863	101,794	4,323	3,910	32	709	8,049	530	8,436	10,060	8,280	9,761	1	

2.4 PREVIOUS PREDICTIONS OF BOREFIELD PERFORMANCE

A summary of previous predictions of borefield performance is presented in Table 7. Given that borefield has been in operation for 18 years, during which about 26 GL of groundwater has been extracted at an average rate of 1.5 GL/a (47 L/s), it is clear that most of the earlier predictions, such as that of Forbes *et al*. (1991) and Lisdon Assoc. (1997), were underestimates.

As a result of using fully parameterised 3D groundwater models and having longer records of water levels and pumpage to calibrate against, the models presented by TGES (2002, 2004b) should be more robust and reliable, although even between these there is a large variation in the predictions of borefield performance.

Table 7 : Previous Predictions of Borefield Performance

Reference	Pumping rate		Estimated supply (yrs)	Comments
	(kL/day)	(L/s)		
Forbes *et al*. (1991)	5,000	58	19	Calculated from aquifer volume and average specific yield
	5,000	58	>10	Extrapolation of pumping test drawdowns, corrected for well interference
Nield (1995)	6,000	69	23	1D finite difference model
Lisdon Assoc. (1997)	5,000	58	15-20	Empirical/analytical model accounting for bedrock leakage
	7,500	87	10	
	10,000	116	8	
Gerrard & Haselgrove (1998)	6,000	69	50	Empirical spreadsheet model (developed by Berry, 1997)
TGES (2002)	5,500	64	>10	3D finite difference model (MODFLOW)
	6,700	78	>10	
	9,000	104	10	
	10,200	118	<10	
TGES (2004b)	9,000	104	>20	3D finite difference model (MODFLOW)
	10,000	116	>20	
	11,000	127	>20	
	12,296	142	>20	

3 NUMERICAL MODELLING OF PUMPING RATES

3.1 MODEL DESCRIPTION

The groundwater model used was Processing Modflow Pro, which incorporates MODFLOW, the industry-standard finite-difference groundwater model designed by the U.S. Geological Survey (McDonald and Harbaugh 1988).

The model domain comprised a 20 x 17 km rectangle, sub-divided into 163 rows and 273 columns, with the rows aligned in an east–west direction, roughly parallel to the orientation of the palaeovalley in its lower reaches (Figs 1, 4). The grid cell size ranged from 200 x 200 m at the model periphery to 50 x 50 m in the area of the palaeovalley. Cells over exposed bedrock were set as inactive and no-flow boundaries were assigned to all sides of the model except where the palaeovalley crosses the model boundary near the railway line. At this location a general-head boundary was used.

Drill logs for all of the exploration boreholes for which logs were available were used to construct more than 20 cross-sections of the palaeovalley fill and adjoining bedrock (Fig. 2), which were used to establish the geometry of the model.

Four model layers were used and hydraulic parameters were assigned to the layers according to four hydrogeological zones representing the palaeovalley sediments, and variably weathered granitic, mafic/ultramafic and meta-sedimentary bedrock. In the lowermost layer (Layer 4) all of the bedrock types were assumed to be fresh. The second lowest layer (Layer 3) included the basal, coarse-grained part of the palaeovalley fill, weathered meta-sedimentary rock, partly weathered granite and fresh mafic/ultramafic rock. The second layer from the surface (Layer 2) was used to represent flows in the upper part of the sandy part of the palaeovalley fill, weathered meta-sediment and granite and partly weathered mafic/ultramafic rock; and the uppermost model layer (Layer 1) was used to model the clay-rich part of the palaeovalley fill, and weathered granite, meta-sediment and mafic/ultramafic rock.

Aquifer parameters for the four hydrological zones in each of the four model layers, after being adjusted to achieve a satisfactory calibration, are shown in Table 8. A fifth hydrogeological zone, not shown in Table 8, was defined to simulate flow within a particularly narrow and sand-rich part of the palaeovalley to the north of bore 8. The parameters were therefore adjusted to produce regionally, „best-fit' values, rather than being adjusted to match individual responses to pumping at each monitoring bore.

Initial (pre-pumping) water levels used in calibration of the model were obtained from the drill logs of production bores 1 to 8 and the logs of selected observation bores. A contour of the initial water levels is shown in Figure 5.

A recharge rate of 2.6 mm/yr, equivalent to 1% of annual rainfall, was applied to the northern part of model domain to simulate run-off from the outcropping mafic/ultramafic rock in that area.

Table 8 : Model Parameters

Parameter	Palaeovalley sediments	Bedrock		
		Granitic	Meta-sediment	Mafic/ Ultramafic
LAYER 1	*(clay, sandy clay, gravel)*	*(weathered)*	*(weathered)*	*(weathered)*
Hydraulic Conductivity, horiz. (m/d)	0.1	0.05	–	0.01
Hydraulic Conductivity, vert. (m/d)	0.1	0.05	–	0.01
Specific Storage (1/m)	0.002	0.00005	–	0.00005
Specific Yield	0.07	0.05	–	0.01
LAYER 2	*(clayey sand, sand, clay)*	*(weathered)*	*(weathered)*	*(weathered/fresh)*
Hydraulic Conductivity, horiz. (m/d)	5.0	0.05	1.0	0.01
Hydraulic Conductivity, vert. (m/d)	0.5	0.05	1.0	0.01
Specific Storage (1/m)	0.0005	0.00005	0.00005	0.00005
Specific Yield	0.07	0.05	0.25	0.01
LAYER 3	*(sand, clayey sand, clay)*	*(weathered/fresh)*	*(weathered)*	*(fresh)*
Hydraulic Conductivity, horiz. (m/d)	12.00	0.01	1.0	0.001
Hydraulic Conductivity, vert. (m/d)	1.2	0.01	1.0	0.001
Specific Storage (1/m)	0.0005	0.00005	0.00005	0.00005
Specific Yield	0.2	0.001	0.25	0.001
LAYER 4		*(fresh)*	*(fresh)*	*(fresh)*
Hydraulic Conductivity, horiz. (m/d)	–	0.001	0.001	0.001
Hydraulic Conductivity, vert. (m/d)	–	0.001	0.001	0.001
Specific Storage (1/m)	–	0.000001	0.000001	0.000001
Specific Yield	–	0.001	0.001	0.001

3.2 MODEL CALIBRATION

The groundwater model was calibrated over almost the entire period of borefield operation (1991–2008) using the pumpages listed in Table 6 and the water levels recorded in monitoring bores DWT455, DWT373, DWT497-WID4617, MND1237, MND1240, MND1241-WID4616 and MND1243, which are all situated within the palaeovalley aquifer; and monitoring bores MND1244-WID4615, MND1035 and MND1036 which are slotted in weathered granite adjacent to the palaeovalley (Fig. 2). Plots showing comparisons of the modelled and observed water levels are shown in Figures 6 to 11. Summaries of each calibration are provided below.

DWT376 & DWT455 Figure 6

The modelled water levels for DWT455 are consistently about 4 m higher than the observed water levels, but the trends are very similar indicating a good calibration. Much of the 4 m discrepancy can be related to a sharp drop in observed water levels that occurred during the first few months of borefield operation. Peaks in observed water levels after periods of high rainfall in early 1992, 1994 and 1995 indicate that the aquifer in this area is well disposed to receive recharge. This is not reflected in the modelled data because of the constant rate at which the recharge was applied.

Bore DWT455 is east of the modelled area, but is included to show that significant drawdown is occurring at least 7 km down-valley from the nearest operating production bore (bore 2).

DWT373 & DWT497-WID4617 Figure 7

As with the DWT455, the modelled water levels for DWT373 follow the trend of the observed water levels, but are consistently higher owing to an abrupt fall in water levels that occurred at the beginning of borefield operation. As the monitoring bore is situated next to bore 1, which was pumped for a short time in 1991 (Table 6), the discrepancy in modelled and observed water levels in DWT466 and DWT373 may in some way be related to the use of this bore. Alternatively, the low observed water levels in bores DWT455 and DWT373 may be a result of increased water density associated with the hyper-saline wedge.

The modelled water levels for DTW497-WID4617 are very close to the observed values, indicating that a good calibration had been achieved. A negligible rise in water levels following the heavy rainfall in early 1995 indicates that this part of the aquifer is not as well disposed to receiving recharge as at DWT455 and DWT373.

MND1237 & MND1240 Figure 8

The modelled water levels for MND1237 and MND140 are fairly similar to their observed counterparts, especially for the period after 2001. No pre-pumping water levels are available for these bores, so it is not possible to determine whether the initial water levels used in the model were too high, or the aquifer suffered a major drop in water levels at the beginning of borefield operation, as occurred in the vicinity of bore 1. Rises in water level occur after some large rainfall events, but these are inconsistent and subdued, suggesting that they are more likely to be due to decreases in pumping rather than recharge following rainfall. No evidence of the very high pumpage from bore 4 during 2001 is evident in the observed water levels indicating that the aquifer responds more to the total, regional pumpage rather than the pumpage from local production bores.

MND1241-WID4616 Figure 9

The modelled water levels for MND1241-WID4616 are very similar to the observed water levels, except for once again being too high. In this case the discrepancy is probably because the pre-pumping water levels in this area, which were interpolated from the observed water levels in bores 5 and 6 (Fig. 5), were too high. It is therefore possible that the modelled water levels in this part of the borefield are 3 to 4 m higher than they should be.

MND1243 & MND1244-WID4615 Figure 10

The modelled and observed water levels for MND1243 are very similar indicating that a good model calibration has been achieved in this area. Bore MND1243-WID4616, which is slotted in weathered granite, appears to be responding to pumping to a greater extent than predicted in the model. This may be due to some local lithological variation, such a structure in the granite linking the bore to the palaeovalley, or a tributary palaeovalley passing close to the bore.

MND1036, MND1037 & MND1238 Figure 11

Bores MND1036, MND1037 and MND1238 are all slotted in weathered granite on the south side of the palaeovalley (Fig. 2). The bores have not been regularly monitored since 1998,

but on the basis of the data available, it would appear that a reasonable calibration in this area has been achieved and that the aquifer parameters adopted for the weathered granite are accurate.

3.3 MODEL PREDICTION

Using the calibrated model parameters shown in Table 8, and the groundwater levels produced at the end of the calibration phase (December 2008), the groundwater model was run to simulate the water levels that will be produced by the following three scenarios.

1. When the borefield is pumped at a total of 80 L/s (6,912 kL/d, 2,523 ML/yr) for 5, 10, 15 and 20 years, with the pumpage being spread equally over the 15 possible production bores at a rate of 5.3 L/s (461 kL/d) per bore. This represents a small (5%) increase in extraction from the rate used in 2007–08 (Fig. 3), although the geographical distribution of pumping is different.
2. When the borefield is pumped at a total of 100 L/s (8,640 kL/d, 3,154 ML/d) for 5, 10, 15 and 20 years, with the pumpage being spread equally over the 15 possible production bores at a rate of 6.7 L/s (576 kL/d) per bore. This represents in 31% increase in pumping from the 2007-08 rates.
3. When the borefield is pumped at a total of 120 L/s (10,368 kL/d, 3,784 ML/d) for 5, 10, 15 and 17 years. This represents in 58% increase in pumping from the 2007-08 rates. In order to minimise drawdown in the central section of the palaeovalley, pumping was re-distributed so that 100 kL/d was removed from bores 5, 13, 6 and 7, and added to bores 9, 10, 15 and 16. Consequently, the pumping rates for bores 5, 13, 6 and 7 was set at 6.8 L/s (591 kL/d), the pumpage for bores 2, 3, 4, 11, 12, 8 and 14 was set at 8.0 L/s (691 kL/d), and the pumpage from bores 9, 10, 15 and 16 was set at 9.2 L/s (791 kL/d).

The results of each scenario are discussed below.

Total Pumpage = 80 L/s for 5, 10, 15 and 20 years — Figures 12, 13, 14

A longitudinal section of the palaeovalley aquifer with the water levels that are predicted to occur in this scenario is shown in Figure 12. This diagram shows the "approximate lower limit of extraction" which has been set at 15 m above the base of the palaeovalley aquifer. Contour plots of the modelled water levels at the end of 10 and 20 years of pumping are presented in Figures 13 and 14, respectively.

The results of the model indicate that the borefield is capable of sustaining a total extraction rate of 80 L/s for between 20 and 25 years under the given distribution of extraction. After this, the palaeovalley aquifer becomes excessively drawn down at bores 5, 13 and 6. It should be noted, that the average pumping rates for these bores during 2008 were about 8.1, 7.1 and 9.3 L/s, respectively (Table 6). These are considerably higher than the 5.0 L/s of pumpage used in the model, so that if the 2008 rates are continued, drawdowns within the central section of the borefield is likely to reach critical levels much earlier.

As with each of the modelling scenarios, the above conclusion is based on the assumption that the water level actually in an operating production bore, which is not predicted by the model (the model only calculates the average water for a grid cell), will be at least 5 m lower than in the aquifer between the production bores, and that pumping will become inefficient if the saturated thickness of the aquifer at the bore is reduced to lower than about 10 m. Furthermore, some bores, such as bores 5 and 3, are not screened to the base of the aquifer, so that these bores will become inoperable at even shallower water table depths (i.e., earlier). Likewise, by the end of 5 years of pumping there will be no monitoring bores in the northern section of the palaeovalley aquifer of sufficient depth to measure water levels.

Total Pumpage = 100 L/s for 5, 10, 15 and 20 years Figures 15, 16, 17

A longitudinal section of the palaeovalley aquifer with the water levels that are predicted to occur in this scenario is shown in Figure 15. This diagram shows the "approximate lower limit of extraction" which has been set at 15 m above the base of the palaeovalley aquifer. Contour plots of the modelled water levels at the end of 10 and 20 years of pumping are presented in Figures 16 and 17, respectively.

The results of the model indicate that the borefield is capable of sustaining a total extraction rate of 100 L/s for up to 15 years under the given distribution of extraction. Once again, it is the central section of the borefield which is first to be excessively drawn down. Borefield life could be extended by re-redistributing the pumpage away from the central section of the palaeovalley, but the resultant increase would be small. It would also result in lower water levels in the eastern part of the borefield, which may accelerate ingress of the hyper-saline wedge.

Total Pumpage = 120 L/s for 5, 10, 15 and 17 years — Figures 18, 19, 20

A longitudinal section of the palaeovalley aquifer with the water levels that are predicted to occur in this scenario is shown in Figure 18. This diagram shows the "approximate lower limit of extraction" which has been set at 15 m above the base of the palaeovalley aquifer. Contour plots of the modelled water levels at the end 5 and 15 years of pumping are presented in Figures 19 and 20, respectively.

The results of the model indicate that the borefield is capable of sustaining a total extraction of 120 L/s for about 13 years under the given distribution of extraction. In this case, a much longer section of the aquifer becomes excessively drawn down owing to re-distribution of pumpages away from the central section of the borefield, as described above. Additional production bores drilled in an unexploited section of the palaeovalley aquifer, such as to the north of bore 17, will be required to extend the life of the borefield.

The results described above indicate that the capacity of the Mt Morgan borefield to supply process water to the St Ives mill is somewhat greater than that estimated by TGES (2002), in which a borefield life of 10 years at a pumping rate of 100 L/s was predicted (Table 7). It is however, less than that predicted by TGES (2004b), in which a borefield life of more than 20 years was predicted to occur at a pumping rate of 142 L/s. The difference in predictions is probably largely due to the accuracy at which the model geometries were constructed and the aquifer parameters were assigned.

4 SUMMARY AND RECOMMENDATIONS

A numerical groundwater model was constructed using the results of a detailed analysis of the bedrock and palaeovalley stratigraphy at Mt Morgan, involving the construction of over 20 geological cross-sections. Aquifer parameters were initially assigned using the results of pumping tests and then adjusted to achieve a satisfactory calibration between predicted and observed water levels in all of the monitoring bores for which there were sufficiently long records of water level measurements. Several of the monitoring bores were situated in weathered granite outside of the palaeovalley aquifer, allowing for the effect of leakage from weathered bedrock into the palaeovalley aquifer to be included in the calibration. The calibration was run over the period beginning in commissioning of the borefield in 1991, to the end of 2008. As a result, the model was constructed and calibrated using the most comprehensive set of data available.

Following calibration, the model was run to predict the water levels that will be produced under several different scenarios of pumping. The results of these indicate that the borefield is capable of sustaining the current rate of extraction (approx. 80 L/s) for another 20–25 years. After that, water levels in the central section of the palaeovalley aquifer will become too low for bores 5, 13 and 6 to operate effectively, at least if they are pumped at 5 L/, which is less than the case in 2008.

Shorter periods of borefield life are predicted to occur if the borefield is pumped at higher rates. At a total extraction rate of 100 L/s the model predicts that the aquifer will become critically depleted after about 15 years, and at 120 L/s the model predicts that the aquifer will become critically depleted after about 13 years. The operational life of the borefield could be extended by re-redistributing pumpage away from the central section of the palaeovalley aquifer, but the resultant gain in time would be small. Furthermore, increasing the pumping rates of some bores may not be possible owing to locally low aquifer permeability, relatively poor well efficiency; and in the eastern section of the borefield, a greater potential for mobilising the wedge of hyper-saline water.

Ten trigger water levels (as mAHD) have been set (Table 5) for the monitoring bores specified for measurement by the groundwater licence. These trigger levels were set at 2 m above the drawdown level predicted by the 80L/second, 20 year duration model scenario. Bores MND1243 and MND 4617 will require deepening (replacement) to be able to access the trigger levels specified by the model. A trigger level has not been set for the licence-specified monitoring bore DWT376 as this bore is considered to be located outside of the borefield-pumping impact area.

It is recommended that solute transport modelling, using a package such as MT3DMS which can be linked to the output of MODFLOW, be performed to assess the rate at which the hyper-saline wedge may migrate under varying conditions of pumping in the eastern section of the borefield. It is also recommended that the present model be periodically up-dated and re-calibrated using the latest available water level and pumpage data, which will continue to improve its accuracy.

5 LIMITATIONS

Thorpe Groundwater and Environmental Services Pty Ltd have prepared this report for Gold Fields Australia in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice indicated in this report.

It is recommended that any plans and specifications prepared by others and relating to the content of this report, or any amendments to those plans and specifications, be reviewed by Thorpe Groundwater and Environmental Services Pty Ltd to verify that the intent of our recommendations is properly reflected in the design or specifications.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

Dr Peter Thorpe, Principal Hydrogeologist

Dr Peter de Broekert, Contract Modelling Specialist

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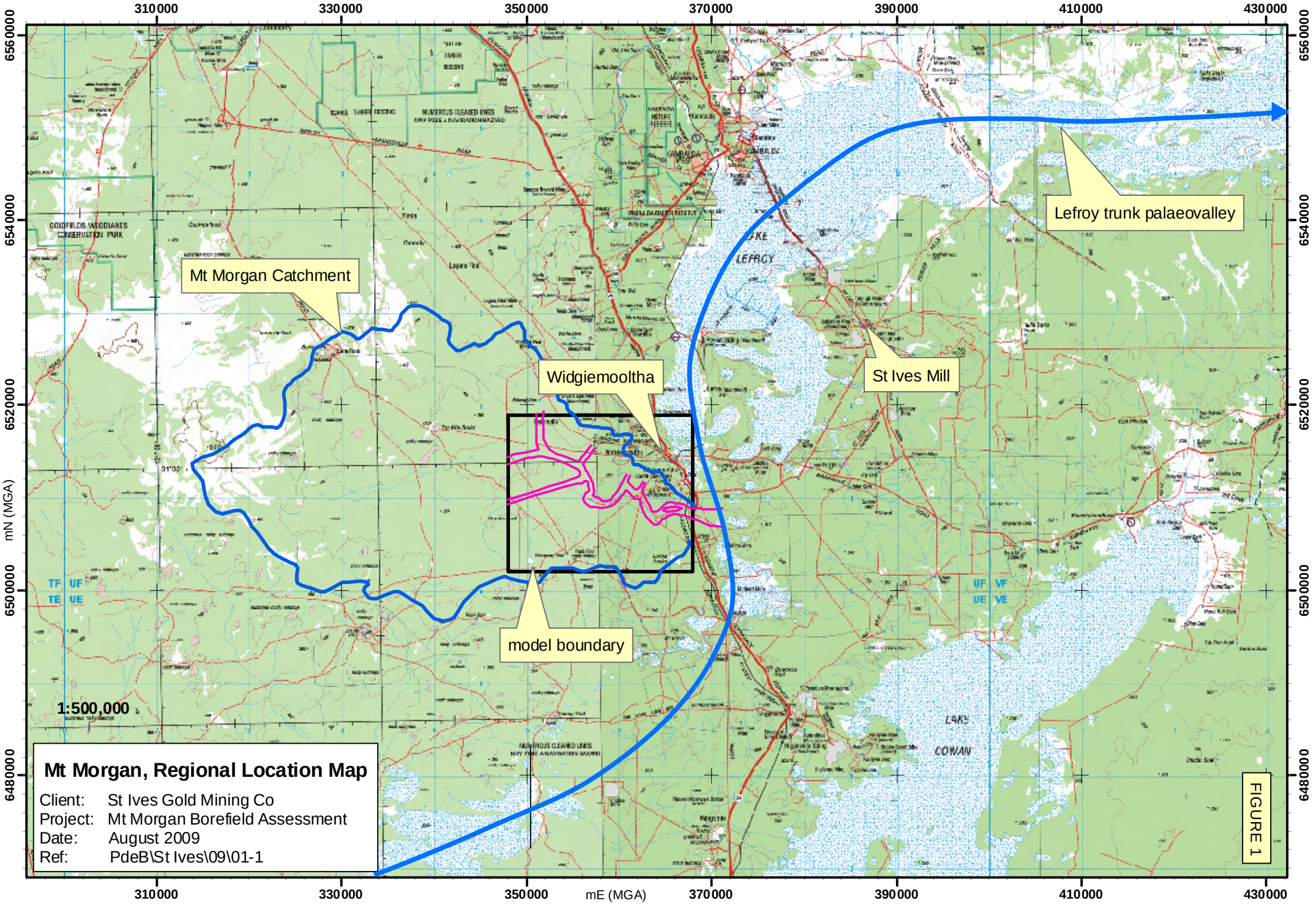
FIGURES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mN (MGA)
mE (MGA)
Mt Morgan Catchment
Widgiemooltha
St Ives Mill
Lefroy trunk palaeovalley
model boundary
LAKE LEFROY
LAKE COWAN
GOLDFIELDS WOODLANDS CONSERVATION PARK
NUMEROUS CLEARED LINES
1:500,000
TF UF
TE UE
UF VF
UE VE
Mt Morgan, Regional Location Map
Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\01-1
FIGURE 1

FIGURE 2

Mt Morgan, Production and Monitoring Bore Locations

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\01-2

1:40,000

356000 358000 360000 362000 364000 366000 368000

mE (MGA)

mN (MGA)

6514000 6512000 6510000 6508000 6506000

Dolerite dyke

Mafic/Ultramafic rocks

Mafic/Ultramafic rocks

Mafic/Ultramafic rocks

Metasediments

Burra Monzogranite

Widgiemooltha Monzogranite

Bore 16 Bore 15 Bore 14 Bore 12 Bore 11 Bore 8 Bore 7 Bore 6 Bore 13 Bore 5 Bore 4 Bore 10 Bore 3 Bore 9 Bore 1 Bore 2

NB8 NB7 NB6 NB5 NB4 NB3 NB2 NB1

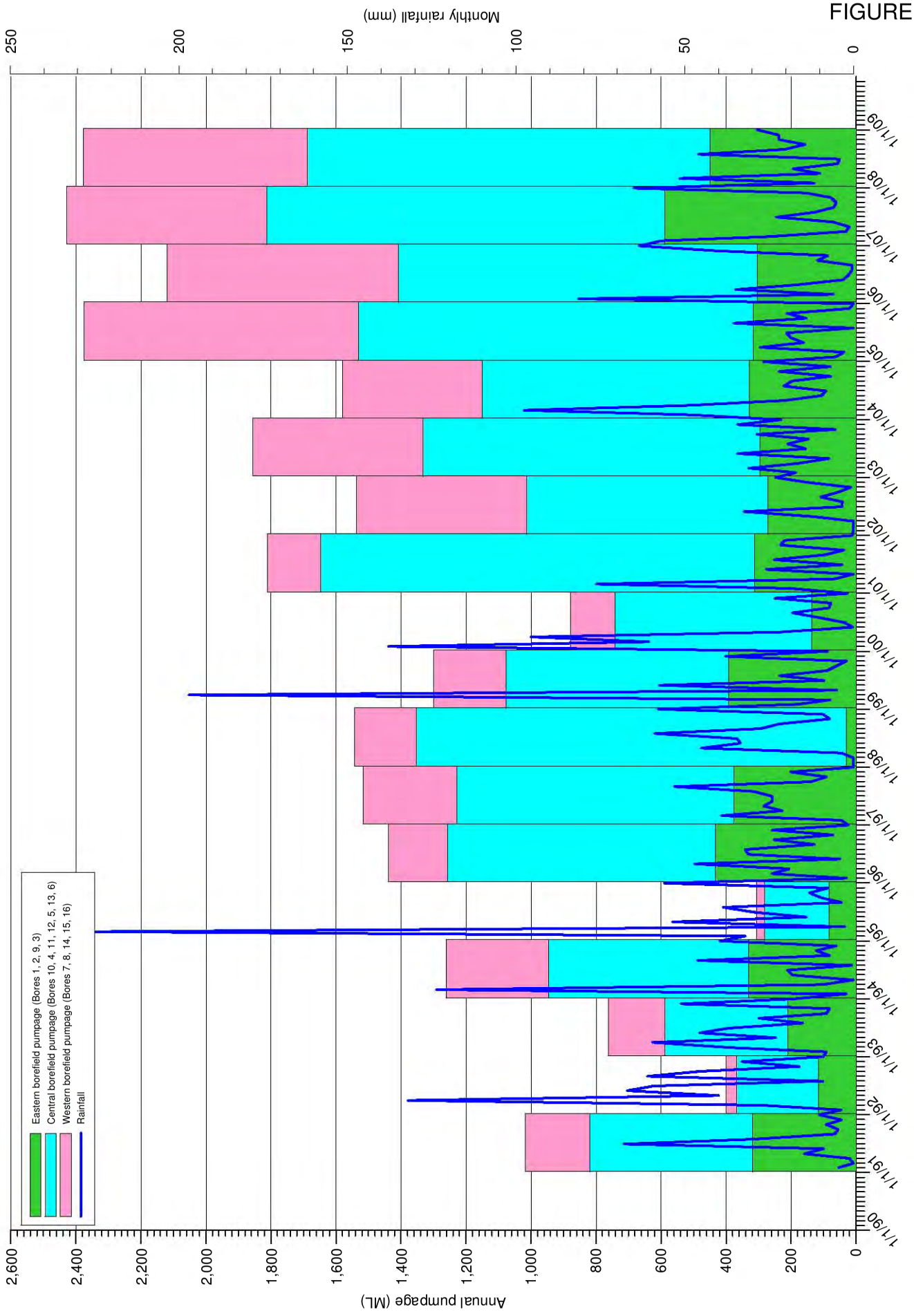
W13 W4 W3A W3B W2 nth W2 sth W9 W8 W1A W1 W6A W6

MND1244-WID4615 MND1193 MND1243 MND1117 MND1115 MND1038 MND1055 MND1194 MND1242 MND1039 MND1241-WID4616 MND1041 MND1221 MND1240 MND1872 MND1239 MND1238 MND1237 MND1181 MND1180 MND1191 MND1192 MND1040 MND1035 MND1036 MND1037 MND1871 DWT455 DWT496 DWT494 DWT373 DWT372 DWT371 DWT497 WID4617- DWT374 DWT498 DWT404 DWT391 DWT493

DWT376 1.3 km

Catchment boundary
Monitoring bore currently in use
(blue labels show bores used in groundwater model)
Monitoring bore used 1991-1995
Production bore
Exploration transect
Palaeovalley aquifer

FIGURE 3



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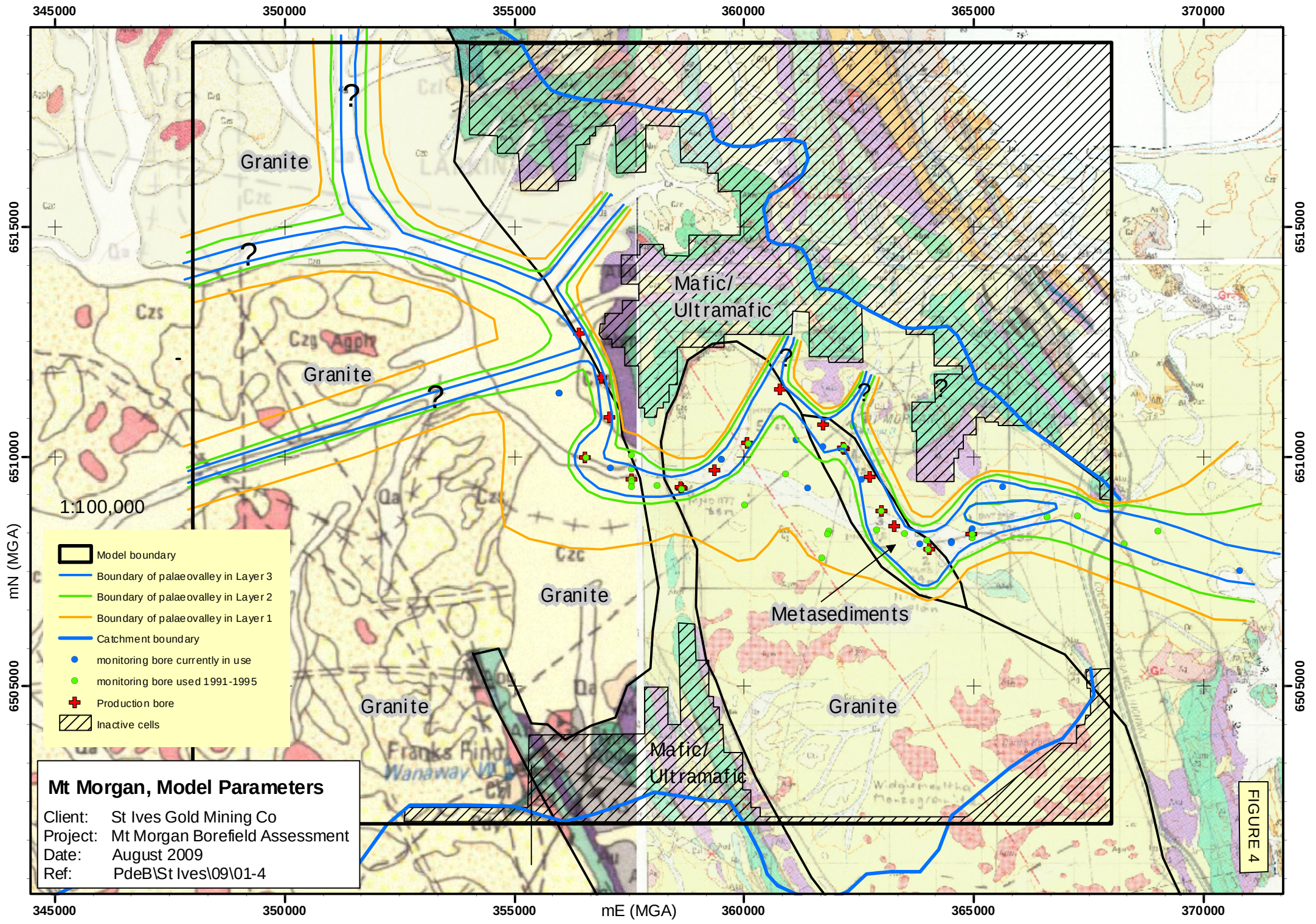
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-3

Annual Pumpage for Eastern, Central & Western Mt Morgan Borefield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Mafic/
Ultramafic
Metasediments
Czs
Czg
Aggh
Czc
Qa
Franks Find
Wanaway
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Model boundary
Boundary of palaeovalley in Layer 3
Boundary of palaeovalley in Layer 2
Boundary of palaeovalley in Layer 1
Catchment boundary
monitoring bore currently in use
monitoring bore used 1991-1995
Production bore
Inactive cells
Mt Morgan, Model Parameters
Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\01-4
FIGURE 4

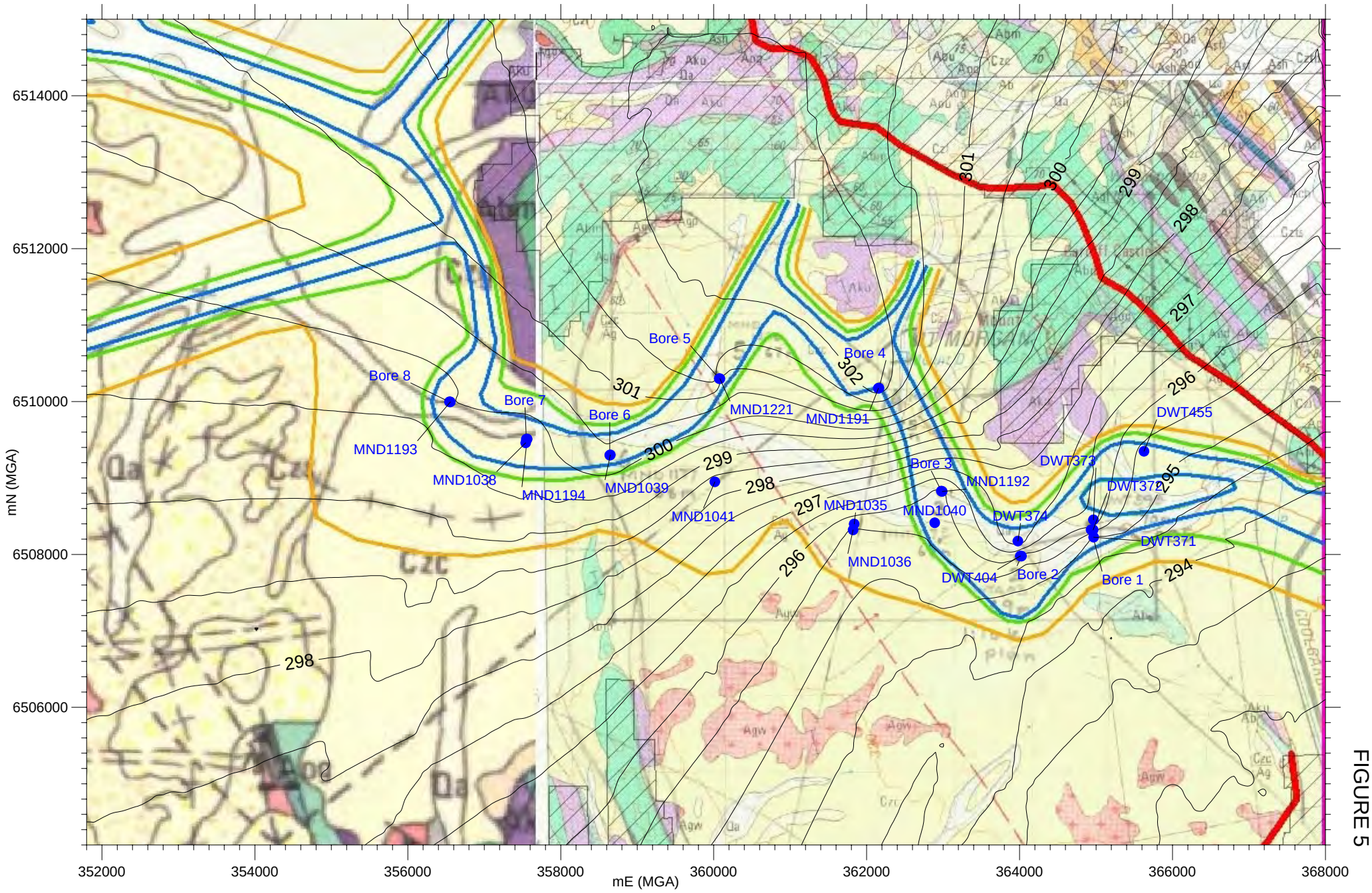
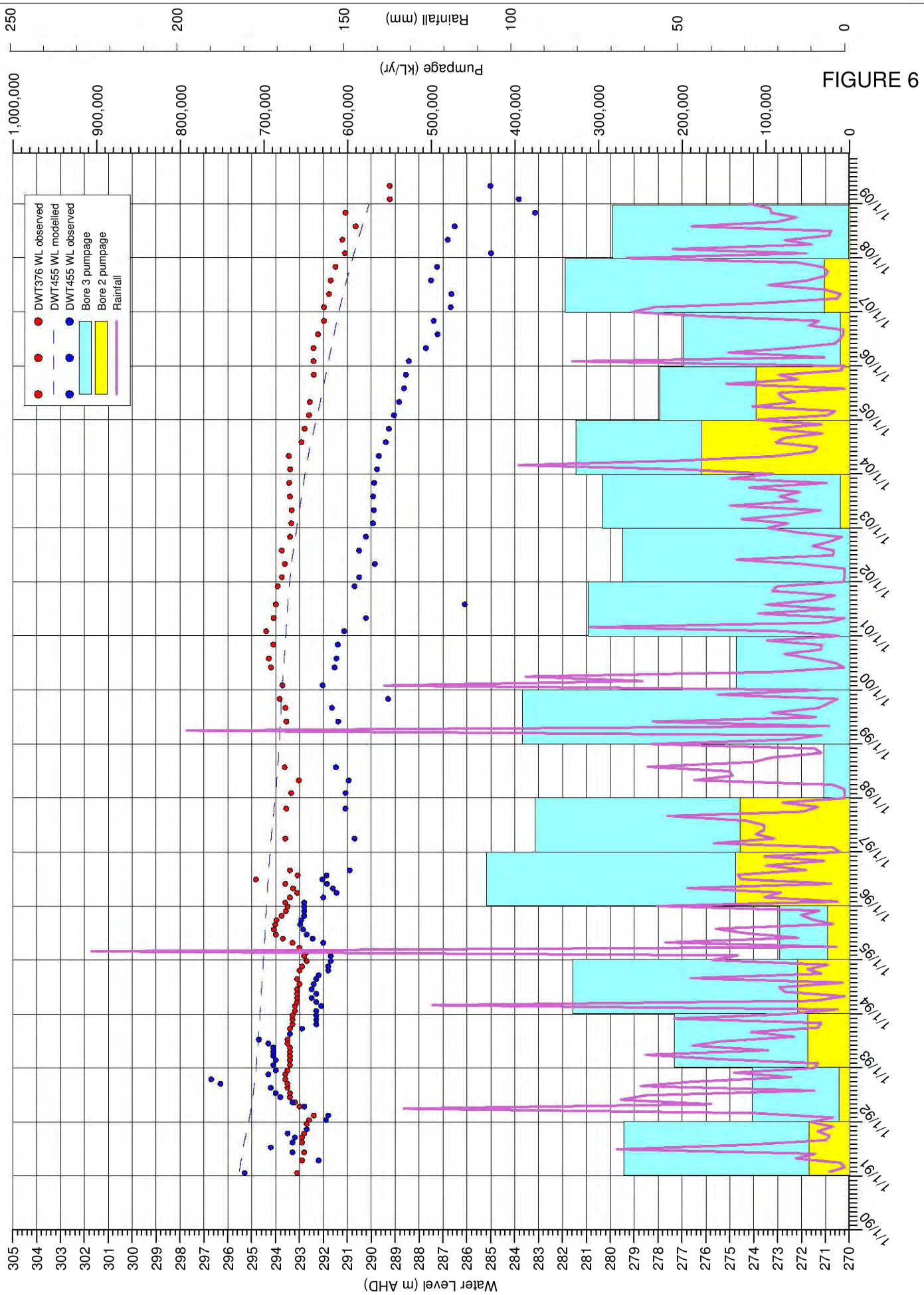


FIGURE 5

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-5

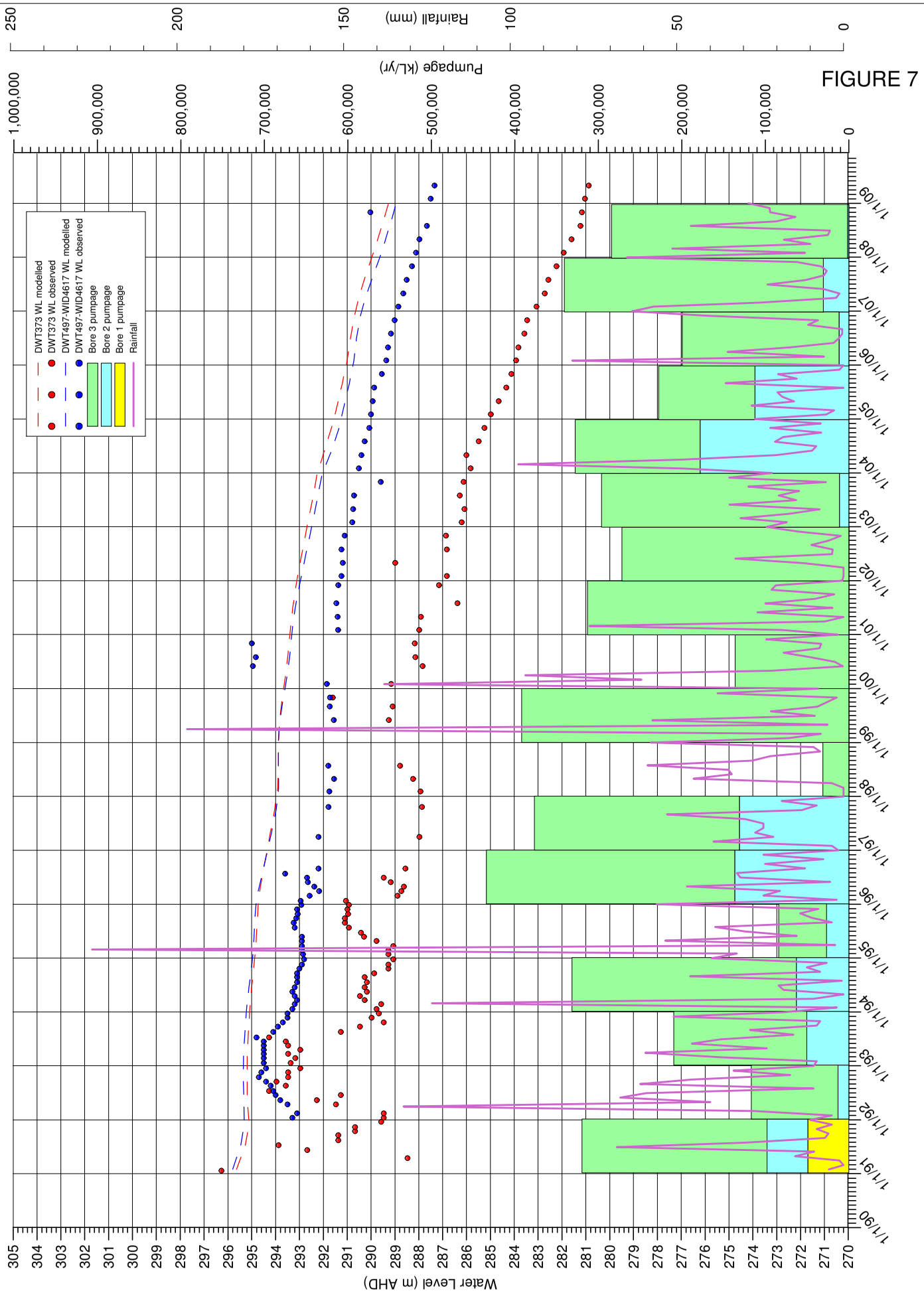
Pre-pumping Water Levels (mAHD), March-June 1990

FIGURE 6



Client: St Ives Gold Mining Co Project: Mt Morgan Borefield Assessment Date: August 2009 Ref: PdeB\St Ives\09\1-6	Observed & Modelled Water Levels (mAHD), Bores DWT376 & DWT455

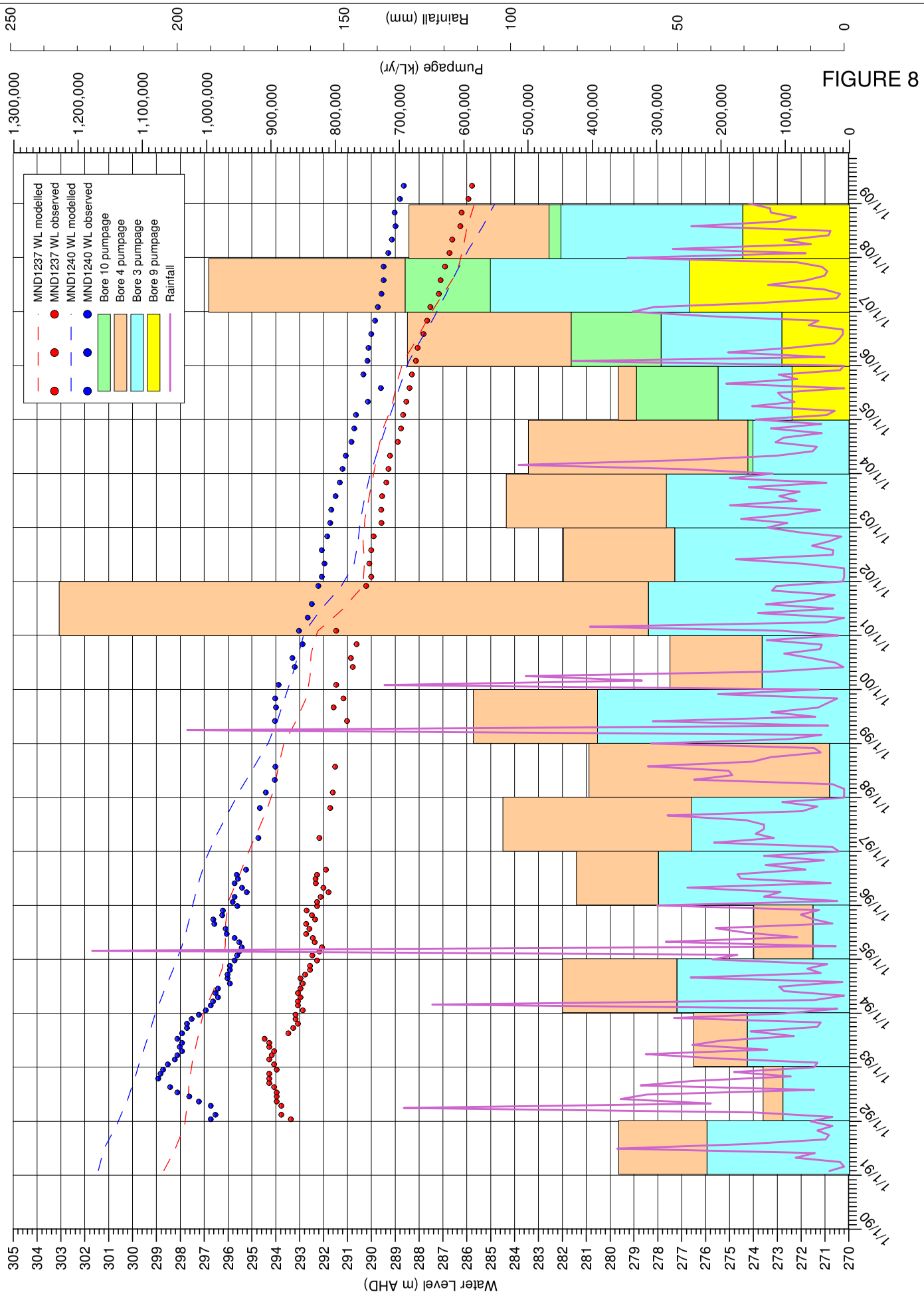
FIGURE 7



Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-7

Observed & Modelled Water Levels (mAHD), Bores DWT373 & DWT497-WID4617

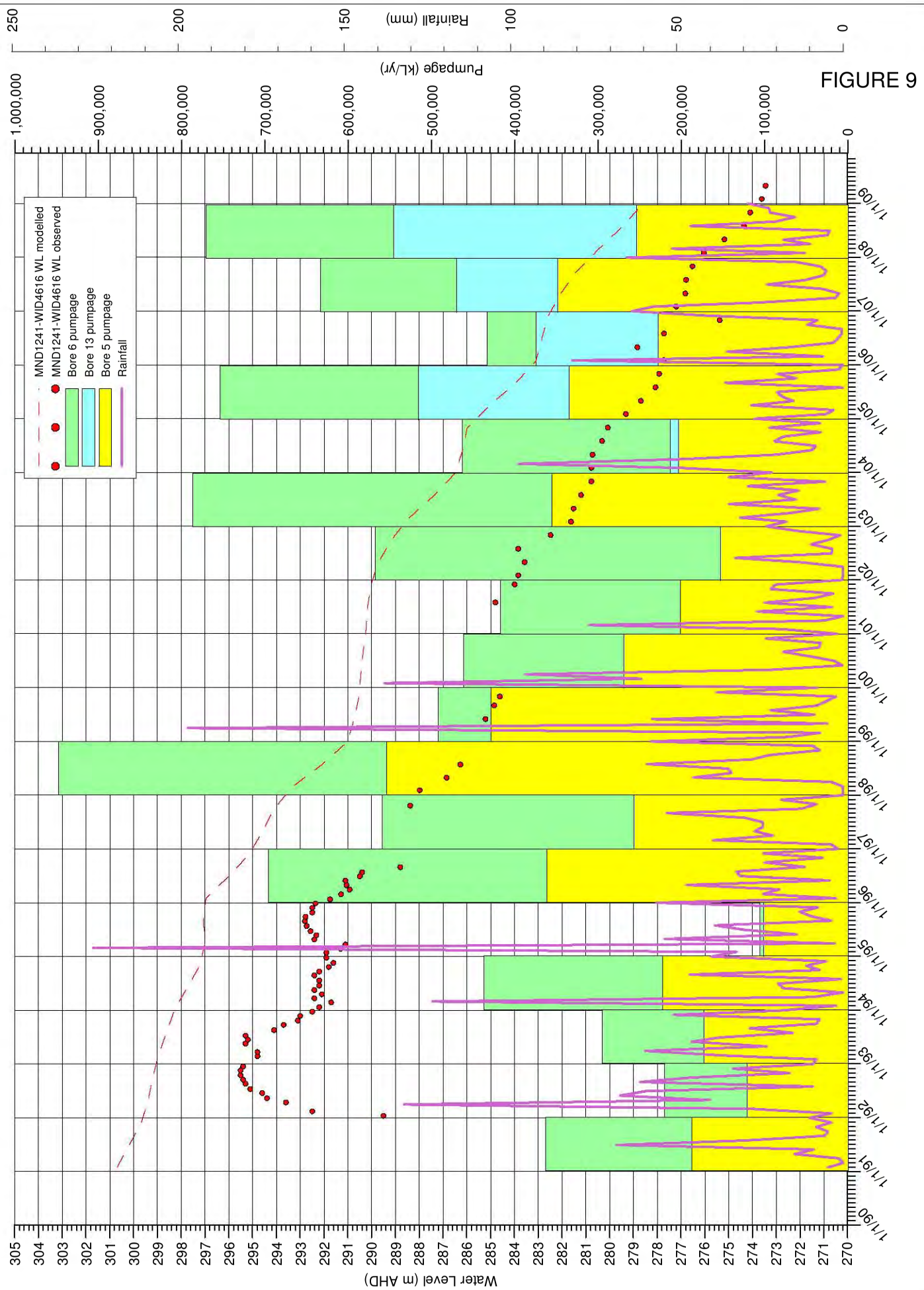
FIGURE 8



Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-8

Observed & Modelled Water Levels (mAHD), Bores MND1237 & MND1240

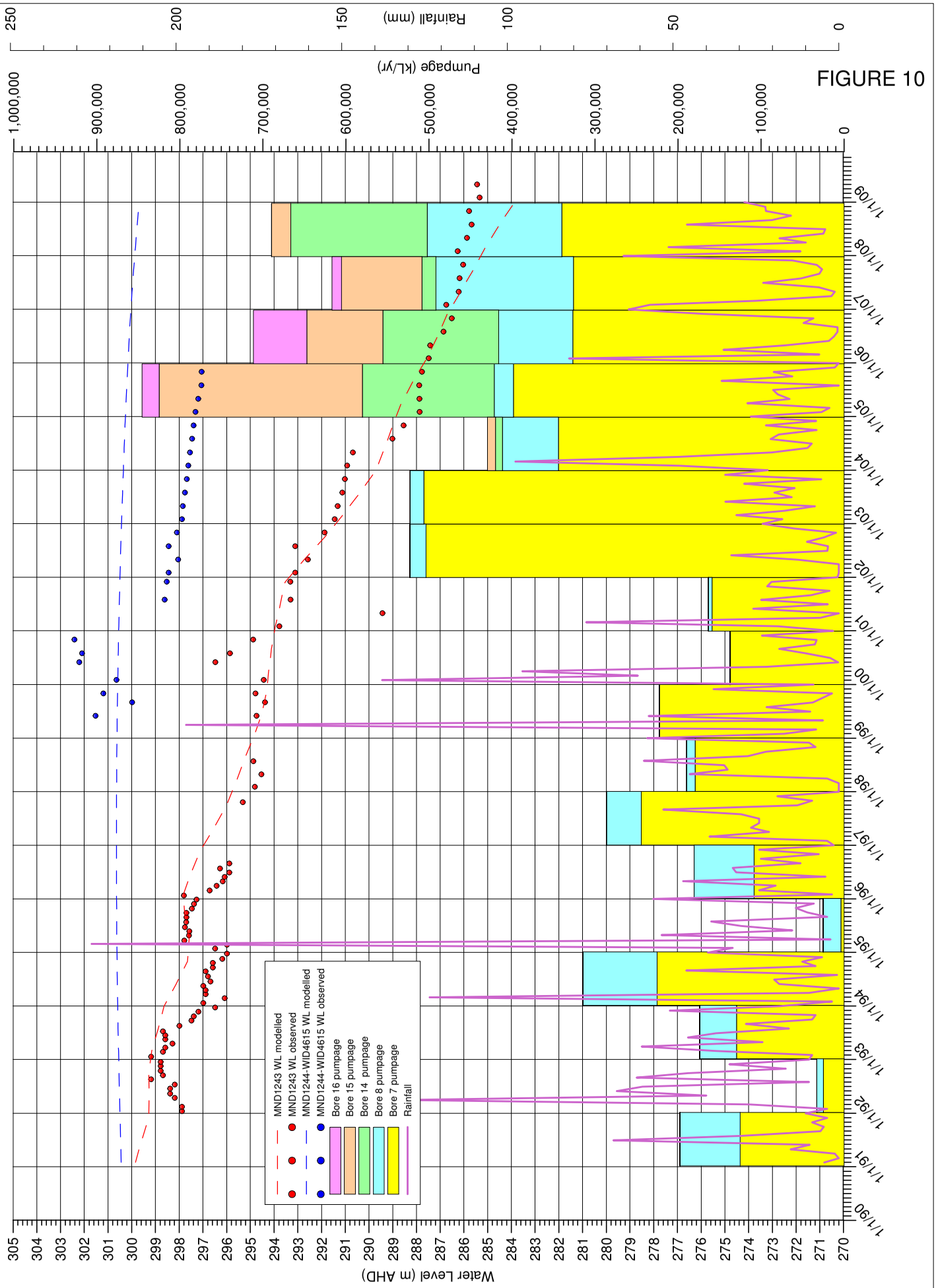
FIGURE 9



Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-9

Observed & Modelled Water Levels (mAHD), Bore MND1241-WID4616

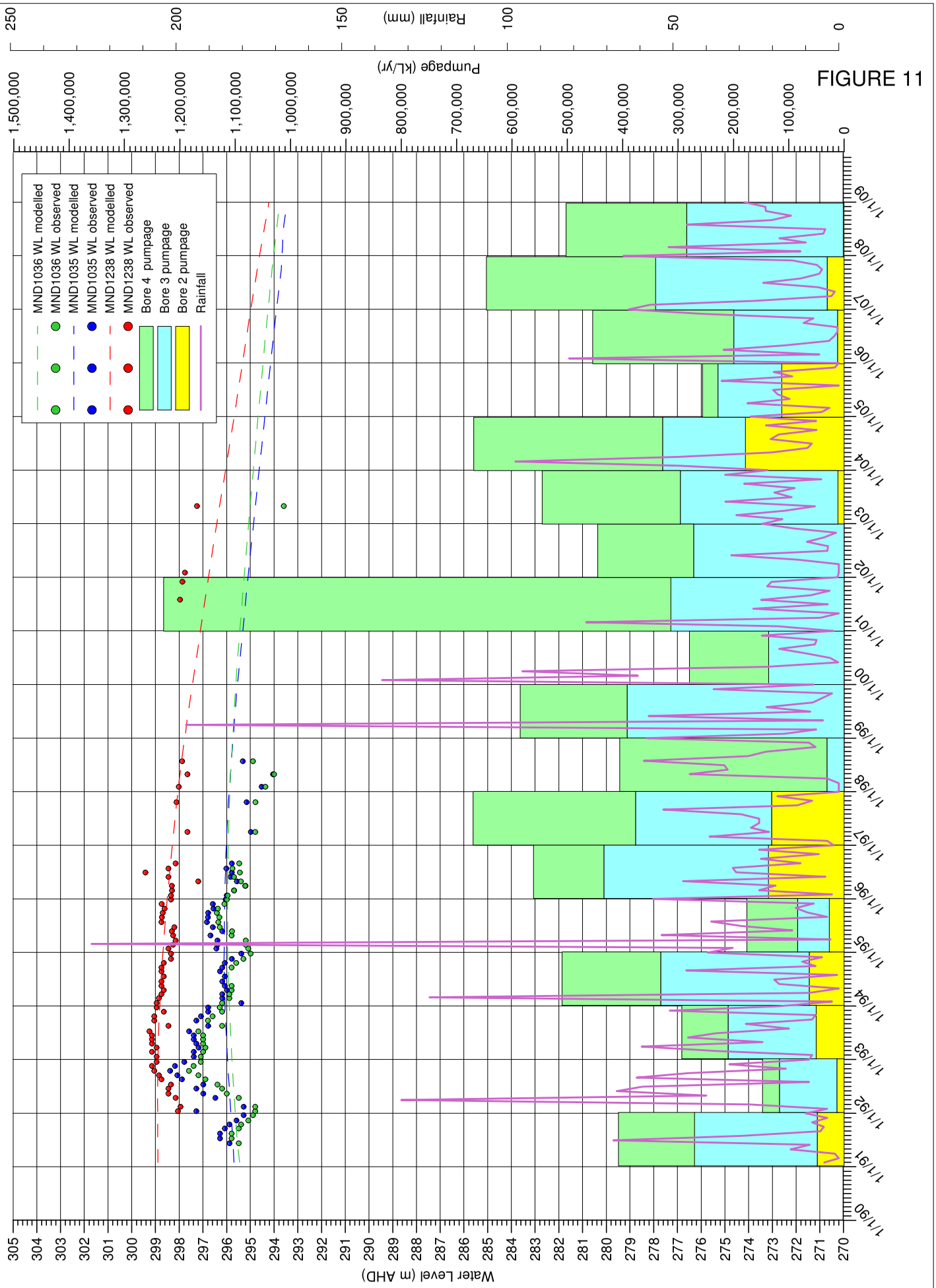
FIGURE 10



Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-10

Observed & Modelled Water Levels (mAHD), Bores MND1243 & MND1244-WID4615

FIGURE 11



Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-11

Observed & Modelled Water Levels (mAHD), Bores MND1238, MND1035 & MND1036

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-12

Longitudinal Section of Modelled Water Levels (mAHD), Q=80 L/s for 5, 10, 15 & 20 Years

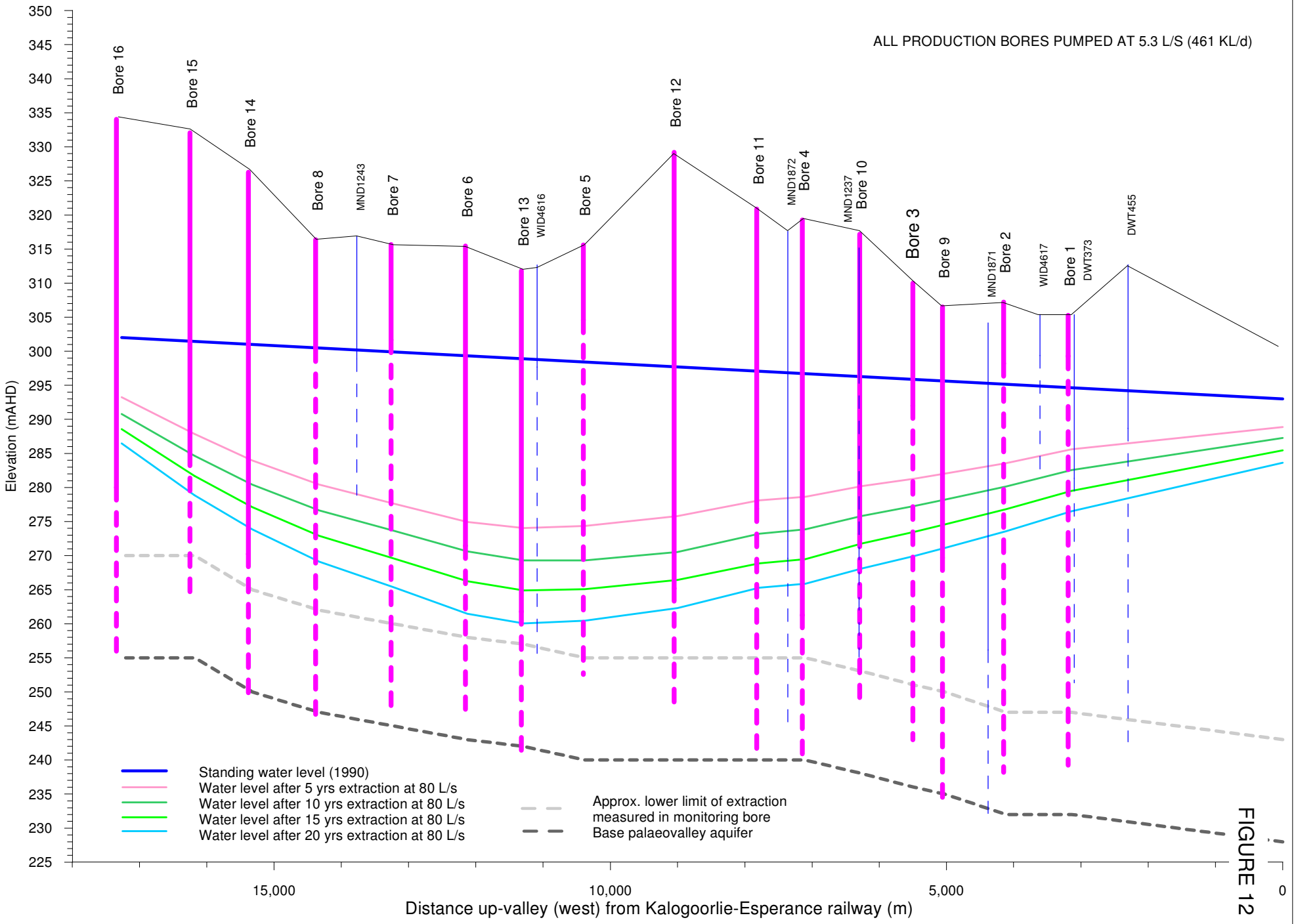


FIGURE 12

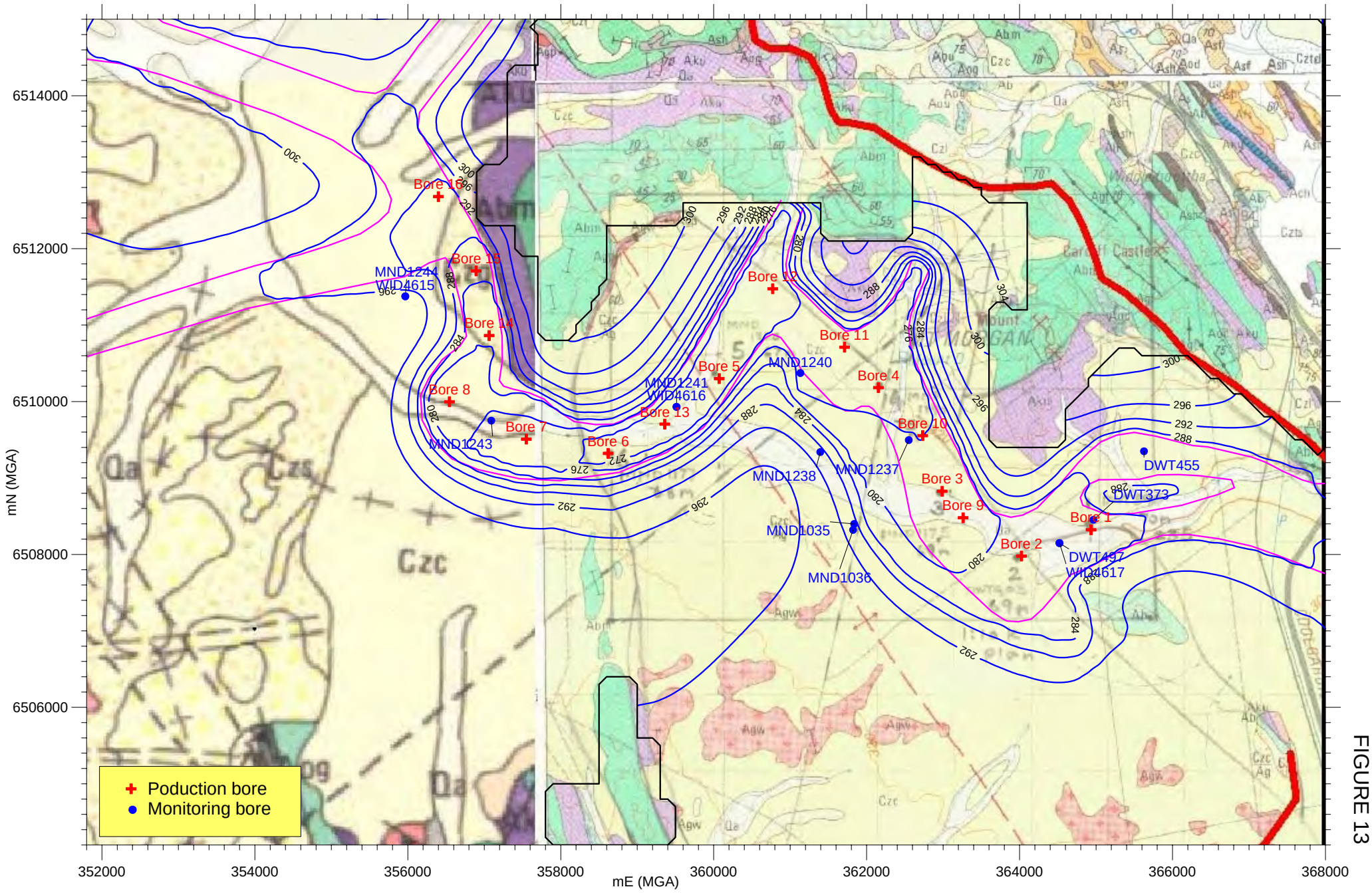


FIGURE 13

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-13

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 80 L/s for 10 years

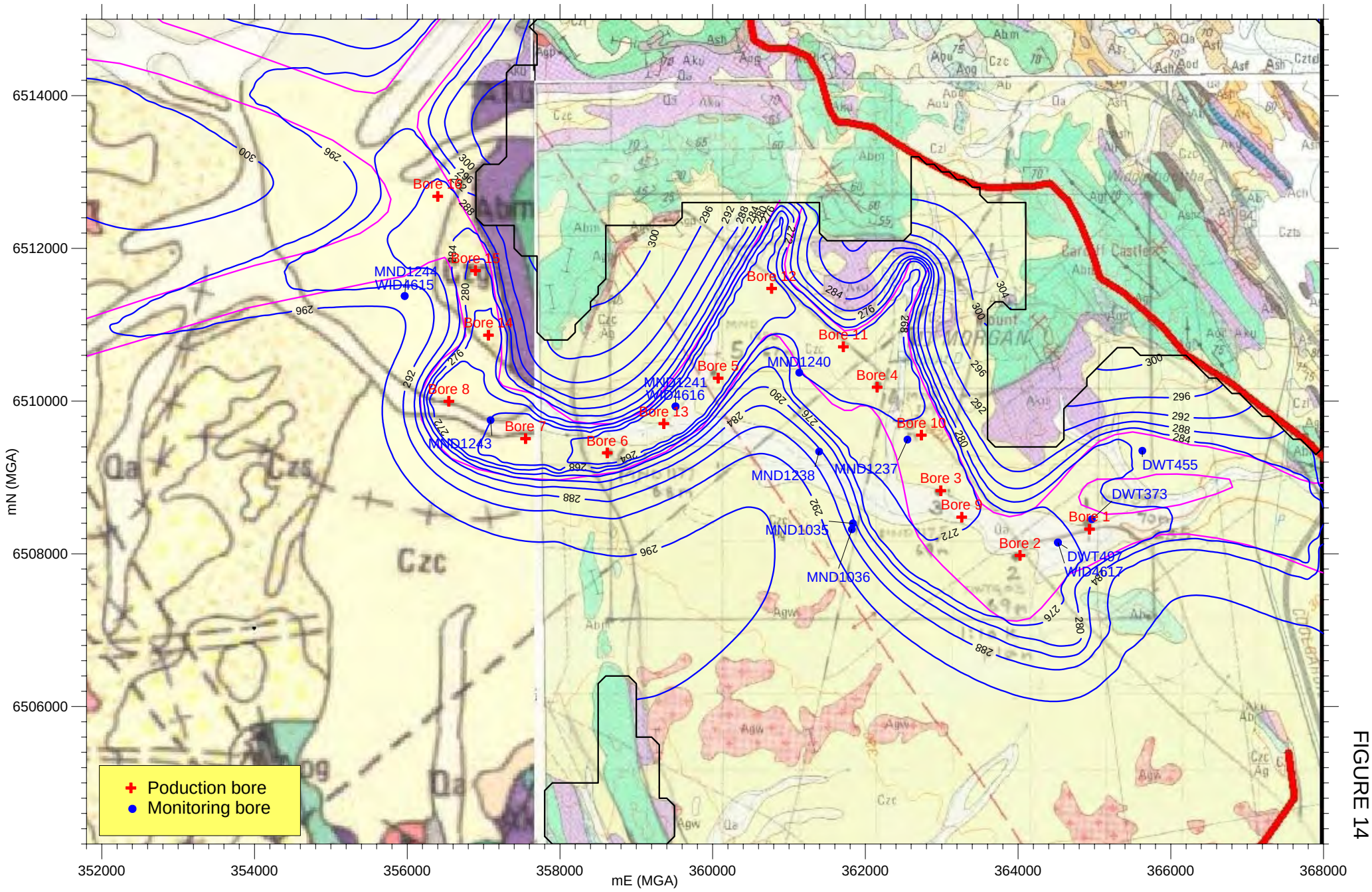


FIGURE 14

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-14

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 80 L/s for 20 years

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-15

Longitudinal Section of Modelled Water Levels (mAHD), Q=100 L/s for 5, 10, 15 & 20 Years

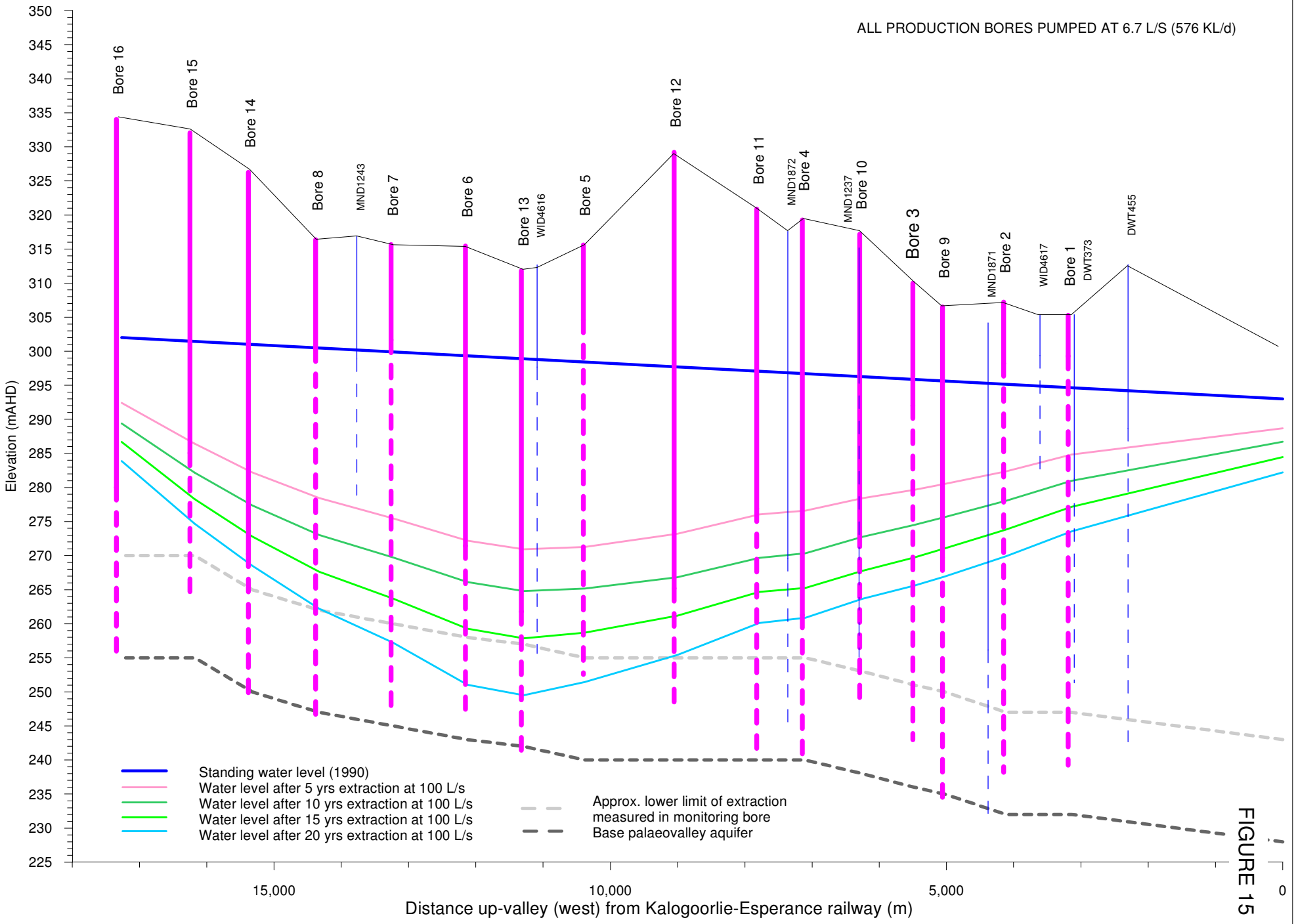


FIGURE 15

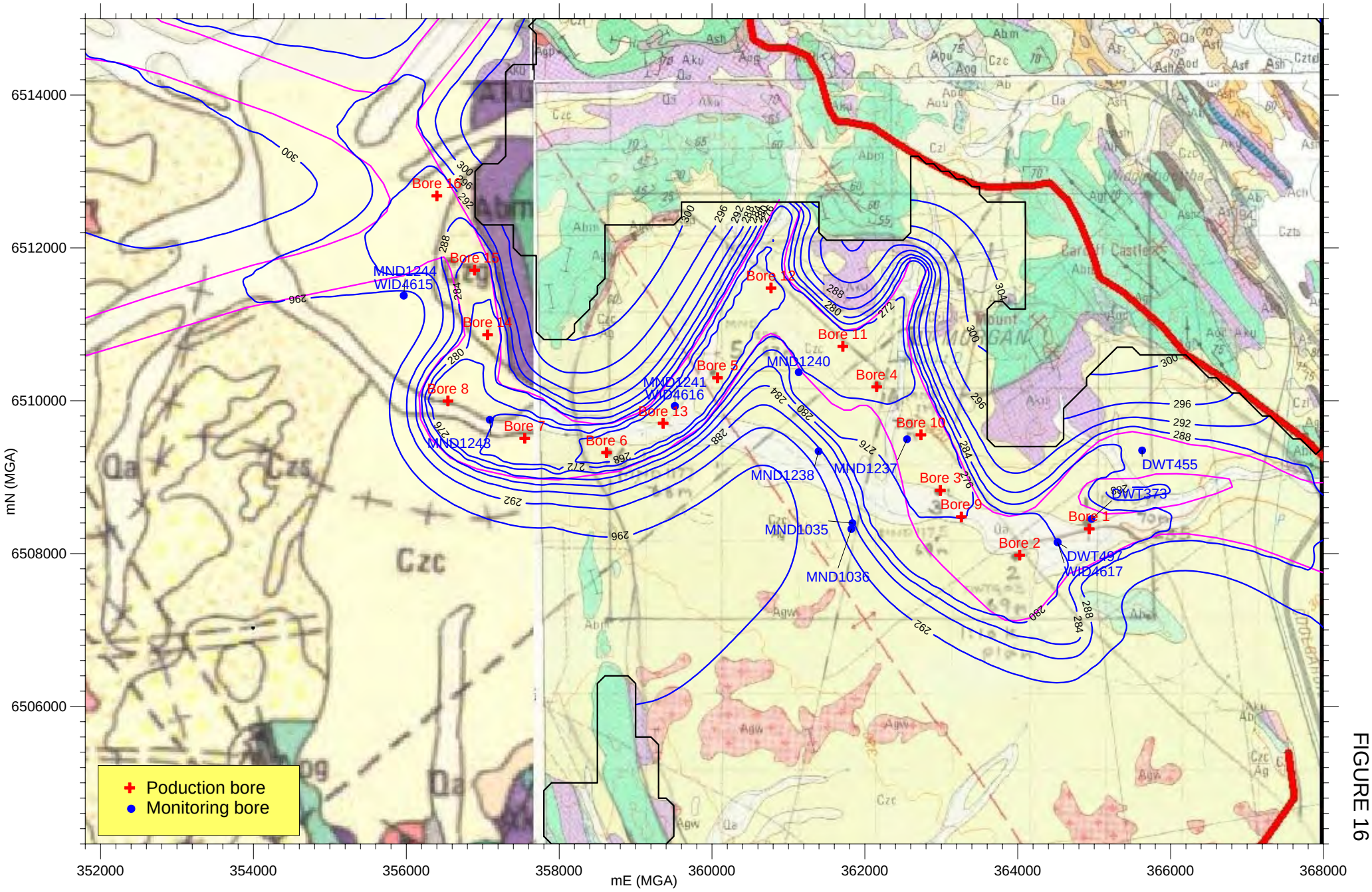


FIGURE 16

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-16

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 100 L/s for 10 years

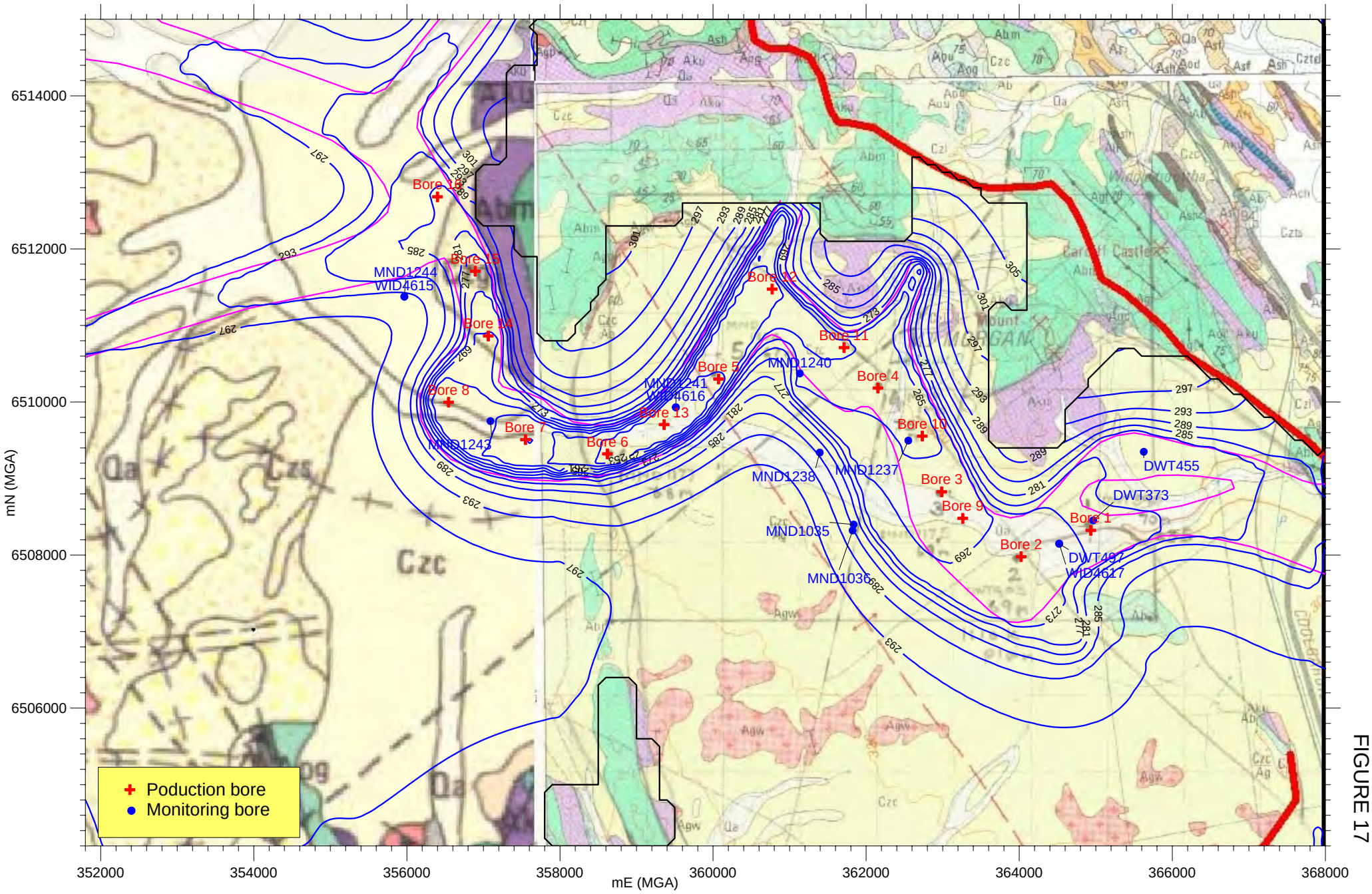


FIGURE 17

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-17

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 100 L/s for 20 years

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB\St Ives\09\1-18

Longitudinal Section of Modelled Water Levels (mAHD), Q=120 L/s for 5, 10, 15 & 17 Years

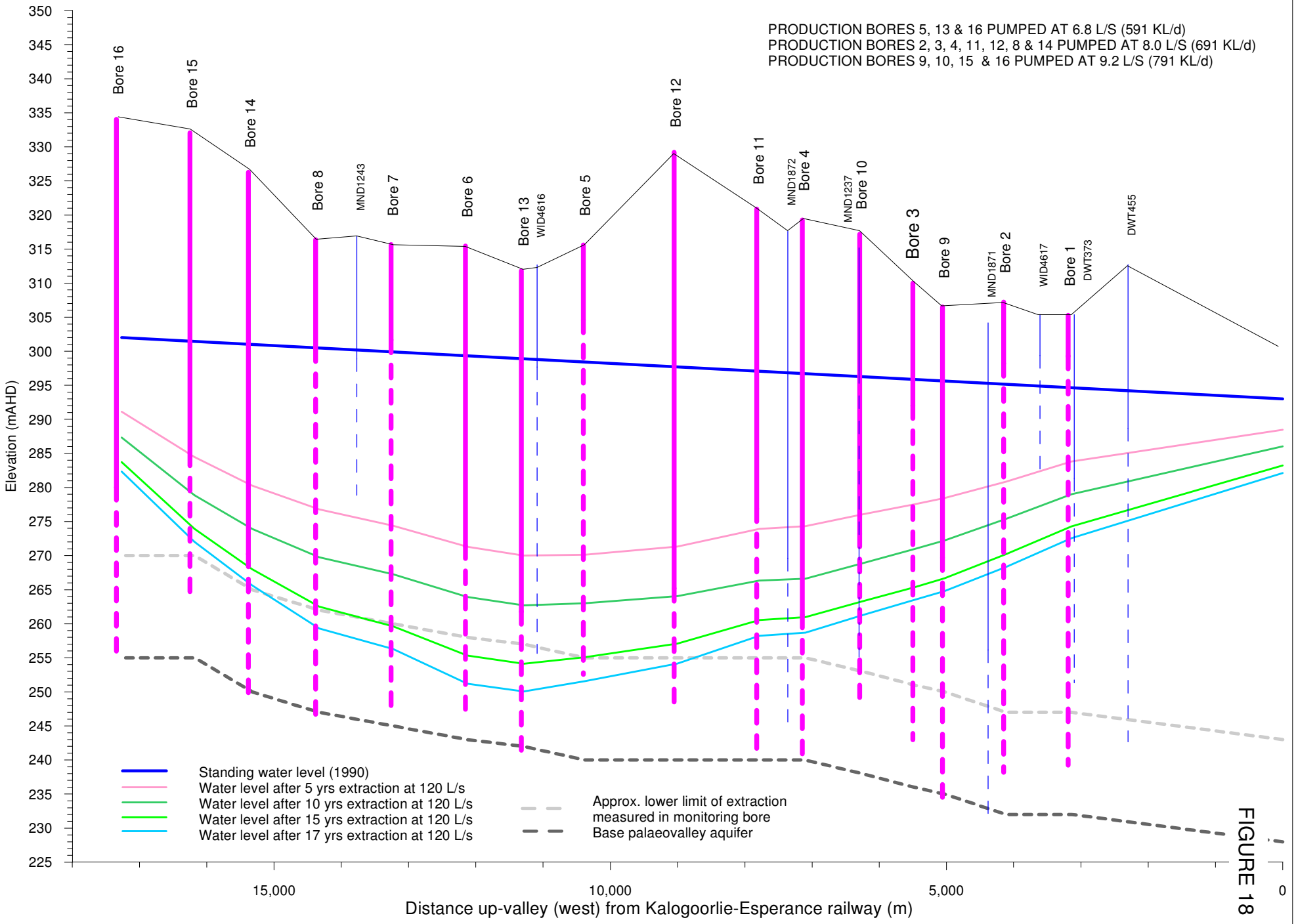


FIGURE 18

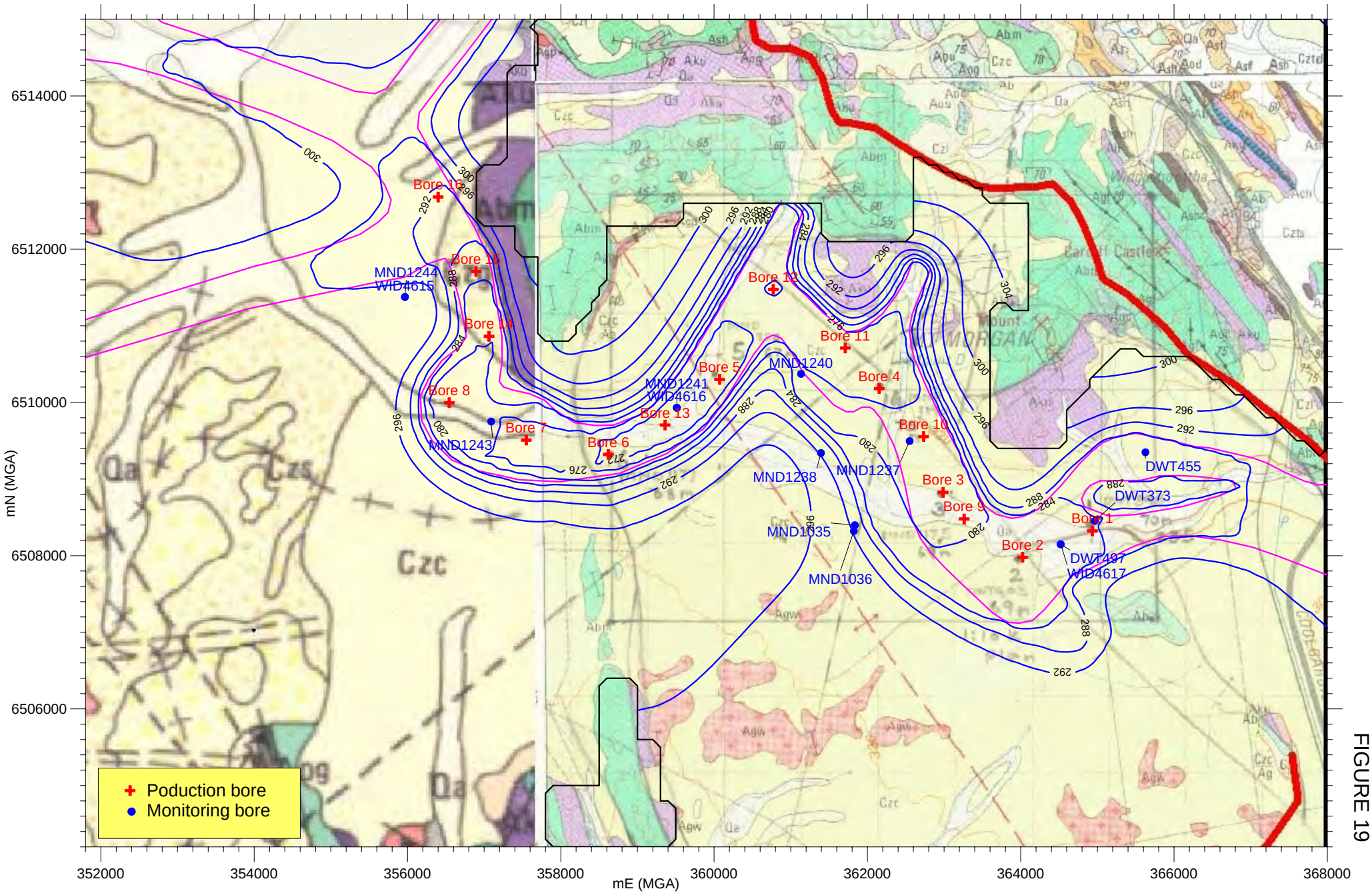


FIGURE 19

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-19

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 120 L/s for 5 years

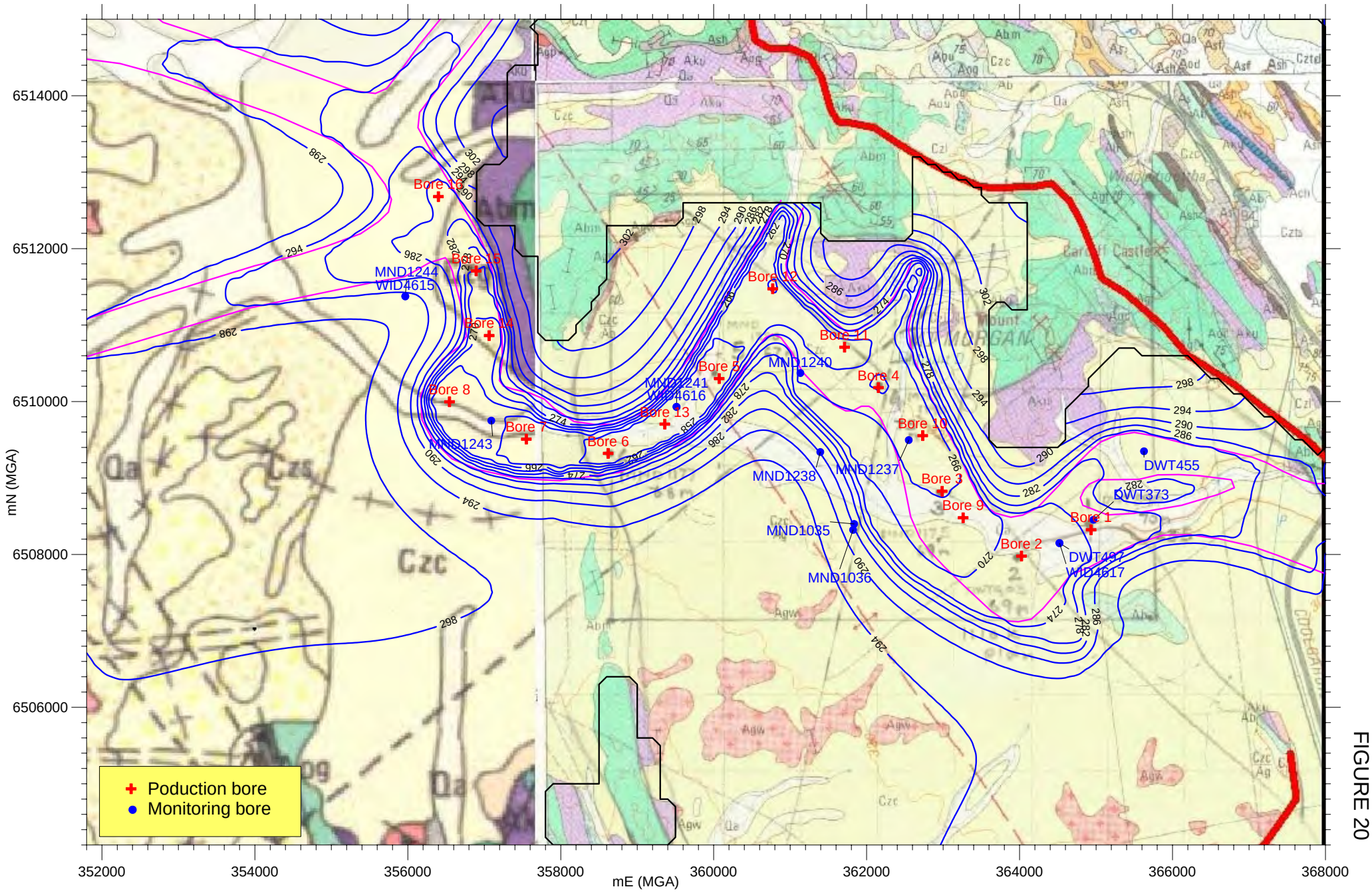


FIGURE 20

Client: St Ives Gold Mining Co
Project: Mt Morgan Borefield Assessment
Date: August 2009
Ref: PdeB/St Ives/09/01-20

Modelled Water Levels (mAHD) in Layer 3 after Pumping at 120 L/s for 15 years

Appendix F

SIGM 2010 Annual Aquifer Review

THORPE
GROUNDWATER & ENVIRONMENTAL SERVICES PTY LTD
ACN 091 124 293

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REPORT No. T125 Rep. 1

ST IVES GOLD MINING COMPANY 2009-2010 GROUNDWATER MONITORING SUMMARY FOR GOLD FIELDS AUSTRALIA LIMITED

CLIENT: GOLD FIELDS AUSTRALIA
REPORT: Rep. 1
DATED: 27 AUGUST 2010
STATUS: FINAL

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SECTION 1
INTRODUCTION

1.1 BACKGROUND

This report provides a review for the period 1 July 2009 to 30 June 2010 of the two Department of Water (DoW) licensed groundwater sources associated with the St Ives Gold Mine. The mines are located between 6 and 34 km southeast of Kambalda as shown on Figure 1 and Figure 2. The two sources are:

- The combined Mt Morgan Borefield, Widgiemooltha and the St Ives Gold Mine Dewatering operations, Kambalda. The Borefield produces saline groundwater used in gold ore processing and is combined in terms of licencing with the St Ives Gold Mine (SIGM) Dewatering operations. The later involves the pumping of hypersaline from underground mines and open pit mining operations with discharge onto Lake Lefroy. Groundwater Well Licence No. 62505(5).

- Cave Rocks Mine Dewatering: hypersaline groundwater pumped from an underground mine. The water produced by dewatering is both discharged to Lake Lefroy and re-used in underground mining operations after treatment in settling ponds. Groundwater Well Licence No. 160912(1).

Groundwater abstraction is regulated by the DoW via the two Groundwater Well Licenses noted above. Copies of the licenses are given in the Appendix and a summary of the licence conditions is provided in Table 1. Groundwater Well Licence No. 62505(5) expired on 30 June 2010 and Groundwater Well Licence No. 160912(1) expires on 10 May 2014.

This report is prepared in accordance with the DoW Hydrogeological and Groundwater Monitoring Report Guidelines and specifically relates to the DoW approved operating strategy prepared by the St Ives Gold Mining Company Pty Ltd, Gold Fields Australia (22 November 2004). The 2004 Operating Strategy is currently under revision and will incorporate recent licence amendments and changes to the monitoring programme. The revised operating strategy will also include the recommendations of a recent numerical modelling study of the supply capability of the Mt Morgan Borefield (TGES, 2009).

The Cave Rocks mine is located about 6 km west of Kambalda West (Figure 2) and consists of three open pits. The mine is situated within a fractured hardrock aquifer and groundwater inflows to the mine were minimal up until mid 2009 (URS, 2010) and any groundwater intercepted was used for dust suppression and for drilling purposes together with fresh scheme water. After mid 2009 groundwater inflows increased, as the mining progressed, and currently dewatered groundwater is both stored in sumps onsite, reused by mining operations, and trucked to Redoubtable Pit for discharge to Lake Lefroy.

The Cave Rocks mine is to be amalgamated, in terms of licencing, with the combined St Ives Gold Mine Dewatering and Mt Morgan Borefield licence. In this report, data is

presented for the Cave Rocks mine together with the data from the multiple sources referred to as St Ives Gold Mine Dewatering.

1.2 CLIMATE

The climate of the area is semi-arid with a mean annual rainfall of 264.1 mm (Kalgoorlie-Boulder Airport weather station No. 12038), moderate winter temperatures and high summer temperatures. Rainfall is highly variable from year to year. Rainfall data have been collected locally at the St Ives Gold Mine weather station (located adjacent to Intrepide open pit and Yacht club) since November 1999. As shown in Table 2, the rainfall for the subject period 2009-2010 at the St Ives weather station was 176.6 mm, approximately 69 % of the yearly average since 1999.

1.3 HYDROGEOLOGICAL SETTING

The occurrence of groundwater is controlled primarily by topography and geology. The region is underlain by Archaean granitoids and greenstones intruded by Proterozoic mafic dykes. The greenstones comprise NNW trending belts of metamorphosed and deformed ultramafic to felsic volcanic, intrusive and sedimentary rocks that have been intruded by granite plutons. Much of the Archaean basement is weathered with the depth of weathering being greatest over felsic and sedimentary rocks and least over mafic–ultramafic rocks, which therefore tend to form topographic lows and highs, respectively.

During the early Tertiary a network of deep, narrow and steep-sided valleys ('palaeochannels') was incised into the low relief and deeply weathered landsurface of the Eastern Goldfields. Depending on their position relative to the highstand shorelines of several marine transgressions during the Middle–Late Eocene, the palaeovalleys initially became filled with continental, marginal-marine or shallow marine sediments. Remaining parts of the palaeovalleys then became filled with fine-grained paludal sediments in the Oligo-Miocene and then buried beneath aeolian, ephemeral fluvial and playa-lake sediments in the Quaternary.

In general terms very limited supplies of saline groundwater are available from fractures in fresh Archaean bedrock and from clayey surficial sediments. Much larger supplies of saline to hypersaline groundwater are available from the basal sediments within the Tertiary palaeovalleys, especially where these have been sourced from granitic terrain and are rich in quartz sand. On account of their great thickness and permeability, these sands form the major aquifer within the Eastern Goldfields and are widely used for mineral ore processing.

The Mt Morgan Borefield occurs within a major tributary of the Lefroy palaeovalley system, which is largely incised into granite and therefore contains a thick basal sand sequence. Groundwater of suitable quality for mineral ore processing occurs within the sand aquifer, but a wedge of hypersaline groundwater has been identified near the base

of the palaeovalley within the down gradient, eastern section of the borefield (Figures 3 and 4). Hypersaline groundwater also occurs within Tertiary palaeovalley fills underlying Lake Lefroy. These have been intersected during mining, such as Argo underground mine, resulting in increased dewatering volumes. Most of the remaining mines occur within fresh bedrock and therefore require less dewatering.

A summary of the groundwater sources impacted upon by the St Ives Gold Mine operations is given below:

BOREFIELD	AQUIFER TYPE	QUALITY	USE
Mt Morgan	Palaeochannel	Saline	Ore processing
St Ives Gold Dewatering	Fractured bedrock and palaeochannel	Hypersaline	Discharged to Lake Lefroy
Cave Rocks Dewatering	Fractured bedrock	Hypersaline	Discharged to Lake Lefroy

SECTION 2
MT MORGAN BOREFIELD

The Mount Morgan borefield was commissioned in March 1991 and consists of 16 production bores (14 operational) and 11 strategically sited monitoring bores (Figures 3 and 4, Tables 3 and 4). Fourteen of the production bores have been operated regularly, the easternmost bore, Bore 1 (DWT390) has not been pumped regularly since commissioning, as it is located near the interface of saline and hypersaline groundwater. Bore 3 (MND1175) was replaced in 1998 with a similarly constructed production bore located 10 m to the north. Bore 6 (MND1177) was replaced in December 2003 by MND1867. Bore 8 was redrilled and equipped during the period.

A major upgrade of the borefield was undertaken in 2003-2004 to meet increased demand for water in the gold processing operation at the mill. Two hydrogeological field investigations (TGES, 2003b, TGES, 2004) undertaken in June 2003 and December 2003 successfully located an extension of the palaeochannel aquifer to the north and located sites for eight new production bores (four within the existing borefield area). Bore locations were selected based on the results of RC-air-core drilling along transects perpendicular to the channel axis.

As previously noted numerical groundwater modelling has been undertaken in 2009 to assess the sustainable supply rate capacity of the extended borefield over a twenty year period to 2028. The results of modelling indicate that the sustainable limit of the borefield over a 20 year period is about 6,912 kL per day or 2,523,000 kL per year (TGES, 2009). A series of trigger water levels for key monitoring bores within the borefield have been set based upon this sustainable supply limit. Monitoring bore water levels are measured quarterly and if trigger points are closely approached, actions will be taken to reduce further drawdown. Actions taken will include a reduction in pump rates or the duration of pumping of an adjacent production bore or bores. The proposed trigger water levels are included in Table 4 and will be incorporated within the revised operating strategy referred to above..

Groundwater supplied from the borefield is saline. The salinity of groundwater supplied from individual production bores has varied slightly since commissioning and currently ranges from about 31,000 mg/L TDS to 41,000 mg/L TDS. Groundwater levels are either stable or slowly declining and overall there has been no significant deterioration of the supply source in terms of yield, water levels or quality. Detailed groundwater salinity profiling has been undertaken on an annual basis since 1993 at the east end of the borefield. This profiling was designed to monitor the position of the hypersaline groundwater wedge at depth within the eastern part of the borefield.

The Mt Morgan borefield license conditions require a monitoring and aquifer review report to be provided to the DoW every 3 years and an annual production summary report to be provided in the intervening periods.

2.1 BORE SCHEDULE

The schedule of production and monitoring bores is given in Tables 3 and 4. Bore locations are shown in Figure 3 and in cross-section in Figure 4. No changes have been made to the bore schedules during the review period.

2.2 PRODUCTION

In 2009-2010 the total production from the borefield was 1,911,587 kL representing 8% of the licensed total annual allocation of 24,015,000 kL. The combined monthly production from the borefield is summarised in Table 5 and shown as a graph in Figure 5.

2.3 WATER LEVELS

The licence conditions require 3 monthly measurements of static water level from all monitoring bores specified in the monitoring programme. The measurement of static water levels in production bores was discontinued as of May 2001 for practical reasons.

Static water levels for the nominated monitoring bores taken during 2009-2010 are given in Table 6 and plotted as hydrographs in Figures 6 to 8. In 2009-2010 the water levels in the monitoring bores were regularly recorded.

During the current reporting period the monitoring bore water levels showed a maximum decline of 0.86 m (DWT376) and an average decline of 0.43 m.

2.4 WATER QUALITY

The operating strategy specifies 3 monthly measurements of groundwater electrical conductivity from each of the production bores. In addition a major component analysis is required of the combined borefield supply on an annual basis and to be completed in November each year. In situ salinity profiling of groundwater within two strategically located bores is required on an annual basis in November each year.

The production bore salinity results for the 2009-2010 period are given in Table 7 and are plotted as graphs in Figures 9 and 10. An anomalously high salinity was recorded in Bore 2 (DWT 403) of 87.3 g/L TDS in May 2010. This result is considered to be erroneous when assessed against the laboratory chemical analysis data for May 2010 given in the Appendix for Bore 2. In the Appendix, in brief, the combined major ion concentrations for sodium and chloride given in the May 2010 laboratory analysis indicate a much lower salinity than 87.3 g/L TDS.

The production bore salinities range from 30.4 g/L to 47.4 g/L TDS, excluding the anomalous result for Bore 2 in May 2010. The average and population standard deviation of the quarterly groundwater salinity tests from all of the production bores in the

borefield over the review period is 37.4 ± 3.5 g/L TDS. In general there is no evidence of a significant change in salinity over the review period.

The annual comprehensive chemical analysis of the combined output of the borefield was discontinued in 2006 and was replaced with quarterly comprehensive chemical testing of groundwater from each individual bore. The results are provided in the Appendix and show no significant change in chemical composition over the review period (excluding the anomalous result for Bore 2 in May 2010).

The salinity profiles for monitoring bores DWT373 and DWT455 were measured in 1998, 1999, 2001, 2002, 2003, 2004, 2006, 2008 and 2009. These bores are strategically located at the boundary of saline and hypersaline groundwater at the eastern margin of the borefield. Any significant change in the profiles, such as an increase in salinity, will provide an early warning of up-gradient movement of hypersaline groundwater from the Lake Lefroy area and the possibility of an increase in salinity of the borefield.

The groundwater salinity profile results for the bores are given in Table 8 and are plotted in Figures 10 and 11. The salinity values are estimated from field measurements of electrical conductivity. The results show no evidence of a change in the position of the hypersaline interface.

2.5 SUMMARY

The annual abstraction from the Mt Morgan borefield was 1,911,587 kL, representing 8% of the licensed annual allocation of 24,015,000 kL.

The static water levels in strategically located monitoring bores have decline slightly over the review period by on average 0.43 m. Considering long-term natural variations in water level due to climatic factors, the results indicate that the palaeochannel aquifer is not being significantly depleted. Further, there is no indication from the available data of a degradation of quality in terms of salinity, or the up-gradient (westward) movement of hypersaline groundwater from Lake Lefroy.

The results show that the borefield has been operated well within the conditions of the current licence.

SECTION 3
ST IVES GOLD MINE DEWATERING

During 2009-2010 SIGM dewatered from 10 mines situated on and adjacent to Lake Lefroy near Kambalda. These included 5 underground mines (Leviathan-Victory Area, Argo, Athena and Cave Rocks operated by SIGM; and Beta-Hunt operated by Consolidated Nickel Pty Ltd) and 5 major open pit mines (Apollo, Mars, Revenge, Thunderer and Temeraire).

All mines pump hypersaline groundwater for dewatering purposes only and discharge it back to Lake Lefroy via a system of discharge pipelines and associated sediment traps. The quality of the groundwater pumped from the mines is similar to that which occurs beneath and within Lake Lefroy. For the Cave Rocks mine (Figure 19) only relatively small quantities of dewatering water are produced and this is partly used onsite and the remainder is trucked to the Redoubtable Pit (Figure 18).

In 2009-2010 the salinity of the groundwater discharged ranged from about 55 g/L TDS (Athena Mine) to 426 g/L TDS (Revenge Pit). The groundwater contains very low levels of naturally occurring metals both in solution and suspension. The salinity of water discharged from the Cave Rocks mine ranged from 83 to 166 g/L TDS.

3.1 SOURCE SCHEDULE

The schedule of sources (mine pits) and associated monitoring bores is given in Table 9. Discharge monitoring locations are provided in Figures 15 to 18.

Not all of the mines require water level monitoring bores. The schedule of monitoring bores around the open cuts varies from year to year as new bores are established to replace those destroyed by mining operations. The mine dewatering volumes are provided in Table 10.

Table 11 provides the available dewatering monitoring bore data including the Argo, Athena, Bahama, Intrepide, North Orchin, Thunderer, Mars Areas and the Tailings Storage TSF4 Area.

3.2 PRODUCTION

For the St Ives Gold Mine in 2009-2010, GWL 62505(5), the total dewatering pumpage volume (excluding discharge from the Cave Rocks mine) was 11,138,957 kL representing 46.4 % of the licensed annual allocation of 24,015,000 kL.

For the Cave Rocks Mine in 2009-2010, GWL 160912(1), the total dewatering pumpage volume was 8,250 kL representing 2.8 % of the licensed annual allocation of 300,000 kL.

Monthly pumpage from the sources included in both licences is given in Table 10 and shown as graphs in Figures 13 and 14.

3.3 WATER LEVELS

Dewatering monitoring bore locations are shown in Figures 15 to 18. The 2009-2010 dewatering monitoring bore water level measurements are provided as reduced levels in Table 11 and Figures 20 to 25 for the Argo Mine, Bahama Pit, Intrepide Pit Area, Mars Pit Area, Thunderer Pit Area, North Orchin Area, Tailings Storage TSF4 Area and Athena Area.

The changes in water level at the individual mines are summarised as follows:

- At the Argo Mine water levels declined slightly by 0.09 m on average in the review period.
- At the Bahama Pit Area water levels declined by 2.57 m in the review period.
- At the Intrepide Pit Area water levels declined slightly by 0.03 m on average in the review period.
- At the Mars Pit Area water levels declined by 17.03 m in the review period.
- At the Thunderer Pit Area water levels declined on average by 15.29 m in the review period due to dewatering of a flooded mine.
- At the North Orchin Pit Area water levels increased on average by 2.86 m in the review period.
- At the Tailings Storage TS4 Area water levels declined on average by 0.45 m in the review period.
- At the Athena Pit Area water levels increased on average by 1.07 m in the review period.

3.4 WATER QUALITY

The licence operating strategy specifies 3 monthly measurements of electrical conductivity or salinity from the production sources. Detailed water chemical analysis of the dewatering discharge is currently undertaken regularly (and reported in the annual environmental report) as a condition of the DEC Licence 4570/9.

The salinity results for 2009-2010 are given in Table 12 and are presented graphically in Figure 26. In addition pH measurements have been made on dewatering discharge, with results provided in Table 13 and Figure 27

Overall the results show that the salinity of the dewatering discharge from each source has varied significantly during 2009-2010 with no discernible trends. The 2009-2010 salinity values are within the range of earlier measurements.

The pH of the discharge from all of the mines is generally near neutral with the exceptions of Apollo Area and Athena Mine Area which discharge acidic water.

3.5 SUMMARY

The annual production of dewatering water at the St Ives gold mining operation in 2009-2010 was 11,138,957 kL representing 46.4 % of the licensed annual allocation of 24,015,000 kL.

The annual production of dewatering water for the Cave Rocks Mine was 8,250 kL representing 2.8 % of the licensed annual allocation of 300,000 kL.

Data from monitoring bores showed the following changes in water level in response to dewatering:
Argo Mine, water levels declined slightly by 0.09 m on average.
Bahama Pit Area water levels declined by 2.57 m.
Intrepide Pit Area water levels declined slightly by 0.03 m on average.
Mars Pit Area water levels declined by 17.03 m.
Thunderer Pit Area water levels declined on average by 15.29 m.
North Orchin Pit Area water levels increased on average by 2.86 m.
Tailings Storage TS4 Area water levels declined on average by 0.45 m.
Athena Pit Area water levels increased on average by 1.07 m.

The salinity of the dewatering discharge from each mine source has varied significantly during 2009-2010 however similar variations in salinity have been experienced in the past.

The results show that the dewatering operations have been operated within the conditions of the current licence.

SECTION 5
MONITORING PROGRAMME

The monitoring requirements as specified in the conditions of the specific licences have been fulfilled and sufficient data has been collected for the 2009-2010 production summary report to be satisfactorily completed.

SECTION 5
CONCLUSIONS

In 2009-2010 groundwater production from the Mt Morgan Borefield was 1,911,587 kL, representing 8% of the licensed total annual allocation of 24,015,000 kL. The static water level in the borefield declined by an average of 0.43 m. This indicates that the palaeochannel aquifer is not being significantly depleted. There is no indication from the available data of a degradation of groundwater quality in terms of salinity.

In 2009-2010 groundwater production (and discharge to Lake Lefroy) from mine dewatering at the St Ives Gold Mine, Licence was 11,138,957 kL representing 46.4 % of the licensed annual allocation of 24,015,000 kL. Monitoring bore data are reported and show localised declines in water level up to a maximum of 17 m in the Mars Pit Area. The salinity of the dewatering discharge from each mine source has varied significantly during 2009-2010 however similar variations in salinity have occurred in the past.

The combined abstraction from the Mt Morgan Borefield and St Ives Gold Mine Dewatering operations was 13,050,544 kL representing 54.3 % of the licensed total annual allocation of 24,015,000 kL.

In 2009-2010 groundwater production from mine dewatering at the Cave Rocks Mine, was 8250 kL representing 2.8 % of the licensed annual allocation of 300,000 kL.

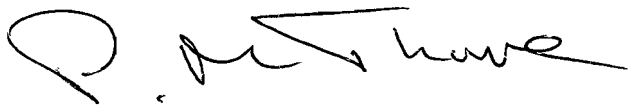
Overall the Mt Morgan Borefield, St Ives Gold Mine dewatering operations and the Cave Rocks Mine dewatering operations were operated efficiently in 2009-2010 and sufficient data were available to enable a summary of aquifer performance to be undertaken.

SECTION 6
LIMITATIONS OF THIS REPORT

Thorpe Groundwater and Environmental Services Pty Ltd have prepared this report for Gold Fields Australia in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice indicated in this report.

It is recommended that any plans and specifications prepared by others and relating to the content of this report, or any amendments to those plans and specifications, be reviewed by Thorpe Groundwater and Environmental Services Pty Ltd to verify that the intent of our recommendations is properly reflected in the design or specifications.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind if the report is used after a protracted delay.



Dr Peter Thorpe, Principal Hydrogeologist

SECTION 7
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TABLES

TABLE 1. SUMMARY OF GROUNDWATER LICENCE CONDITIONS

Licence No. (GWL-)	Licence Expiry	Borefield/Source ID	Production Bores/Sources (No.)	Pumpage Allocation (kL per year)	Bores/Sources	Bore Monitoring Requirements				Report to Department of Water
						Water Levels (mAHD)	Pumpage (kL)	Salinity	Full Water Analysis	
62505(5)	30 June 2010	L15/147 and M15/795 Mt Morgan Borefield, Widgiemooltha	16	24,015,000	Production bores: DWT-390 & 403; MND-1175, 1176, 1178, 1190, 1220, 1867, 1868, 1869, 1870, 1822, 1827, 1843, 1854 & 1861.	*	Monthly	3 monthly	3 years	Annual production/Monotoring summary. Aquifer review every 3 years.
					Monitoring bores: DWT-373, 376 & 455; MND-1237, 1240, 1243, 1871 & 1872; WID-4615, 4616 & 4617.	3 monthly		Annual salinity profiles of bores DWT373 & DWT455		
		St Ives Gold Project Dewatering	23		Production sources: scheduled to include mines: Beta-Hunt, Bahama, Mars, Belleisle, Revenge North Kapai, West Revenge, Pluton, Agamemnon (west & east), office, delta, Swiftsure, Pistol Club, Grinder, Thunderer, Neptune, North Orchin, Leviathan, Argo, Apollo & Junction.	3 monthly	Monthly	3 monthly	3 years	
160912(1)	10 May 2014	Cave Rocks Site	1	300,000	Production sources: two adjacent pits and attached declines. No bores.		Monthly	3 monthly		Annual production/Monotoring summary. Aquifer review every 3 years.

Note

* The continuous operation of production bores in the wellfield does not allow accurate (static) water level data to be recorded.

TABLE 2. RAINFALL DATA

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January		137.80	18.40	0.00	17.02	48.00	5.20	81.40	57.00	11.15	14.19	11.13
February		60.60	76.20	0.00	30.86	97.60	2.80	5.80	25.00	51.54	127.41	18.82
March		95.50	5.60	0.00	16.27	48.40	27.60	34.80	2.20	9.90	9.17	10.86
April		21.80	0.00	12.20	7.16	20.20	14.80	16.20	1.20	17.87	38.80	25.68
May		0.20	25.80	32.40	34.22	9.40	18.40	3.00	6.00	4.63	9.25	8.46
June		2.60	3.30	3.40	14.20	8.10	19.80	1.40	22.80	4.05	46.01	1.33
July		10.00	23.40	3.20	19.40	20.60	0.00	0.40	11.40	16.71	15.70	
August		18.00	8.40	9.60	13.28	18.10	35.40	0.40	5.80	38.52	0.00	
September		7.20	2.80	4.40	28.53	6.70	14.00	10.60	5.00	54.82	0.00	
October		6.70	21.60	0.80	5.25	22.00	19.60	7.60	6.60	20.81	8.65	
November	37.80	23.20	20.30	13.50	34.30	6.80	1.20	40.80	14.00	54.12	38.07	
December	7.60	1.70	0.40	23.00	21.40	26.60	0.00	63.40	65.00	66.80	37.85	
Water year	**1999-2000**	**2000-2001**	**2001-2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	
Water year total	**363.9**	**196.1**	**124.9**	**174.2**	**353.9**	**189.4**	**212.8**	**237.4**	**206.9**	**496.6**	**176.6**	

Data collected at the St Ives Gold Mine Weather Station

Notes
All values as mm

TABLE 3. Mt MORGAN BOREFIELD: SCHEDULE OF PRODUCTION BORES

Bore Reference	Alternative Ref.	Top of casing level (mAHD)	Initial SWL		AMG		Total Depth (mbgl)	Slotted Interval		Status	Casing Type	Casing diameter (mm)
			mbtc	date	mE	mN		Top (mbgl)	Base (mbgl)			
DWT390	Bore 1	305.29	9.40	22/01/91	364804	6508163	70.0	6.0	66.0	not operated	PVC	200
DWT403	Bore 2	307.22	11.50	22/01/91	363887	6507821	69.0	9.0	69.0	decommisioned 08-09	PVC	200
MND1175	Bore 3	310	14.20	22/01/91	362841	6508670	68.5	18.0	68.0	operational	PVC	200
MND1190	Bore 4	319.28	17.00	22/01/91	362024	6510018	78.0	18.0	78.0	operational	PVC	200
MND1220	Bore 5	315.6	14.00	22/01/91	359934	6510441	66.0	11.0	66.0	operational	PVC	200
MND1177	Bore 6	315.52	15.00	22/01/91	358503	6509140	67.0	18.0	66.0	replaced by 6a	PVC	200
MND1867	Bore 6a	315.46	35.86	17/12/03	358633	6509309	68.0	44.0	68.0	operational	PVC	200
MND1176	Bore 7	315.67	16.00	22/01/91	357412	6509349	70.0	14.0	68.0	operational	PVC	200
MND1178	Bore 8	316.37	16.80	22/01/91	356408	6509838	70.0	16.0	70.0	operational	PVC	200
MND 1868	Bore 9	306.51	24.58	26/10/04	363263	6508479	72.8	36.8	72.8	operational	PVC	200
MND 1869	Bore 10	317.19	36.61	24/10/04	362734	6509553	68.4	44.0	68.0	operational	PVC	200
MND 1870	Bore 11	320.87	43.32	22/10/04	361712	6510710	80.0	44.0	80.0	operational	PVC	200
MND 1822	Bore 12	329.19	49.92	20/10/04	360772	6511474	82.0	64.0	82.0	operational	PVC	200
MND1827	Bore 13	311.8	33.09	20/10/04	359361	6509704	71.0	50.0	71.0	operational	PVC	200
MND1843	Bore 14	326.26	41.63	14/10/04	357065	6510862	78.0	56.0	77.0	operational	PVC	200
MND1854	Bore 15	332.08	43.14	12/10/04	356894	6511708	69.0	47.0	68.0	operational	PVC	200
MND1861	Bore 16	334.03	42.70	10/10/04	356400	6512680	79.0	54.0	78.0	commisioned 08-09	PVC	200

Notes
m AHD = metres above height datum
mbgl = metres below ground level
mbtc = meters below top of bore casing
SWL = static water level

TABLE 4. Mt MORGAN BOREFIELD: SCHEDULE OF MONITORING BORES

Bore Reference	Top of bore casing (mAHD)	Ground Level (mAHD)	Initial SWL		AMG		Trigger water level (mAHD) *	Trigger water level (mbtc) *	Total Depth (mbgl)	Slotted Interval		Casing Type	Casing diameter (mm)	Comment
			mbtc	date	mE	mN				Top (mbgl)	Base (mbgl)			
MND1237	315.27	315.16	21.9	1991	362552	6509495	269	46	60	18	60	PVC	40	
MND1240	316.73	316.59	20	1991	361052	6510345	270	47	38	18	38	PVC	40	
WID4616	313.09	312.68	28.3	08/01	359267	6509689	262	51	57	15	57	PVC	50	replaced MND1241 (dry)
MND1243	316.59	316.88	19	1991	356595	6509639	269	48	38	18	38	PVC	40	
WID4615	321.61	321.02	23	08/01	355894	6511252	296	26	56	8	56	PVC	50	replaced MND1244 (damaged)
DWT373	305.47	305.37	9.19	1991	364829	6508294	278	27	65	24	54	PVC	80	
DWT376	298.40	298.30	5.3	1991	370856	6507380			58	18	58	PVC	80	
DWT455	312.80	312.70	17.5	1991	365349	6508976	281	32	70	24	70	PVC	50	
MND1871	304.87	304.17	20.45	12/03	363836	6508108	275	30	70	48	68	PVC	50	
MND1872	318.28	317.61	33.57	12/03	361713	6510216	267	51	73	48	70	PVC	50	
WID4617	305.54	305.40	14.1	08/01	364325	6507975	277	29	24	6	24	PVC	50	replaced DWT497 (damaged)

Notes
m AHD = metres above height datum
mbgl = metres below ground level
mbtc = meters below top of bore casing
SWL = static water level
* Trigger water level for 80 L/second, 20 year pumpage scenario from TGES, 2009

TABLE 5. Mt MORGAN BOREFIELD: PRODUCTION

	2000	2001	2002	2003	2004	2005	2006
January	83,274	59,035	149,951	170,479	64,048	309,859	257,006
February	55,316	87,196	142,102	161,607	66,289	311,371	223,936
March	21,538	133,743	137,266	172,089	39,638	245,420	101,268
April	83,318	128,902	149,941	181,936	113,717	252,831	124,483
May	97,697	75,987	147,644	195,732	117,767	171,268	38,526
June	41,083	144,082	139,596	139,441	183,243	205,253	102,272
July	83,350	101,404	143,812	148,516	164,994	167,034	71,278
August	64,154	103,237	155,132	144,731	165,928	151,315	225,573
September	65,237	98,299	159,867	182,739	182,851	141,477	199,761
October	53,259	132,699	152,364	162,234	200,631	207,729	258,394
November	58,146	134,539	169,226	156,384	148,313	234,433	232,205
December	40,511	145,787	189,969	120,796	220,139	247,375	216,727
Water year	**2000-2001**	**2001-2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**
Water year total	**993,602**	**1,582,465**	**1,991,654**	**1,500,102**	**2,578,858**	**1,996,854**	**2,217,575**

Notes
All values as kL

TABLE 6. Mt MORGAN BOREFIELD: MONITORING BORE WATER LEVELS

	MND1237	MND1240	WID4616	MND1243	WID4615	DWT373	DWT376	DWT455	WID4617	MND1871	MND1872
Jun-99	24.25	22.69		22.14	20.09	16.22	4.85	21.42			
Sep-99	23.69	22.73		22.5	21.63	16.38	4.81	21.15			
Nov-99	24.1	22.7		22.1	20.42	13.87	4.56	23.5			
Feb-00	23.8	22.84		22.45	20.97	16.31	4.69	20.77			
Jun-00	24.49	23.52		20.41	19.41	17.63	4.21	21.27			
Aug-00	24.41	23.42		21.02	19.52	17.33	4.12	21.34			
Nov-00	24.65	23.85		22	19.2	17.3	4.3	21.4			
Feb-01	23.80	23.70		23.10		17.49	4.00	21.67			
May-01		24.06		27.45		17.56	4.32	22.58			
Aug-01		24.23	28.28	23.58	23.00	19.09	4.41	26.70	14.09		
Dec-01	25.06	24.51	29.09	23.57	23.09	18.32	4.48	22.10	14.17		
Feb-02	25.27	24.65	29.25	23.77	23.17	18.65	4.66	22.29	14.30		
May-02	25.19	24.76	29.51	24.31	23.57	16.49	4.78	22.95	14.36		
Aug-02	25.27	24.65	29.25	23.77	23.17	18.65	4.66	22.29	14.30		
Nov-02	25.37	24.88	30.60	25.01	23.52	18.61	5.01	22.57	14.44		
Feb-03	25.70	25.00	31.46	25.44	23.73	19.27	5.06	22.87	14.76		
May-03	25.69	25.05	31.57	25.56	23.77	19.39	5.07	22.91	14.80		
Aug-03	25.72	25.23	31.88	25.76	23.86	19.19	5.00	22.88	14.83		
Nov-03	25.90	25.41	32.32	25.87	23.94	19.35	4.96	22.92	15.95		
Feb-04	25.99	25.52	32.32	25.96	24.00	19.64	5.01	23.04	15.04	20.45	33.57
May-04	26.05	25.66	32.36	26.20	24.07	19.47	4.95	23.12	15.14		
Aug-04	26.38	25.90	32.76	27.87	24.16	19.98	5.49	23.40	15.28		
Nov-04	26.51	26.01	33.00	28.34	24.22	20.22	5.61	23.54	15.47		
Feb-05	26.61	26.08	33.77	29.02	24.30	20.49	5.80	23.75	15.54		
May-05	26.74	26.58	34.39	29.01	24.42	20.82	5.83	23.96	15.61		
Aug-05	26.87	27.13	35.00	29.00	24.55	21.14		24.17	15.68		
Nov-05	26.97	26.39	35.16	29.12	24.56	21.35	6.00	24.25	16.00		
Feb-06	27.14	26.56	35.36	29.40		21.55	5.98	24.38	16.18	23.19	34.42
May-06	27.21	26.61	34.25	29.46		21.65	5.99	25.09	16.25	22.59	34.32
Aug-06	27.46	26.72	35.37	30.02		21.90	6.17	25.58	16.38	22.39	34.73
Nov-06	27.61	26.88	37.70	30.37		22.01	6.42	25.42	16.53	24.22	35.55
Feb-07	27.74	27.00	35.88	30.14		22.40	6.42	26.12	16.69	24.12	35.57
May-07	28.10	27.15	36.26	30.66		22.75	6.64	26.15	16.90	25.25	35.83
Aug-07	28.17	27.24	36.30	30.70		22.90	6.70	25.30	17.04	25.54	35.94
Nov-07	28.36	27.24	36.56	30.85		23.24	6.90	25.55	17.26	26.53	36.22
Feb-08	28.54	27.44	37.04	30.62		23.54	7.30	27.81	17.43	26.50	36.36
May-08	28.66	27.59	37.91	31.01		23.87	7.20	26.00	17.57	27.14	36.65
Aug-08	29.00	27.74	38.73	31.21		24.25	7.75	26.29	17.88	26.79	36.19
Nov-08	29.05	27.70	38.98	31.10		24.31	7.32	29.65	15.52	26.66	37.32
Feb-09	29.34	27.93	39.48	31.55		24.44	9.17	28.97	18.04	26.07	37.40
May-09	29.49	28.09	39.64	31.44		24.59	9.17	27.78	18.20	26.60	37.87
Jul-09	**29.49**	**28.08**	**39.64**	**31.44**		**24.59**	**9.17**	**27.78**	**18.20**	**26.60**	**37.87**
Nov-09	**29.87**	**27.28**	**39.66**	**31.74**		**24.74**	**9.88**	**28.57**	**18.48**	**27.04**	**38.10**
Feb-10	**29.97**	**28.38**	**40.10**	**31.67**		**24.78**	**9.91**	**28.56**	**18.50**	**27.35**	**38.24**
May-10	**30.15**	**28.52**	**40.46**	**31.70**		**24.91**	**10.03**	**27.12**	**18.53**	**27.41**	**38.37**

Notes

All values in m below bore casing (mbtc) reference point

blocked by root material

TABLE 7. Mt MORGAN BOREFIELD: PRODUCTION BORE WATER SALINITY

Bore ref.	DWT390	DWT403	MND1175	MND1190	MND1220	MND1177	MND1176	MND1178	MND1868	MND1869	MND1870	MND1822	MND1827	MND1843	MND1854	MND1861
Bore no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nov-00	34.70	37.40	32.20	31.80	31.60		30.40	29.50								
Feb-01	35.20	37.70	32.20	32.30	32.90	34.80	34.10	32.30								
May-01	29.10	32.10	27.00	27.30	27.50	28.50	27.90	26.80								
Aug-01	30.10	32.70	32.10	30.20	31.40	29.80	31.50	28.00								
Nov-01	29.50	33.20	28.30	27.10	28.90	26.90	27.90	31.60								
Feb-02			26.70	26.58		26.52	27.54									
May-02			34.74	29.98		34.80	34.92									
Aug-02			28.92		28.80	28.56	28.62	29.58								
Nov-02			28.98	28.92	28.98	29.64		28.74								
Feb-03			36.00	37.00	35.00	36.00	36.00									
May-03			34.00	33.00	33.00	33.00	33.00	34.00								
Aug-03		40.00	35.00	35.00	35.00	36.00	34.00	34.00								
Nov-03		31.00	34.00	32.00	29.00	31.00	33.00									
Feb-04		39.00	34.00	35.00	34.00	34.00	34.00									
May-04		40.00		33.00	34.00	33.00	34.00									
Aug-04		35.00	33.00	33.00	34.00	33.00	34.00									
Nov-04		37.00	33.00	33.00	34.00	34.00	35.00									
Feb-05			33.00		33.00	33.00	34.00	34.00	33.00	33.00	33.00	33.00	33.00	32.00	31.00	31.00
May-05		41.00	34.00		34.00	33.00	34.00		33.00	34.00	34.00	34.00	33.00	32.00	31.00	40.00
Aug-05																
Nov-05		40.00	33.00	32.00	34.00	33.00	35.00		35.00	32.00	34.00	35.00	34.00		32.00	31.00
Feb-06		40.00	33.00	33.00	33.00	34.00	37.00		33.00	33.00	33.00	34.00	33.00	32.00	32.00	32.00
May-06		41.00	35.00	34.00	35.00		38.00		35.00	35.00	35.00	35.00	35.00	33.00	33.00	32.00
Aug-06		44.00	38.00	36.00	38.00		40.00		37.00	36.00	36.00	36.00	36.00	35.00		
Nov-06		41.00	35.00	34.00	35.00		37.00	34.00	35.00	33.00	34.00		33.00	32.00		32.00
Feb-07		48.00	37.00	36.00	36.00		43.00	38.00	39.00	36.00	37.00		39.00			
May-07		53.00	36.00	33.00	35.00		41.00	36.00		35.00		35.00			34.00	
Aug-07		38.00	34.00	34.00	35.00		37.00	35.00	35.00	34.00		34.00				
Nov-07		47.00	35.00	33.00	35.00		39.00	35.00	35.00	34.00		34.00			35.00	
Feb-08		60.00	39.00	35.00	36.00		43.00	39.00	37.00	36.00		36.00	38.00		37.00	
May-08		49.00	38.00	37.00	37.00			37.00	38.00	35.00	36.00	36.00	37.00		36.00	
Aug-08		46.00	35.00	33.00	35.00	35.00	38.00	35.00		34.00	34.00	34.00	34.00	34.00	33.00	
Nov-08			36.00	35.00	36.00	36.00	40.00	36.00	37.00	35.00	35.00	35.00	35.00	34.00	35.00	
Feb-09			37.80	41.00	35.60		48.00	37.40	57.40		38.80	41.20	39.40	39.20	39.20	
May-09			34.30	35.10				35.80	36.80	36.60	36.50	35.80		38.00		35.10
Aug-09			**38.60**	**38.60**	**37.60**	**47.40**	**43.10**	**38.10**	**38.00**	**38.20**	**39.80**	**37.50**	**40.80**	**30.60**		**30.40**
Nov-09			**37.50**	**35.40**	**37.00**	**37.80**	**38.40**	**37.10**	**36.70**	**36.90**		**35.00**	**36.90**	**35.40**		**36.20**
Feb-10		**40.80**	**36.40**	**42.00**	**37.80**	**37.70**	**46.40**	**36.70**	**36.80**	**38.00**		**39.80**	**43.60**	**38.20**	**35.10**	**37.00**
May-10			**41.60**	**33.00**	**34.00**	**38.20**	**39.40**		**33.80**	**34.50**	**35.00**	**32.80**	**33.70**	**39.60**	**30.80**	**32.50**

Notes

All salinity data as g/L total dissolved solids

Bore WID4615 replaced bore MND1244 in 2001

Bore out of service-unable to collect samples

TABLE 8. Mt MORGAN BOREFIELD: SALINITY PROFILES

Monitoring bore DWT 373								
Depth (m)	1998	2001	2002	2003	2004 (23/11/04)	2006 (14/02/06)	2008 (5/11/08)	2009 (27/11/09)
17.50	20.28							
18.00	24.90	34.40						
19.00	25.44	34.40	9.30	4.97				
20.00	25.92	34.30	10.45	7.85				
21.00	26.52	34.20	15.42	11.05	27.12			
22.00	27.48	34.40	20.82	14.94	27.06	8.82		
23.00	31.44	34.60	27.06	21.12	27.06	30.00		
24.00	31.80	34.90	33.96	33.42	27.00	33.66		
25.00	31.86	35.10	34.50	33.60	27.00	34.08	30.60	31.00
26.00	31.98	35.00	34.50	33.60	27.06	34.26		
27.00	31.98	34.90	34.50	33.60	27.06	34.26		
28.00	31.98	35.10	34.50	33.60	27.06	34.26		
29.00	31.98	35.10	34.56	33.60	27.06	34.32		
30.00	31.98	35.00	34.56	33.60	27.06	34.32	31.00	31.30
31.00	31.98	35.00	34.56	33.60	27.06	34.32		
32.00	31.98	34.80	34.56	33.60	27.06	34.32		
33.00	31.98	34.70	34.62	33.60	27.12	34.32		
34.00	31.98	34.90	34.68	33.60	27.12	34.32		
35.00	31.98	35.00	34.68	33.60	27.12	34.32	31.10	31.30
36.00	31.98	35.10	34.68	33.60	27.12	34.32		
37.00	31.98	35.10	34.68	33.60	27.12	34.32		
38.00	31.98	35.10	34.68	33.60	27.18	34.32		
39.00	31.98	35.20	34.68	33.54	27.18	34.32		
40.00	31.98	35.20	34.68	33.54	27.18	34.32	31.10	31.30
41.00	31.98	35.20	34.68	33.54	27.18	34.32		
42.00	31.98	35.00	34.74	33.54	27.24	34.32		
43.00	31.98	35.10	34.74	33.54	27.24	34.26		
44.00	31.98	36.10	34.80	33.54	27.24	34.20		
45.00	31.98	36.10	34.80	33.54	27.36	34.38	31.10	31.30
46.00	31.98	36.10	34.80	33.54	27.42	34.44		
47.00	31.98	35.90	34.80	33.54	27.90	34.86		
48.00	31.98	35.90	34.80	33.54	28.14	35.16		
49.00	31.98	36.00	34.80	33.54	28.44	35.46		
50.00	31.98	36.00	34.86	33.54	28.86	36.12	31.40	31.40
51.00	31.98	36.10	34.86	33.54	29.16	36.24		
52.00	31.98	36.10	34.92	33.54	29.28	36.36		
53.00	31.98	36.20	36.96	35.28	31.38	39.12		
54.00	33.12	36.20	37.74	37.26	33.66	41.46		
55.00	33.12		37.80	37.50	34.20	41.76	31.60	31.60
56.00	33.12	36.30	37.80	37.50	34.26	41.58		
57.00	33.18	36.40	36.96	37.50	34.26	41.52		
58.00	33.18	36.20	36.12	34.74	34.26	41.46		
59.00	33.18	36.20	34.50	35.34	30.12	37.80		
60.00	33.18	36.20	35.04	34.02	31.08	37.68	32.00	31.50
61.00	33.18	36.20	35.22	34.68	30.06	37.02		
62.00	33.18	36.20	33.24	33.12	30.00	36.78		
63.00	33.18	36.40	32.04	31.98	29.10	36.18		
64.00	33.18	36.30	32.40	31.92	28.92	36.18		
65.00		36.20	30.84	30.84	27.48		33.10	31.60

Monitoring bore DWT 455									
Depth (m)	1998	1999	2001	2002	2003	2004 (23/11/04)	2006 (14/02/06)	2008 (5/11/08)	2009 (27/11/09)
22.00	1.46	0.23							
23.00	4.25	0.31		2.78	0.08				
24.00	8.06	0.90		16.50	0.15	20.16			
25.00	12.84	4.10		16.92	0.17	28.44	1.44		
26.00	18.00	6.25		16.92	5.04	28.44	6.48		
27.00	21.60	10.57	1.98	16.98	11.65	28.44	17.46		
28.00	23.70	14.88	2.03	17.82	15.12	28.44	27.00		
29.00	25.38	18.96	4.91	19.56	16.62	28.44	32.76		
30.00	26.70	22.20	14.75	21.24	17.22	28.44	34.62	13.14	10.96
31.00	29.40	29.64	20.70	30.72	30.48	28.44	35.04		
32.00	29.40	29.64	25.10	30.72	30.60	28.56	35.10		
33.00	29.40	29.64	20.80	30.72	30.60	28.56	35.16		
34.00	29.40	29.64	19.30	30.72	30.60	28.5	35.22		
35.00	29.40	29.64	17.60	30.72	30.60	28.5	35.22	28.80	26.20
36.00	29.40	29.64	21.40	30.72	30.60	28.5	35.28		
37.00	29.40	29.64	28.30	30.72	30.54	28.56	35.28		
38.00	29.40	29.64	29.70	30.72	30.54	28.5	35.28		
39.00	29.40	29.64	29.70	30.66	30.48	28.5	35.28		
40.00	29.40	29.64	29.70	30.60	30.48	28.44	35.28	30.20	29.60
41.00	29.40	29.64	28.20	30.54	30.42	28.44	35.22		
42.00	29.40	29.64	30.10	30.48	30.30	28.32	35.22		
43.00	29.40	29.64	33.70	30.30	30.24	28.26	35.10		
44.00	29.40	29.64	34.10	30.24	30.18	28.2	35.10		
45.00	29.40	29.64	35.40	30.06	30.06	28.14	35.04	29.80	30.20
46.00	29.40	29.64	32.70	30.00	30.00	28.14	35.04		
47.00	29.40	29.64	38.10	29.94	29.94	28.14	34.98		
48.00	29.40	29.64	39.40	29.88	29.94	28.14	34.98		
49.00	29.40	29.64	41.20	29.82	29.94	28.14	34.98		
50.00	29.40	29.64	41.10	29.82	29.94	28.26	35.10	30.80	30.00
51.00	29.40	29.64	46.70	30.00	30.18	28.44	35.40		
52.00	29.40	29.64	48.30	30.54	30.78	28.74	35.76		
53.00	29.40	29.64	50.60	30.54	30.78	28.86	35.94		
54.00	29.40	29.64	49.40	30.60	30.84	29.16	36.24		
55.00	29.40	29.64	52.20	30.78	31.08	29.46	36.60	32.00	31.40
56.00	29.40	30.72	56.80	31.02	31.38	30.36	37.62		
57.00	31.56	36.30	53.70	36.60	40.26	37.92	48.00		
58.00	37.56	43.92	55.60	47.10	50.46	49.44	48.00		
59.00	43.86	48.54	57.80	51.72	55.68	54.6	48.00		
60.00	49.26	51.42	58.10	55.56	59.70	52.62	48.00	36.20	48.90
61.00	51.84	54.48	58.20	59.58	63.66	62.04	48.00		
62.00	57.00	60.36	59.70	65.82	69.66	66.96	48.00		
63.00	61.68	62.76	59.50	69.42	72.60	69.42	48.00		
64.00	65.16	66.72	59.90	73.80	76.38	72.96	48.00		
65.00	69.48	71.28	60.50	77.82	80.10	76.38	48.00	58.90	38.20
66.00	72.00	73.50	60.20	79.98	81.96	77.88	48.00		
67.00	78.18	79.86	62.10	85.62	87.90	83.88	48.00		
68.00	80.04	81.48	64.80	86.64	88.26	84.18	48.00		
69.00	81.00	82.20	65.40	87.00	88.56	84.36	48.00		
70.00	82.68	83.88		88.38	89.76	85.44	48.00	103.70	65.00

Notes
Salinity data, as g/L, estimated from raw electrical conductivity measurements.

TABLE 9. ST IVES GOLD MINE DEWATERING: SCHEDULE OF PRODUCTION SOURCES & MONITORING BORES FOR 2009-2010

Bore Hole /Site Name	Northing MGA	Easting MGA	Location	Type	Depth drill (m)	RL of datum (m AHD) Datum	RL ground (m AHD) Ground	Stickup (m)	Datum Description	Casing depth (m) Depth	Casing (mm) Diameter	Casing Type	Slotted Interval 1	Slotted Interval 2	Original SWL (mbtc)	Date	Original SWL (m AHD)	SWL Oct 2004 (mbtc)	SWL Oct 2004 (m AHD)	Installed Date	Status
Argo Pit Area																					
TD7436a	6525807.45	383435.72	Argo	Monitoring	57	293.174	292.444	0.73	25 mm PVC	24.6	25	Cl 18 uPVC	14 - 24	-	9.765	36566	282.679	13.64	279.534	36526	Operational
TD7436b	6525807.45	383435.72	Argo	Monitoring	57	293.174	292.444	0.73	25 mm PVC	45.6	25	Cl 18 uPVC	30 - 45	-	15.46	36566	276.984	23.21	269.964	36526	Operational
TD7436c	6525807.45	383435.72	Argo	Monitoring	57	293.174	292.444	0.73	25 mm PVC	57.6	25	Cl 18 uPVC	52 - 57	-	23.72	36566	268.724	52.07	241.104	36526	Operational
TD7438a	6525728.676	383369.32	Argo	Monitoring	60	293.27	292.55	0.72	25 mm PVC	27.8	25	Cl 18 uPVC	15 - 27	-	5.915	36566	286.635	13.53	279.74	36526	Operational
TD7438b	6525728.676	383369.32	Argo	Monitoring	60	293.27	292.55	0.72	25 mm PVC	42.8	25	Cl 18 uPVC	32 - 42	-	39.04	36566	253.51	42.2	251.07	36526	Operational
TD7438c	6525728.676	383369.32	Argo	Monitoring	60	293.27	292.55	0.72	25 mm PVC	60.8	25	Cl 18 uPVC	47 - 60	-	38.32	36566	254.23	51.56	241.71	36526	Operational
TD7441a	6525436	383499	Argo	Monitoring	54	296.68	295.89	0.79	50 mm PVC	27.8	50	Cl 9 uPVC	15 - 27	-	6.265	36566	289.625	10.72	285.96	36526	Operational
TD7441b	6525436	383499	Argo	Monitoring	54	296.68	295.89	0.79	50 mm PVC	54.8	50	Cl 9 uPVC	32 - 45	-	26.365	36566	269.525	42.06	254.62	36526	Operational
TD7729a	6525360	384275	Argo	Monitoring	70	299.84	298.84	1	50 mm PVC	N.D.	50	Cl 9 uPVC	20 -	-	11.2	37323	287.64	20.25	279.59	37292	Operational
TD7729b	6525360	384275	Argo	Monitoring	70	299.88	298.84	1.04	50 mm PVC	N.D.	50	Cl 9 uPVC	N.D.	-	34.8	37323	264.04	34.55	265.33	37292	Operational
TD7729c	6525360	384275	Argo	Monitoring	70	299.88	298.84	1.04	50 mm PVC	70	50	Cl 9 uPVC	- 70	-	20.5	37288	278.34	49.36	250.52	37292	Operational
TD7731a	6525706	384133	Argo	Monitoring	56	297.63	296.89	0.74	50 mm PVC	26	50	Cl 9 uPVC	20 - 26	-	N.D.	N.D.	N.D.	22.9	274.73	37295	Operational
TD7731b	6525706	384133	Argo	Monitoring	56	297.72	296.89	0.83	50 mm PVC	56	50	Cl 9 uPVC	32 - 56	-	23.6	N.D.	273.29	31.97	265.75	37295	Operational
Bahama Pit Area																					
BM1	6541235	374805	Bahama	Monitoring		289	287.96	1.04	50 mm PVC		50										
Intrepide Pit Area																					
LD4850	6541878	376305.344	Intrepide	Monitoring	110	289	288.47	0.53													Operational
LD4975	6541878	376310.344	Intrepide	Monitoring	12	289	288.1	0.9													Operational
Mars Pit Area																					
SW Bore / LD-50916	6538896.885	378618.788	Mars - Deep	Production	80	288.624	287.394	1.23	Baseplate top	63	195	Steel	N.D.	-	N.D.	N.D.	N.D.	42.4	246.224	37212	Operational
North Orchin Pit Area																					
CD1295	6534209	381863.8	North Orchin	Monitoring	277	297.224	293.419	0.915	Steel	N.D.	20	uPVC	N.D.	N.D.	24.13	36143	#REF!	41.32	#REF!	1998	Unknown
CD7929	6534887.5	382216.7	North Orchin	Monitoring	162	295.051	291.456	0.76	Steel	162	50	Cl 9 uPVC	48-54 144-156	144-156	18.255	36143	#REF!	40.83	#REF!	1998	Unknown
Heap Leach - Pinnace - North Orchin Area																					
CD1711	6533650.8	381603.2	Heap Leach	Monitoring	67	314.53	314.11	0.42	Steel	67	25	Cl 9 uPVC	49 - 67	-	28.81	36143	285.72	29.1	#REF!	Bef 1998	Operational
CD7260	6533105.3	381830	Heap Leach	Monitoring	151	310.72	310.12	0.6	Steel	151	50	Cl 9 uPVC	103 - 145	-	30.34	36147	280.38	36.08	#REF!	36130	Operational
Thunderer Pit Area																					
TMB2	6535695	381981	Thunderer			290.1	289.06	1.04													Operational
TMB3	6535707	382244	Thunderer			289.3	288.57	0.73													Operational
TDW1/ TMB1	6536081	382109	Thunderer			288.8	288.26	0.54													Operational
Tailings Storage TSF4 Area																					
TSFMB6a	6531924	380246	TSF4	Monitoring	54	311.98	311.33	0.65	Steel	54	50	Cl12 uPVC	47-53		27.1	39610	284.88			39508	Operational
TSFMB11a	6532645	378313	TSF4	Monitoring	42	295.76	295.11	0.65	Steel	15	50	Cl12 uPVC	3-15		8.28	39611	287.48			39508	Operational
TSFMB11b	6532645	378313	TSF4	Monitoring	42	295.76	295.11	0.65	Steel	35.5	50	Cl12 uPVC	19-35.5		9.07	39611	286.69			39508	Operational
TSFMB13b	6532964	377557	TSF4	Monitoring	30	293.22	292.57	0.65	Steel	14	50	Cl12 uPVC	3-9		6.18	39611	287.04			39508	Operational
TSFMB13a	6532964	377557	TSF4	Monitoring	30	293.22	292.57	0.65	Steel	29	50	Cl12 uPVC	14-29		6.65	39611	286.57			39508	Operational
Athena Area																					
TD11148	6525362	386022	Athena	Monitoring	45	302.6	302	0.6	50 mm PVC	45	50	Cl12 uPVC				39854				39864	Operational
TD11149	6525559	386060	Athena	Monitoring	18	302.65	302	0.65	50 mm PVC	18	50	Cl12 uPVC				39854				39864	Operational
TD11150	6525758	386002	Athena	Monitoring	90	301.68	301	0.68	50 mm PVC	90	50	Cl12 uPVC				39854				39864	Operational
TD11152	6525646	387059	Hamlet	Monitoring	38	308.4	308	0.4	50 mm PVC		50	Cl12 uPVC				39854				39864	Operational

TABLE 10. MINE DEWATERING: DISCHARGE TO LAKE LEFROY

Mine Outlet	Total kL	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10
LAND OPERATIONS													
Athena	**293,354**	0	24,408	23,832	22,392	26,496	25,362	29,264	26,432	29,264	28,320	29,264	28,320
Argo	**1,905,596**	155,812	163,929	166,737	168,745	157,923	172,266	146,817	141,592	159,227	159,228	154,091	159,228
Apollo	**221,130**	0	0	0	0	0	0	0	90,000	32,670	32,670	32,310	33,480
Sirius	**1,113,416**	75,461	77,733	94,279	79,551	75,985	73,734	146,837	139,277	95,178	86,443	42,587	126,351
Cave Rocks	**8,250**	0	0	0	0	0	0	0	0	0	0	750	7,500
LAKE OPERATIONS													
Belleisle	**4,261,786**	392,579	386,295	215,806	384,316	387,898	411,281	376,342	294,334	356,106	356,106	356,106	344,619
Beta Hunt	**286,105**	31,142	33,264	32,784	20,557	17,900	16,065	21,003	19,850	32,372	21,730	24,546	14,892
Temeraire	**147,096**	9,954	10,080	46,800	8,064	8,568	6,426	9,324	5,544	7,056	13,860	9,072	12,348
Agamemnon	**315,018**	6,930	4,284	0	0	4,896	21,618	108,864	29,376	28,332	35,532	39,006	36,180
Revenge	**646,596**	34,200	32,400	12,348	22,320	46,800	41,040	70,200	97,020	83,261	82,555	61,920	62,532
Thunderer	**1,948,860**	0	0	0	0	0	62,748	2,808	236,916	413,100	403,488	421,308	408,492
	Monthly Totals	**706,078**	**732,393**	**592,586**	**705,945**	**726,466**	**830,540**	**911,458**	**1,080,340**	**1,236,566**	**1,219,932**	**1,170,960**	**1,233,942**
2009/2010 TOTAL	**11,147,207**												

Mine Outlet	Total kL	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06
LAND OPERATIONS													
Argo	**1,912,409**	142,820	162,019	163,345	152,336	155,912	151,077	189,254	149,708	153,981	172,480	161,436	158,041
Leviathan (Sirius)	**848,367**	65,505	70,891	71,571	67,469	71,484	82,196	79,389	63,802	70,553	73,182	68,696	63,629
Leviathan (Conqueror)	**94,745**	0	0	6,978	8,408	10,316	12,807	175	11,430	13,474	11,611	9,715	9,831
Leviathan (East Repulse)	**300,638**	22,901	26,944	27,984	23,501	28,033	37,857	31,793	26,037	14,280	9,951	25,963	25,394
Beta-Hunt	**311,904**	22,616	18,083	18,900	28,211	19,943	18,820	25,976	27,497	23,749	24,144	44,032	39,933
Junction	**4,937**	4,937	0	0	0	0	0	0	0	0	0	0	0
LAKE OPERATIONS													
Bahama	**10,206**												10,206
Revenge	**261,249**	61,377	69,099	67,549	63,224	0	0						
East Agamemnon	**179,430**										50,965	63,583	64,882
Thunderer	**902,741**	51,610	28,397	19,469	25,963	43,718	32,236	85,068	80,924	138,942	131,508	130,680	134,226
Pluton	**104,230**	21,672	24,296	27,662	30,600	0	0	0	0	0	0	0	0
Mars	**4,329,939**	321,692	363,056	344,278	374,094	394,632	271,796	420,236	466,651	435,168	347,425	289,361	301,550
Temeraire	**122,624**	11,340	18,598	8,165	11,340	6,653	6,048	8,921	6,804	14,818	11,491	11,642	6,804
	Monthly Totals	726,470	781,383	755,901	785,146	730,691	612,837	840,812	832,854	864,965	832,758	805,108	814,496
2005/2006 TOTAL	**9,383,420**												

Mine Outlet	Total kL	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05
LAND OPERATIONS													
Argo	**1,827,657**	157,582	158,217	163,776	160,220	160,089	144,037	155,214	150,441	134,225	145,248	143,533	155,075
East Repulse	**125,329**	0	0	0	0	0	0	6,596	22,607	20,424	25,787	24,492	25,423
Hunt	**328,243**	48,795	40,912	34,136	29,755	36,701	18,035	35,462	21,076	13,963	20,691	18,783	9,934
Junction	**604,020**	84,046	83,910	94,226	91,244	92,209	74,855	10,988	18,925	15,827	18,821	8,414	10,555
Leviathan (Sirius)	**746,528**	60,617	59,135	60,638	58,092	68,172	60,363	63,471	65,837	59,985	63,692	61,760	64,766
Leviathan (Conqueror)	**181,255**	0	86,525	14,048	6,833	30,436	23,977	9,363	10,073	0	0	0	0
North Orchin	**39,859**	*Not In Use*										8,064	31,795
Pinnace	**7,953**	167	382	823	851	797	1,884	1,035	1,231	246	2	246	289
LAKE OPERATIONS													
Greater Revenge Area	**3,353,625**	657,078	373,654	272,090	176,986	258,510	178,706	184,229	166,512	140,980	123,224	458,218	363,438
Pluton	**218,792**	0	0	0	0	0	0	26,164	20,866	45,208	81,648	22,378	22,529
Temeraire	**161,658**	9,360	65,664	7,200	12,600	9,000	342	7,920	10,800	10,800	10,130	11,945	5,897
	Monthly Totals	1,017,645	868,399	646,937	536,581	655,914	502,199	500,442	488,368	441,658	489,243	757,832	689,701
2004/2005 TOTAL	**7,594,919**												

Mine Outlet	Total kL	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Greater Revenge Area	**3,919,550**	121,939	150,066	171,496	182,974	248,701	258,188	93,729	291,977	403,798	594,802	695,229	706,651
Sirius	**654,573**	31,104	7,499	83,670	167,420	67,900	61,285	22,874	23,943	23,448	50,350	57,250	57,830
Argo	**1,599,395**	161,730	141,082	159,908	159,806	208,497	127,191	40,889	69,878	74,778	123,544	158,060	174,032
Junction	**772,585**	66,174	93,220	51,918	63,322	77,771	69,898	32,113	26,863	31,892	71,601	104,451	83,362
Hunt	**551,705**	15,467	55,528	50,110	45,114	49,311	44,239	45,516	47,817	47,856	50,940	52,479	47,328
Pinnace	**30,344**	2,726	3,297	4,244	3,827	4,543	2,788	2,643	1,841	846	1,259	1,572	758
Temeraire	**187,457**	0	0	17,424	5,112	15,347	19,566	24,708	19,440	35,100	23,400	16,020	11,340
East Repulse	**85,000**	85,000	0	0	0	0	0	0	0	0	0	0	0
Conqueror	**718,812**	196,321	65,391	1,110	100	0	126,230	67,931	2,078	19,029	57,014	72,915	110,693
	Monthly Totals	680,461	516,083	539,880	627,675	672,070	709,385	330,403	483,837	636,747	972,910	1,157,976	1,191,994
2003/2004 TOTAL	**7,712,537**												

TABLE 10 continued

Mine Outlet	Total kL	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Greater Revenge Area	1,376,347	173,637	162,462	121,233	89,939	123,756	104,623	107,190	84,791	75,379	113,832	126,800	92,704
Sirius	79,693	4,752	6,545	4,947	4,333	7,277	13,281	14,324	10,996	13,239	0	0	0
North Orchin	528,661	66,671	69,462	63,920	60,402	38,395	51,793	17,140	42,743	56,024	49,684	12,427	0
Argo	1,892,506	169,534	165,835	144,070	152,821	157,928	144,810	150,836	149,439	133,624	160,523	186,597	176,489
Junction	605,962	49,888	53,233	51,350	53,911	58,037	54,579	45,462	40,650	52,567	37,053	41,529	67,703
Hunt	159,619	12,247	12,247	17,197	15,850	16,345	14,824	18,247	12,912	11,958	12,051	6,978	8,763
Redoutable	360,770	0	0	0	6,635	58,165	145,026	58,183	25,833	25,920	16,740	24,268	0
Pinnace	16,649	1,415	1,274	994	1,731	1,884	1,860	1,811	996	980	615	2,028	1,061
Temeraire	63,900	0	0	0	0	0	0	0	0	11,592	16,740	35,568	0
East Repulse	614,414	0	0	0	0	0	0	0	0	0	162,209	301,776	150,429
Conqueror	81,981	0	0	0	0	0	0	0	0	0	0	0	81,981
	Monthly Totals	478,144	471,058	403,711	385,622	461,787	530,797	413,193	368,360	381,283	569,447	737,971	579,130

2002/2003 TOTAL **5,780,502**

Mine Outlet	Total kL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Agamemnon	100,566	16,616	31,059	19,154	16868.5	16868.5							
Minotaur/Agamemnon	988,479	59,816	36,369	4,191	17,978	29,263	65,211	173,637	162,462	121,233	89,939	123,756	104,623
Sirius	50,861	0	0	0	0	4,143	5,584	4,752	6,545	4,947	4,333	7,277	13,281
North Orchin	546,394	31,518	41,134	25,161	22,216	16,411	59,311	66,671	69,462	63,920	60,402	38,395	51,793
Argo	1,590,792	92,418	87,504	152,808	97,678	37,613	187,773	169,534	165,835	144,070	152,821	157,928	144,810
Junction	488,667	18,368	32,805	28,275	26,846	11,644	49,731	49,888	53,233	51,350	53,911	58,037	54,579
Hunt	169,178	10,113	10,113	10,113	10,113	14,600	25,416	12,247	12,247	17,197	15,850	16,345	14,824
Redoutable	209,826										6,635	58,165	145,026
Pinnace	9,637						479	1,415	1,274	994	1,731	1,884	1,860
	Monthly Totals	228,849	238,984	239,702	191,700	130,543	393,505	478,144	471,058	403,711	385,622	461,787	530,797

2002 TOTAL **4,154,400**

Mine Outlet	Total kL	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01
Intrepide	53,551	53,551	0	0	0	0	0	0	0	0	0	0	0
North Revege Kapai	328,138	0	0	0	29,020	24,721	17,147	49,283	49,283	49,283	49,283	49,283	10,836
Leviathan (Sirius)	412,995	65,744	67,780	29,873	52,531	52,531	25,398	4,081	9,991	18,777	36,133	50,157	0
North Orchin	803,395	133,695	163,378	121,486	126,487		49,824	41,853	16,506	40,888	43,055	36,899	29,324
Argo	1,409,863	59,541	134,165	93,488	102,210	156,492	155,138	135,577	70,070	114,015	114,546	106,455	168,166
Junction	509,543	36,790	36,484	29,690	29,690	29,690	63,238	47,150	47,330	49,895	51,706	41,954	45,927
Agamemnon	60,637	0	0	0	0	0	0	0	0	0	0	23,836	36,801
Minotaur	22,243	0	0	0	0	0	0	0	0	0	0	0	22,243
	Monthly Totals	349,321	401,807	274,536	339,937	263,433	310,745	277,944	193,180	272,858	294,723	284,748	254,252

2001 TOTAL **3,600,364**

Mine Outlet	Total kL	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
Intrepid	2,073,959	217,066	275,760	252,935	227,812	153,344	125,297	189,187	182,043	69,722	111,927	164,594	104,272
Santa Ana	2,386,130	389,819	343,890	460,625	391,259	361,561	343,218	95,758	0	0	0	0	0
Leviathan (Sirius)	561,698	62,640	91,744	31,584		18,871	54,150	55,800	33,000	56,634	63,309	40,710	53,256
North Orchin	1,098,953		268,800	138,880	138,880	138,880	80,352	33,000	58,944	33,000	33,000	56,589	118,628
Argo	1,304,525	105,908	183,111	86,267		42,970	84,081	117,893	115,991	168,161	159,703	78,163	162,277
Junction	516,763	63,634	63,859	61,747		66,196	29,467			98,433	55,533	42,156	35,738
	Monthly Totals	839,067	1,227,164	1,032,038	757,951	781,822	716,565	491,638	389,978	425,950	423,472	382,212	474,171

2000 TOTAL **7,942,028**

Notes

No data available, flow meter problem

TABLE 11. ST IVES GOLD MINE DEWATERING: MONITORING BORE WATER LEVELS

	ARGO AREA								BAHAMA AREA	INTREPIDE AREA		MARS AREA
Bore No.	**TD7436a**	**TD7436b**	**TD7436c**	**TD7438a**	**TD7438c**	**TD7441a**	**TD7441b**	**TD7731b**	**BM1**	**LD4850**	**LD4975**	**LD50916**
27/01/2005												245.52
20/04/2005												245.52
10/05/2005												
29/06/2005												
8/08/2005												
1/09/2005												
1/10/2005												
28/11/2005												
7/12/2005									279.23			
31/01/2006												
22/02/2006												
3/03/2006												
1/04/2006												
1/05/2006												
1/06/2006												
20/07/2009	**278.85**	**269.84**	**243.4**	**279.07**	**243.62**	**284.63**	**252.46**	**243.61**	**278.9**	**271.1**	**285.55**	**252.77**
20/07/2009						**284.58**						
1/10/2009	**280.74**	**270.09**	**242.65**	**278.95**	**243.97**	**284.48**	**253.58**		**280.54**	**271.16**	**285.52**	**245.14**
1/11/2009	**278.82**	**270.03**	**243.42**	**278.96**	**243.65**	**285.27**	**252.45**	**247.64**	**280.59**	**271.11**	**285.56**	**247.08**
23/12/2009	**278.72**	**270.01**	**243.38**	**278.87**	**243.6**	**285.39**	**252.44**	**243.6**	**280.76**	**271.24**	**285.44**	
2/02/2010	**278.72**	**270.01**	**243.38**	**278.87**	**243.6**	**285.39**	**252.44**	**243.69**	**280.83**	**271.37**	**285.46**	**241.74**
29/04/2010	**278.62**	**269.93**	**243.31**	**278.73**	**243.54**	**285.04**	**252.24**	**242.9**	**281.34**	**271.44**	**285.61**	**234.49**
29/05/2010	**278.62**	**269.94**	**243.31**	**278.7**	**243.52**	**285.07**	**252.23**	**243.49**	**281.38**	**271.48**	**285.27**	**235.62**
25/06/2010	**278.53**	**269.84**	**243.25**	**278.62**	**243.48**	**284.96**	**252.6**		**281.47**	**271.35**	**285.25**	**235.74**

Notes

All groundwater levels as m AHD (Australian Height Datum)

TABLE 11 continued

	THUNDERER AREA			NORTH ORCHIN PIT AREA & HEAP LEACH				TAILINGS STORAGE TSF4 AREA					ATHENA AREA			
Bore No.	**TMB1**	**TMB2**	**TMB3**	**CD1295**	**CD7929**	**CD1711**	**CD7260**	**TSFMB6a**	**TSFMB11a**	**TSFMB11b**	**TSFMB13a**	**TSFMB13b**	**TD11148**	**TD11149**	**TD11150**	**TD11152**
27/01/2005																
20/04/2005																
10/05/2005																
29/06/2005																
8/08/2005																
1/09/2005																
1/10/2005																
28/11/2005	264.26	266.05	266.17													
7/12/2005																
31/01/2006																
22/02/2006		261.13														
3/03/2006	260.53	262.05	262.44													
1/04/2006																
1/05/2006																
1/06/2006																
20/07/2009	**252.25**	**251.80**	**252.58**	**262.22**	**251.00**	**285.13**	**273.96**	**284.33**	**286.96**	**286.34**	**286.21**	**286.56**	**280.88**	**292.82**	**271.96**	**292.08**
1/10/2009	**246.40**	**256.24**	**257.64**	**259.94**	**252.28**	**285.09**	**274.10**						**290.30**	**294.57**	**283.91**	**293.00**
1/11/2009	**256.63**	**258.32**	**257.07**	**262.87**	**252.39**	**285.13**	**274.09**						**280.23**	**292.51**	**283.92**	**292.12**
23/12/2009	**256.58**	**256.45**	**257.68**	**263.11**	**252.75**	**285.17**	**274.09**	**284.17**	**286.29**	**288.02**	**286.20**	**286.43**	**280.08**	**292.33**	**284.60**	**292.29**
2/02/2010	**256.74**	**257.42**	**257.82**	**264.57**	**253.88**	**285.33**	**274.20**	**284.22**	**286.22**	**287.97**	**286.13**	**286.36**	**280.04**	**292.29**	**284.56**	**292.20**
29/04/2010	**249.19**	**244.07**		**257.25**	**255.71**	**285.26**	**274.16**	**284.10**	**286.06**	**286.77**	**286.16**	**286.40**	**279.72**	**291.89**	**282.41**	**291.67**
29/05/2010		**236.60**		**268.71**	**255.46**	**285.27**	**274.00**	**284.10**	**287.06**	**286.03**	**285.96**	**286.35**	**279.69**	**291.78**	**280.42**	**291.51**
25/06/2010	**243.80**	**236.12**	**230.83**	**268.84**	**255.49**	**285.30**	**274.13**	**284.05**	**286.02**	**286.02**	**285.83**	**286.21**	**279.59**	**291.71**	**279.31**	**291.42**

Notes

All groundwater levels as m AHD (Australian Height Datum)

TABLE 12. ST IVES GOLD MINE DEWATERING: DISCHARGE SALINITY

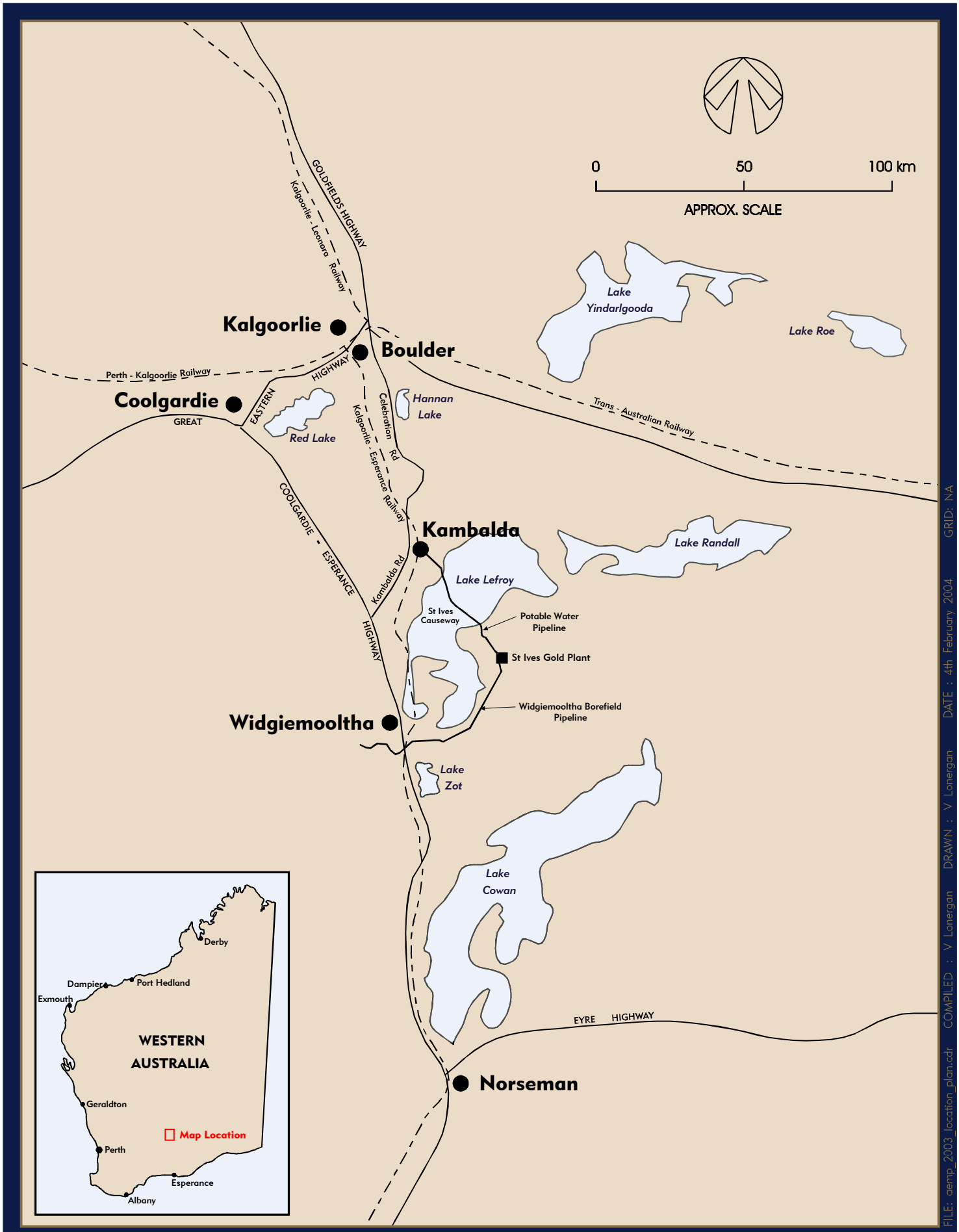
	Junction	Leviathan-Victory Area (via Africa pit)	Apollo	Argo Bores	Argo	Athena	Greater Revenge Area	Mars (via Belleisle settlement pond)	Revenge	Beta-Hunt	Temeraire	Thunderer	North Orchin	Santa Ana	Intrepide, Agamemnon, Minotaur	Redoubtable	Cave Rocks
Nov-99	150	340			280								330	340			
Feb-00	170				270								340	360	340		
May-00	190				260								310	330	320		
Aug-00	130	300		320	280								350		350		
Nov-00	160	330		280	260								320		330		
Feb-01	162	338		275	320								336				
May-01	160	370		310	330								360				
Aug-01	160	360		250	230								260		370		
Nov-01	160	371		294	304								360		370		
Feb-02	174	360			283		390			389			364		390		
May-02	160	340		320	280		350			290			330		350		
Aug-02	190	340		280	270		340			340			340		340		
Nov-02	195	366		387	388		344			268			348		344	332	
Feb-03	323	353		287	307		381			310			376		381	382	
May-03	167	254		257	278		289			299	213				289		
Aug-03	172	303		246	236		348			298					348		
Nov-03	186	297		252	255		345			303					345		
Feb-04	187	323		194	270		333			303					333		
May-04	150	306			256		346			295					346		
Aug-04	162	321			246		335			285							
Nov-04	178	331			264		348			263							
Feb-05	130	331			256		332				328						
May-05		299			246		324			305			326				
Aug-05		308			261		341			306		328					
Nov-05		319			261		339			306	320	326					
Feb-06		346			274		354		339	318		335					
May-06		326			250		339		333	295	311	335					
Aug-06					263					283							
Dec-06					273					307							
Feb-07		284			276					289							
May-07					267						311						
Aug-07					358				339	317							
Nov-07					274				362	287							
Feb-08					256				361								
May-08		320			276				367	338	362						
Aug-08		322			283			386	377								
Nov-08		328			286			408	394								
Feb-09		423			266			358		274							
May-09					302			393	274	343							
Aug-09		**334**			**114**	**55**		**123**	**364**	**125**							
Sep-09											**334**						
Nov-09		**374**			**279**	**82**		**366**		**355**							
Feb-10		**385**			**328**	**143**		**425**	**426**		**412**	**400**					**116**
Mar-10			**78**							**365**							
May-10		**124**			**142**	**85**		**171**		**153**	**131**	**115**					**83**

Notes
All water salinity data as g/L TDS

TABLE 13. ST IVES GOLD MINE DEWATERING: DISCHARGE pH

	Leviathan-Victory Area (via Africa pit)	Apollo	Argo	Athena	Mars (via Belleisle settlement pond)	Revenge	Beta-Hunt	Temeraire	Thunderer	Cave Rocks
Feb-06			7.2				7.4			
May-06			7.5				7.4	7.0		
Aug-06			7.1				7.8			
Dec-06			7.3				7.5			
Feb-07	7.1		4.4				6.8			
May-07			7.1							
Aug-07			6.7			6.9	7.4			
Nov-07			7.3			7.1	7.6			
Feb-08			6.9			6.9				
May-08	6.8		7.2			6.9	7.6	6.7		
Aug-08	6.4		6.9		6.1	6.7	7.6			
Nov-08	6.7		7.2		6.7	6.4				
Feb-09	6.7		6.7		6.4		7.0			
May-09			7.1		6.1	6.5	7.0			
Aug-09	**6.6**		**7.3**	**3.2**	**7.4**	**6.7**	**7.1**			
Sep-09								**6.5**		
Nov-09	**6.9**		**6.7**	**3.9**	**7.0**	**6.8**	**6.8**			**7.6**
Feb-10	**6.8**		**7.2**	**4.0**	**6.8**	**6.8**		**6.8**	**6.7**	**7.2**
Mar-10		**3.4**					**6.9**			
May-10	**6.8**		**7.0**	**6.6**	**6.9**		**7.0**	**6.9**	**6.6**	**7.1**

FIGURES

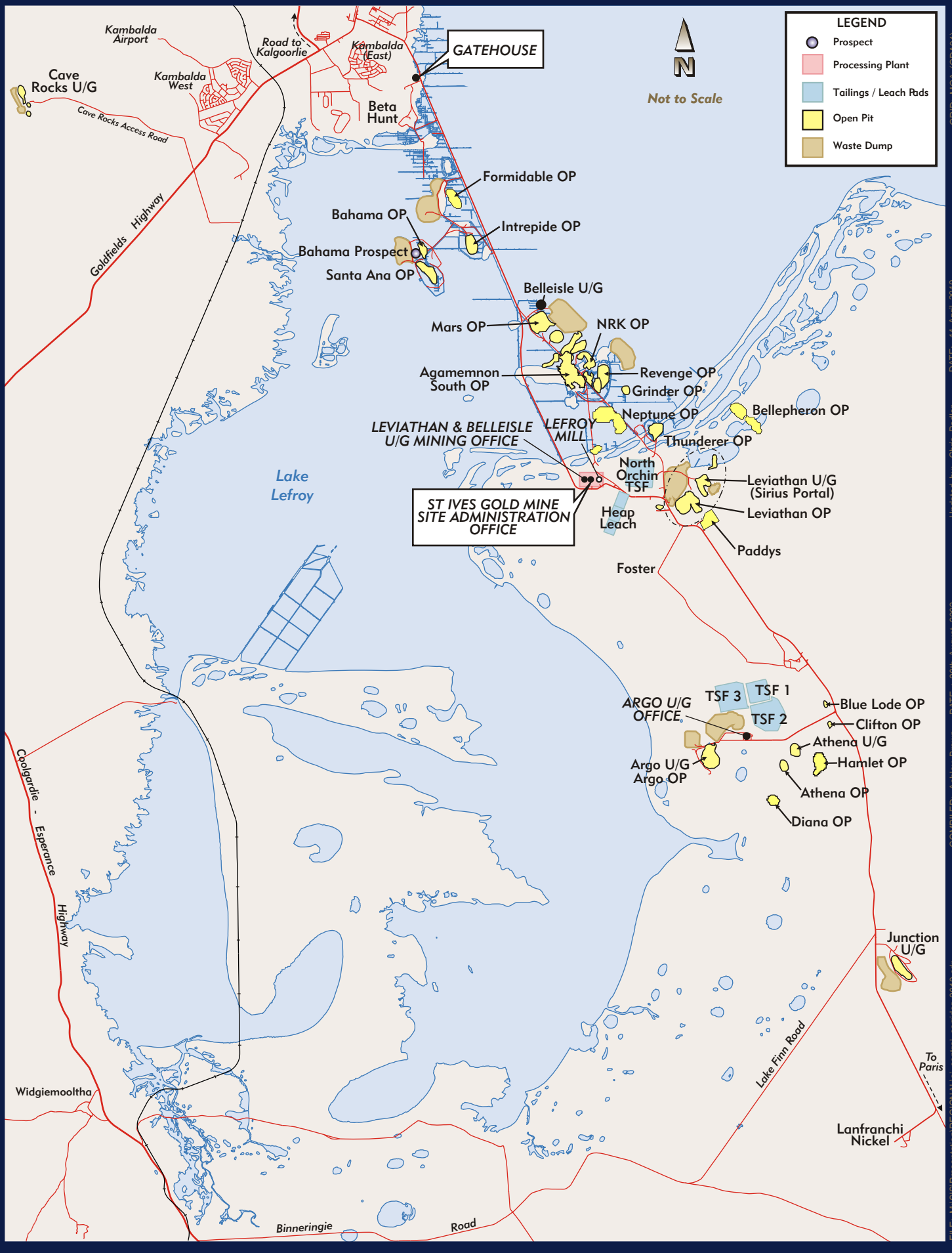


FILE: aemp_2003_location_plan.cdr COMPILED : V Lonergan DRAWN : V Lonergan DATE : 4th February 2004 GRID: NA

St Ives

GOLD FIELDS

FIGURE 1
Regional Location

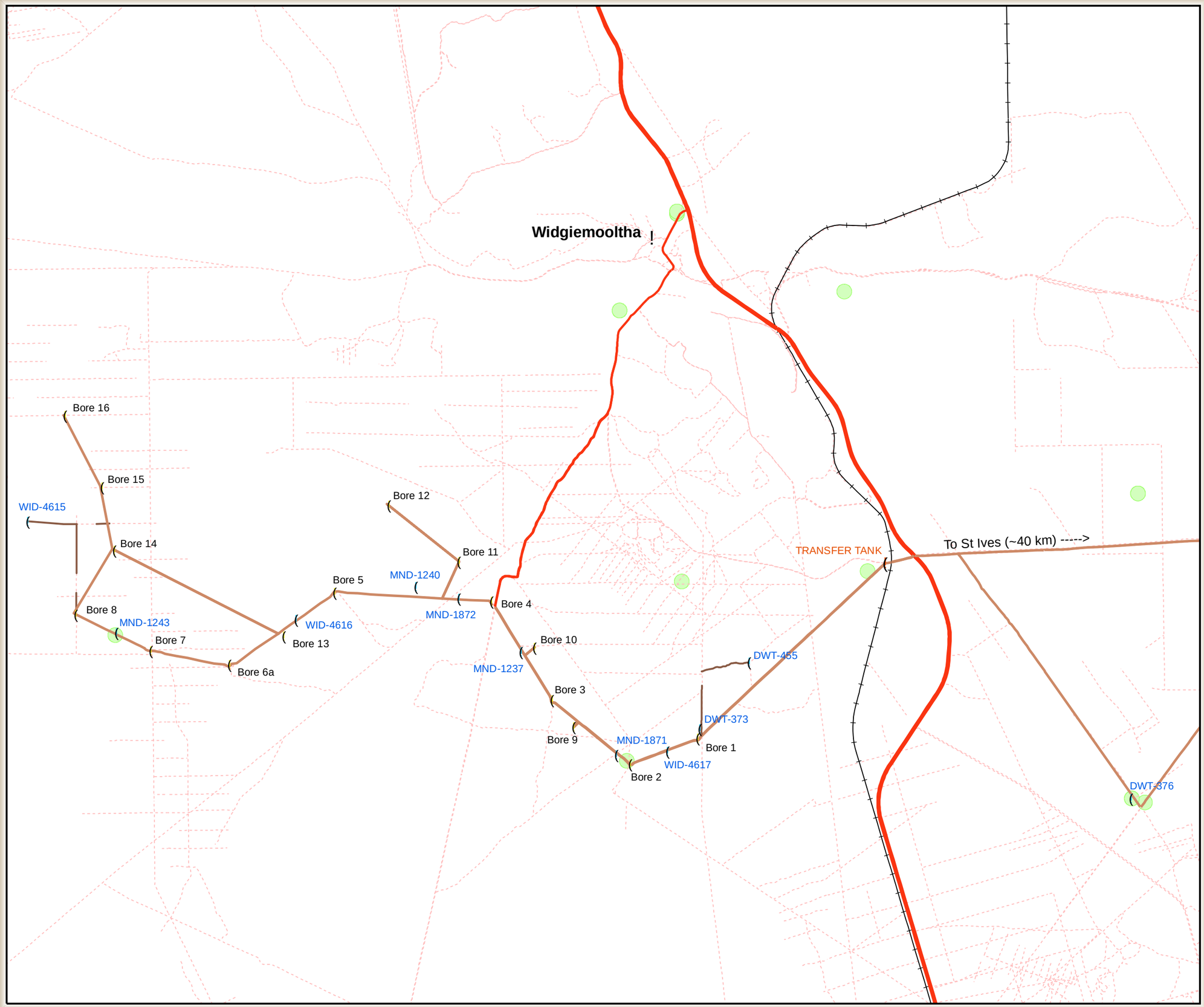


ST IVES

GOLD FIELDS

ST IVES GOLD

CENTRAL CORRIDOR 2010



GOLD FIELDS
ST IVES GOLD MINE

Figure 3

Mt Morgan Borefield Bore Locations

- Transfer Tank
- Production Bore
- Monitoring Bore
- Declared Rare Flora

Main Route Transport

- Main Borefield Route
- Small acess tracks
- Main Highway
- Track to Widgiemooltha
- Railway Line

SCALE

0 0.25 0.5 1 1.5 2

Kilometres

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

5

DATE: 25 July 2006
COMPILED: Environment
DRAWN: C.Wharton
FILENAME: Mt Morgan Borefield.mxd
SCALE: 1:50,000

SIG LEASE LOCALITY MAP

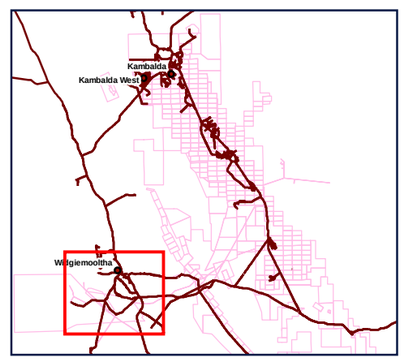
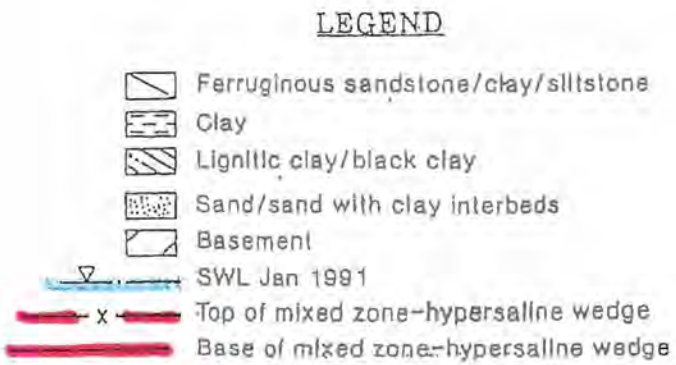


Figure 4 Mt MORGAN BOREFIELD: HYDROGEOLOGICAL CROSS SECTION



(After Berry (1992))

P = PRODUCTION BORE
M = MONITOR BORE

SCREEN INTERVAL

FIGURE 5. Mt MORGAN BOREFIELD: Monthly Production

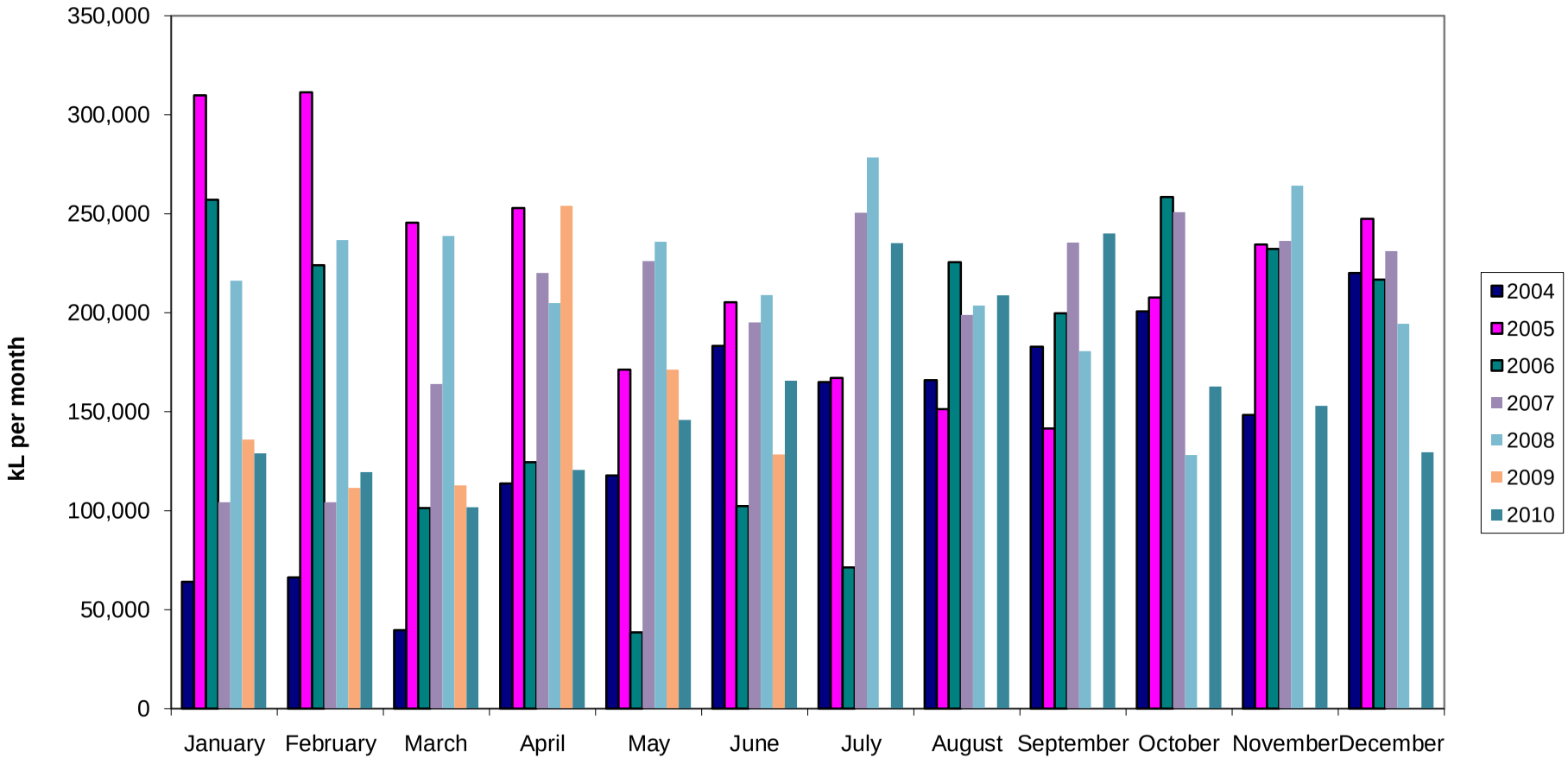


FIGURE 6. Mt MORGAN BOREFIELD HYDROGRAPHS: MND1237 & MND1240

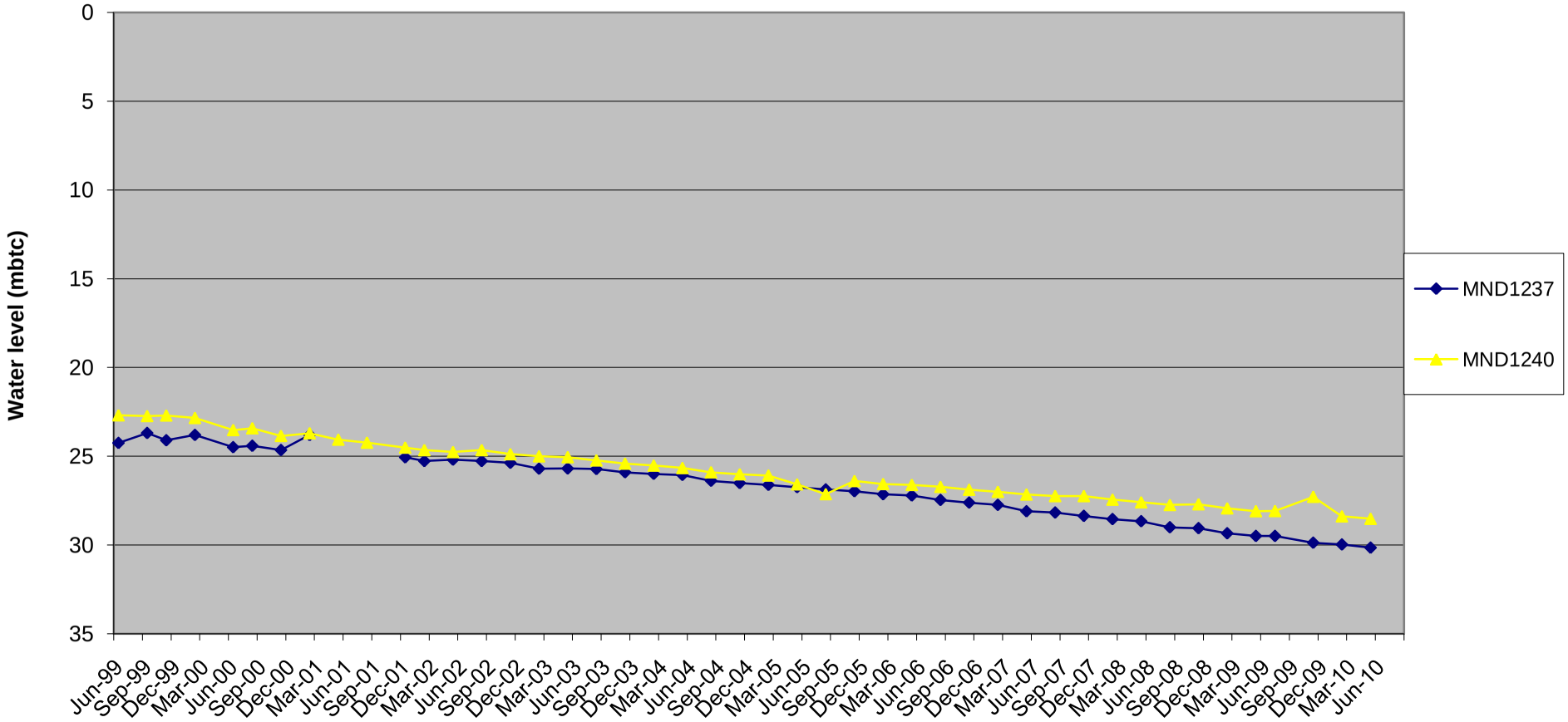


FIGURE 7. Mt MORGAN BOREFIELD HYDROGRAPHS:
WID4616, MND1243, WID4615 & DWT373

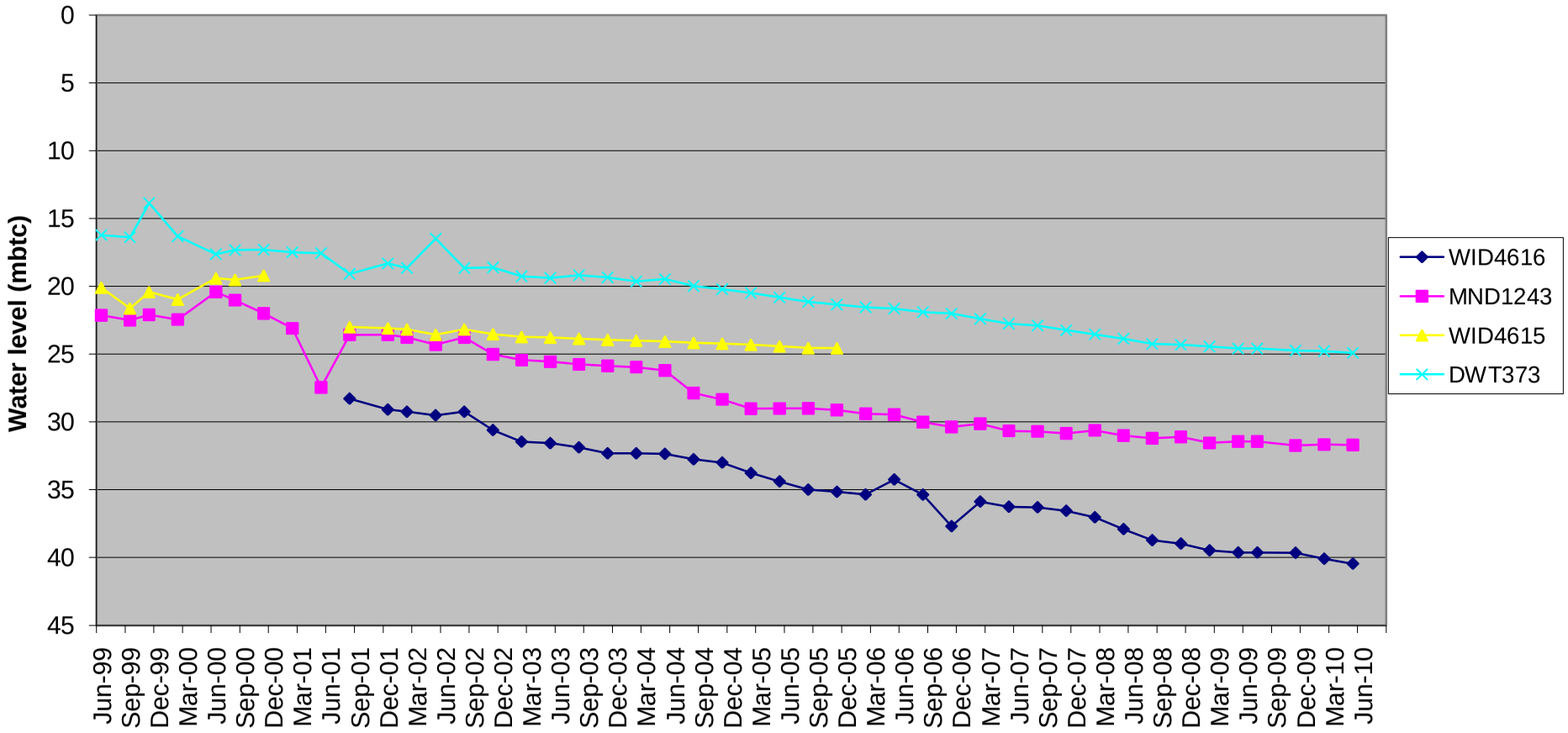


FIGURE 8. Mt MORGAN BOREFIELD HYDROGRAPHS: DWT376, DWT455, WID4617, MND1871 & MND1872

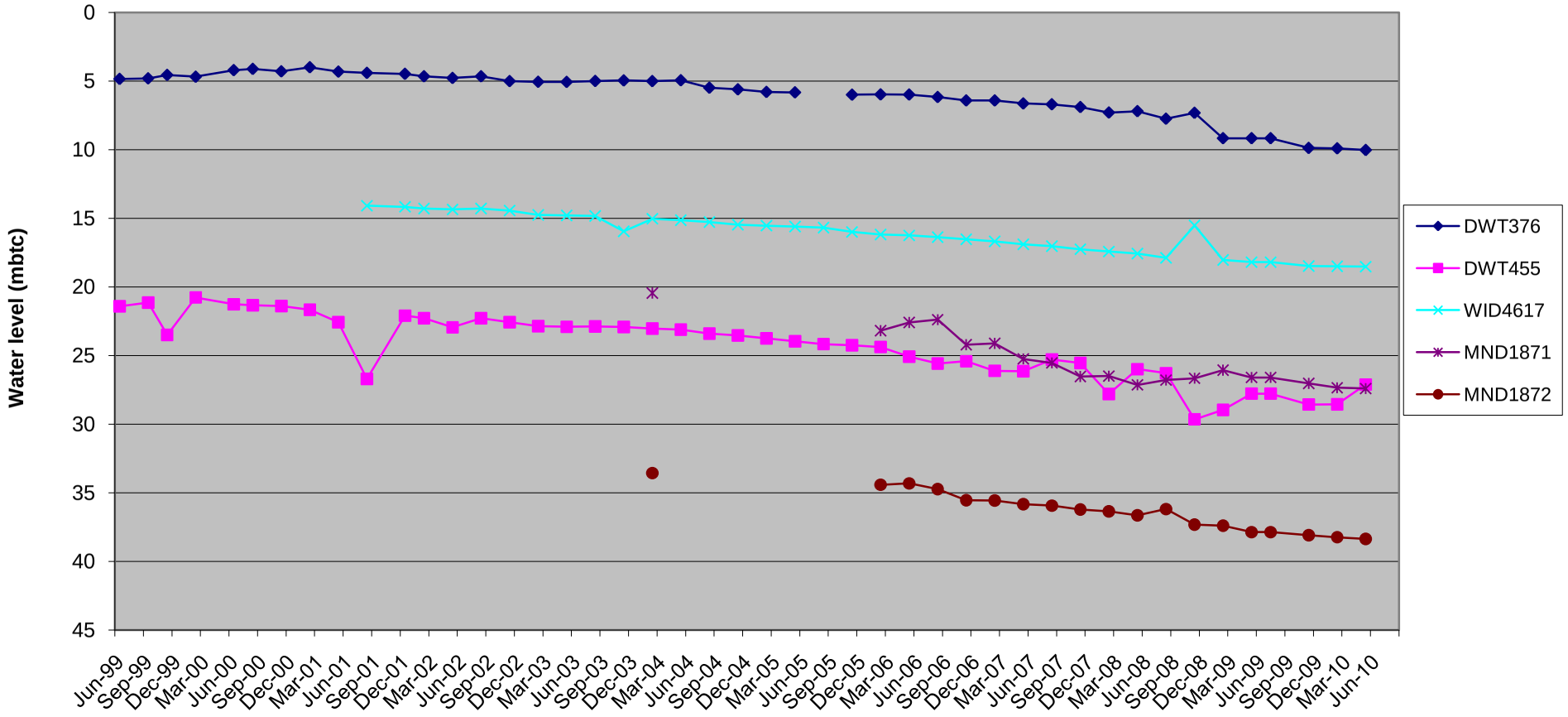


FIGURE 9. Mt MORGAN BOREFIELD: Groundwater Salinity for Production Bores DWT390, DWT403, MND1175, MND1176, MND1177, MND1178, MND1190 & MND1220

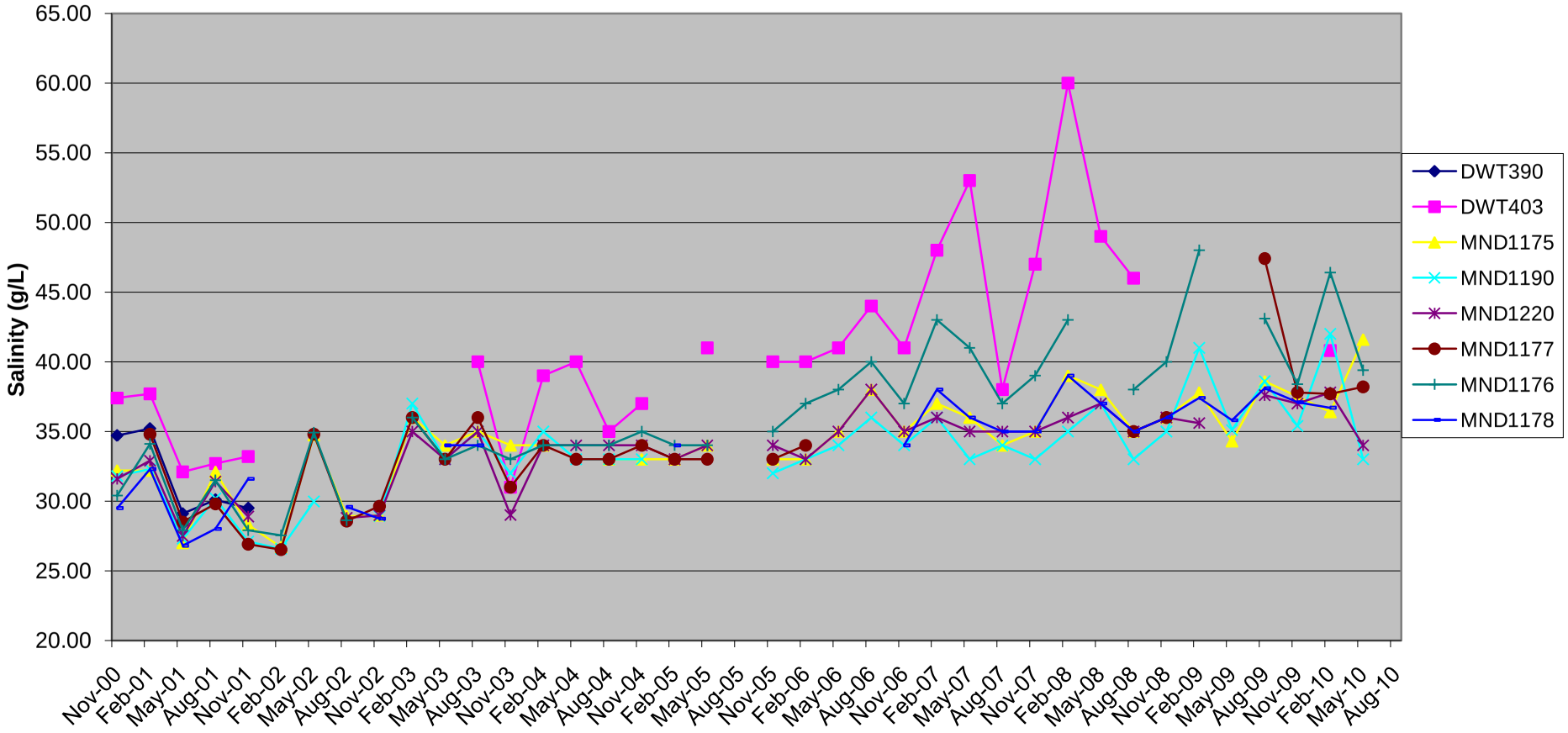


FIGURE 10. Mt MORGAN BOREFIELD: Groundwater Salinity for Production Bores MND1822, MND1827, MND1843, MND1854, MND1861, MND1868, MND1869 & MND1870

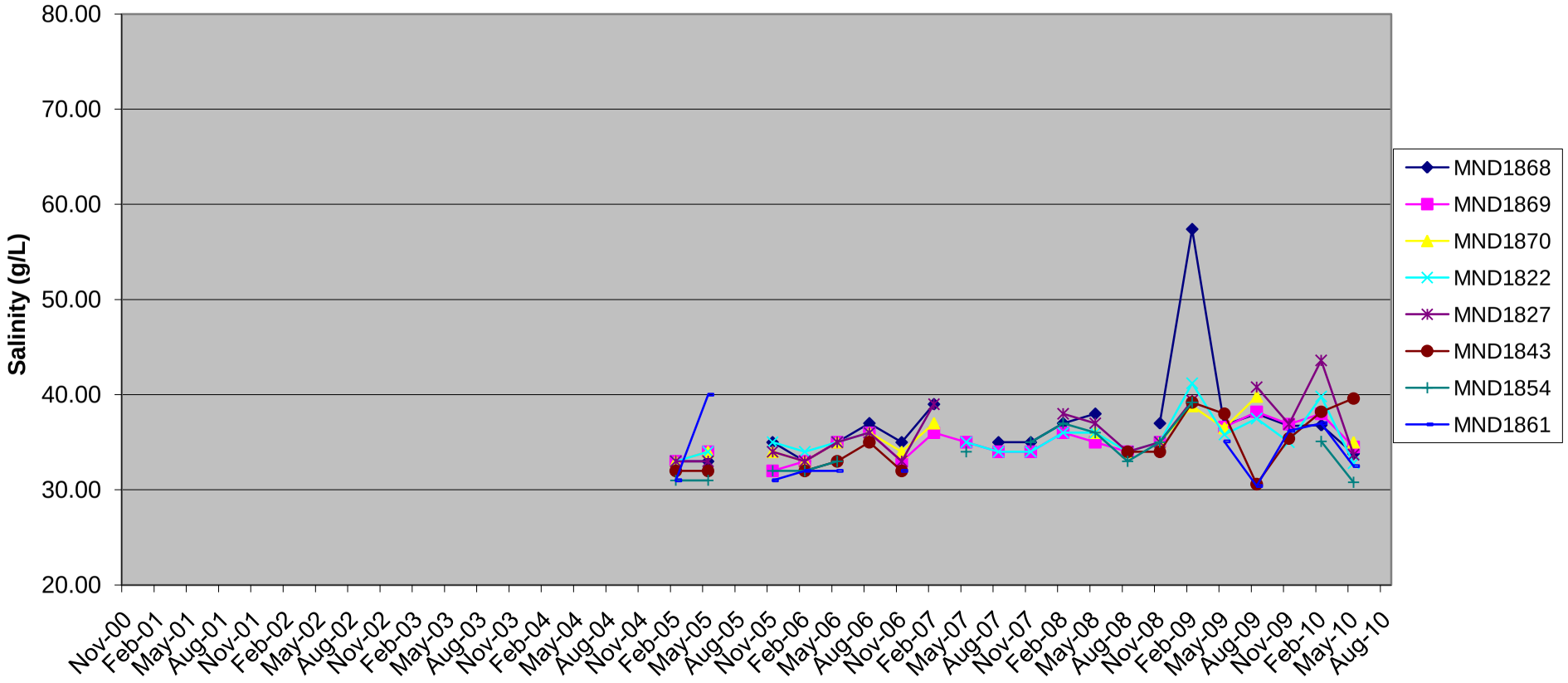


FIGURE 11. Mt MORGAN BOREFIELD: Salinity Profile of Bore DWT373

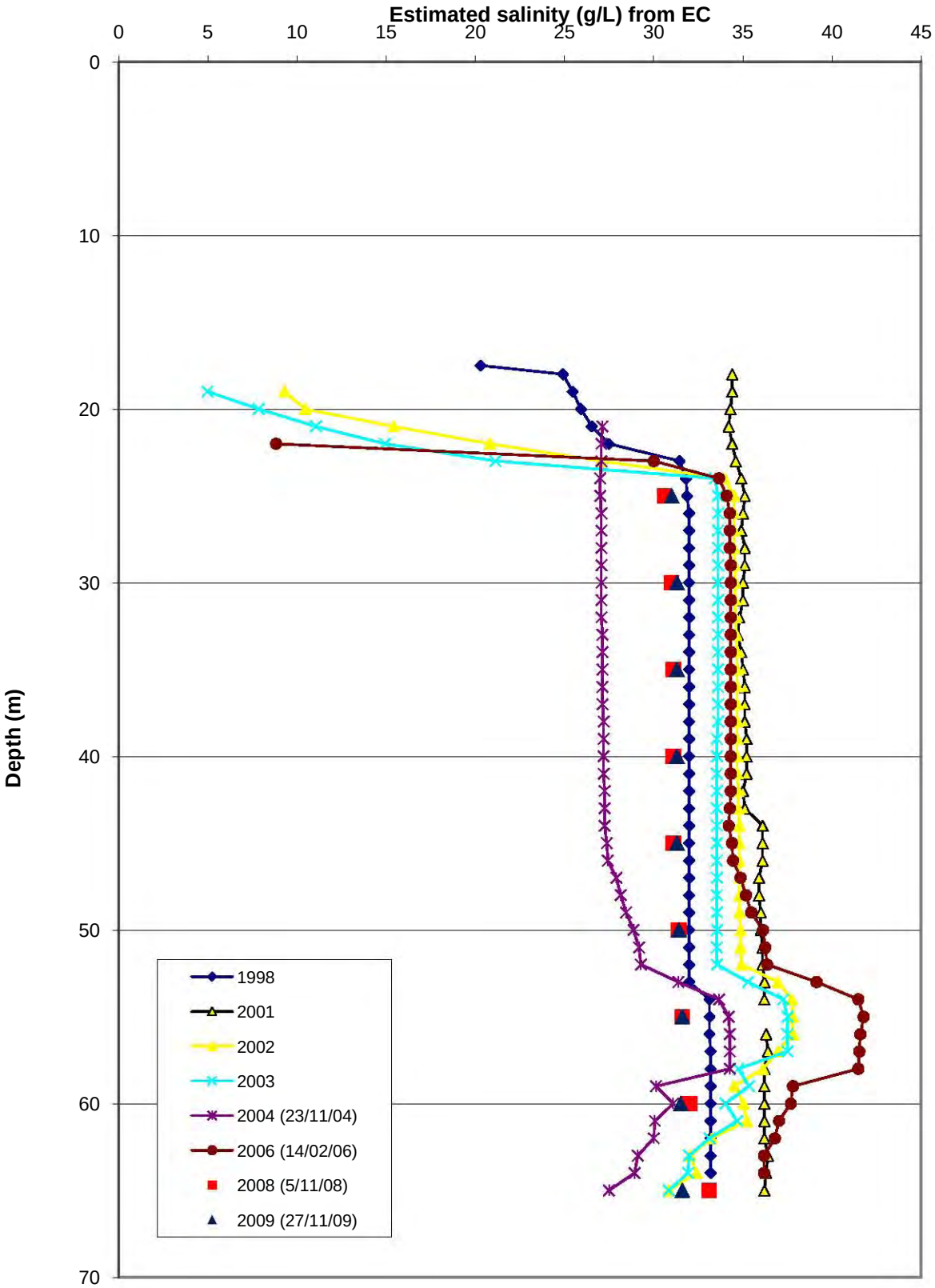


FIGURE 12. Mt MORGAN BOREFIELD: Salinity Profile of Bore DWT455

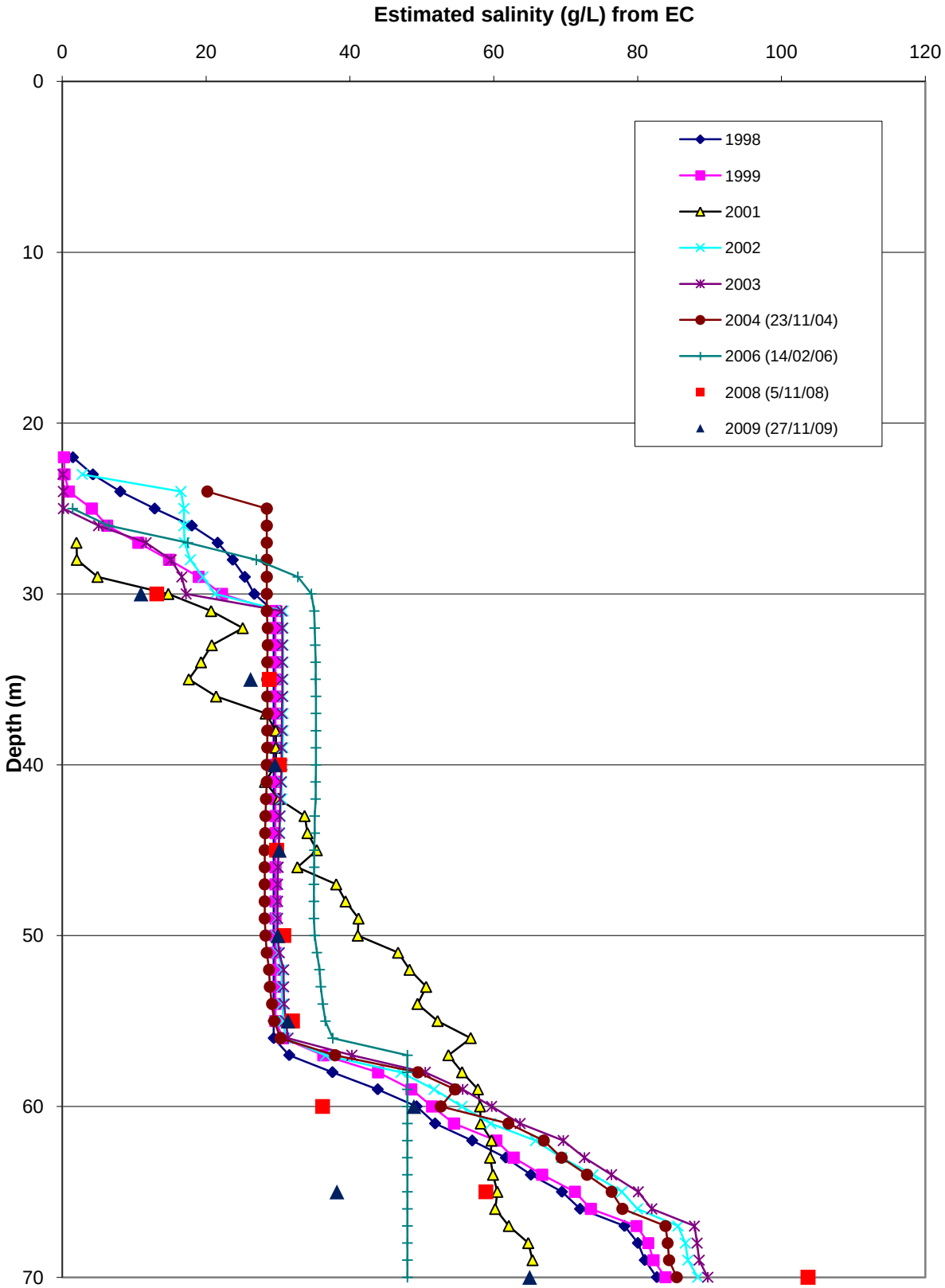


FIGURE 13 ATHENA, ARGO, APOLLO, SIRIUS & CAVE ROCKS MINES: DEWATERING VOLUMES

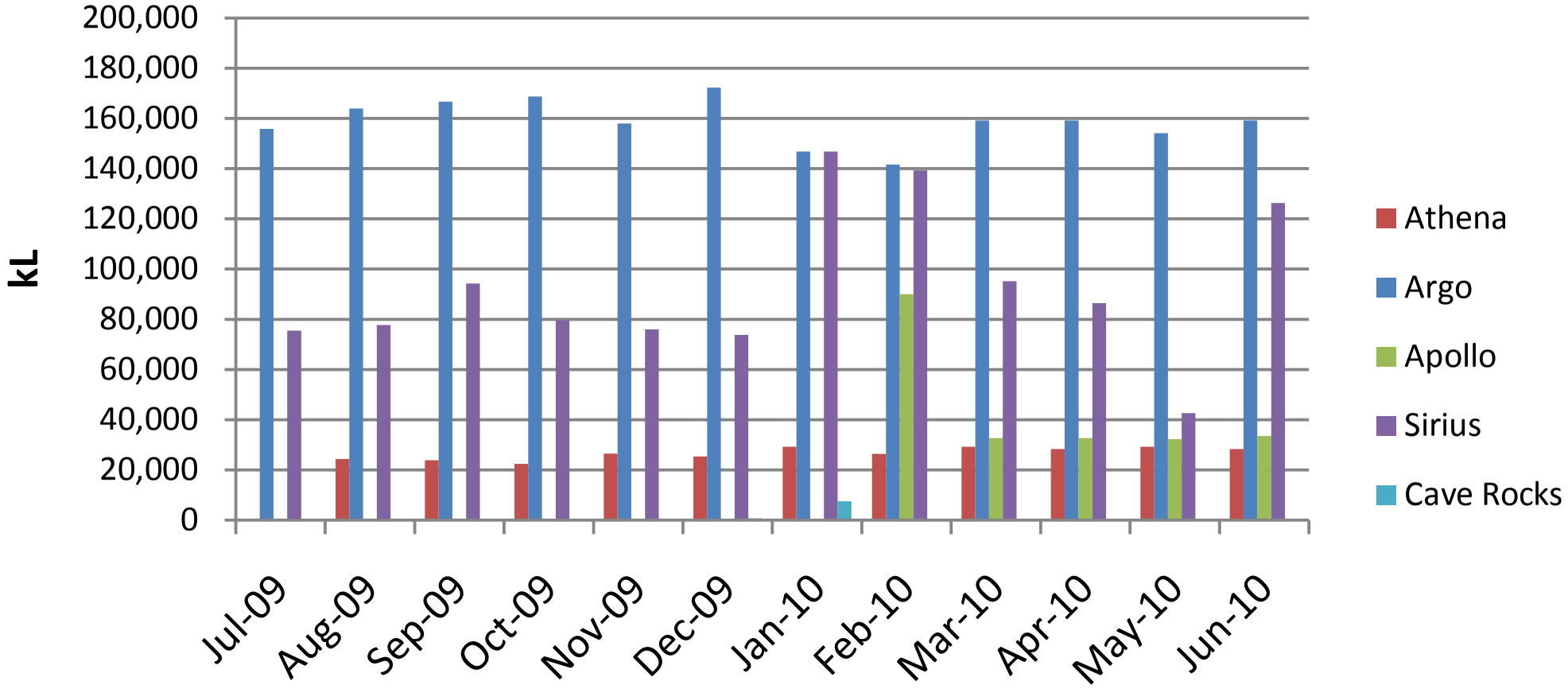
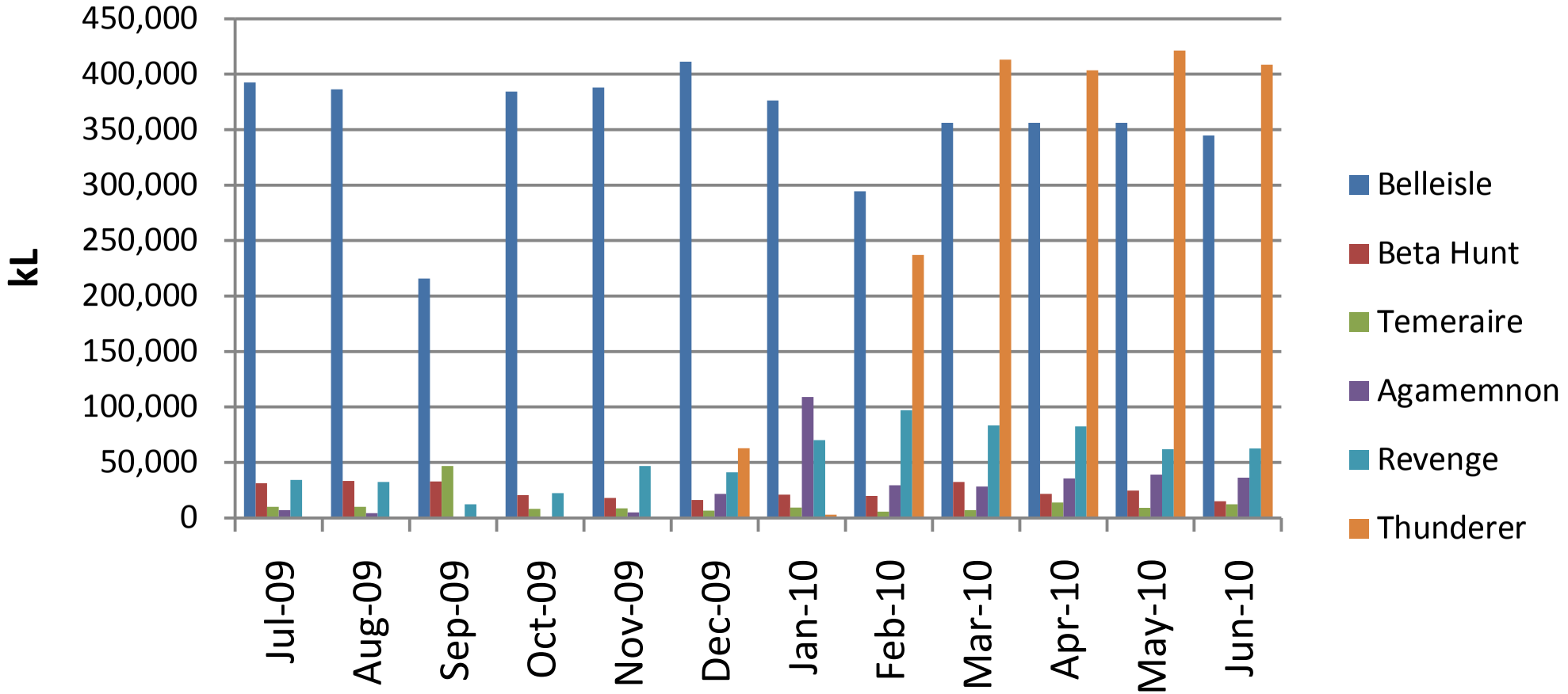


FIGURE 14 BELLEISLE, BETA HUNT, TEMAIRE, AGAMEMNON, REVENGE & THUNDERER MINES: DEWATERING VOLUMES




382000
384000
386000
6528000
6526000
6524000
Blue Lode
Argo Hydroslide
Apollo
Athena Boxcut
TD11150
TD11152
TD11149
TD11148
TD7438b TD7438c
TD7436c TD7438a
TD7731a TD7731b
TD7441a TD7441b
Argo
TD7729b TD7729c
TD7729a
GOLD FIELDS
ST IVES GOLD MINE
Dewatering Discharge Points
Open Pit Monitoring
Pit_Status
Active
Inactive
Inactive (Partially Backfilled)
250 125 0 250 500 750
Meters
N
W
E
S
Figure 15
Kambalda
Kambalda West
Widgiemooltha
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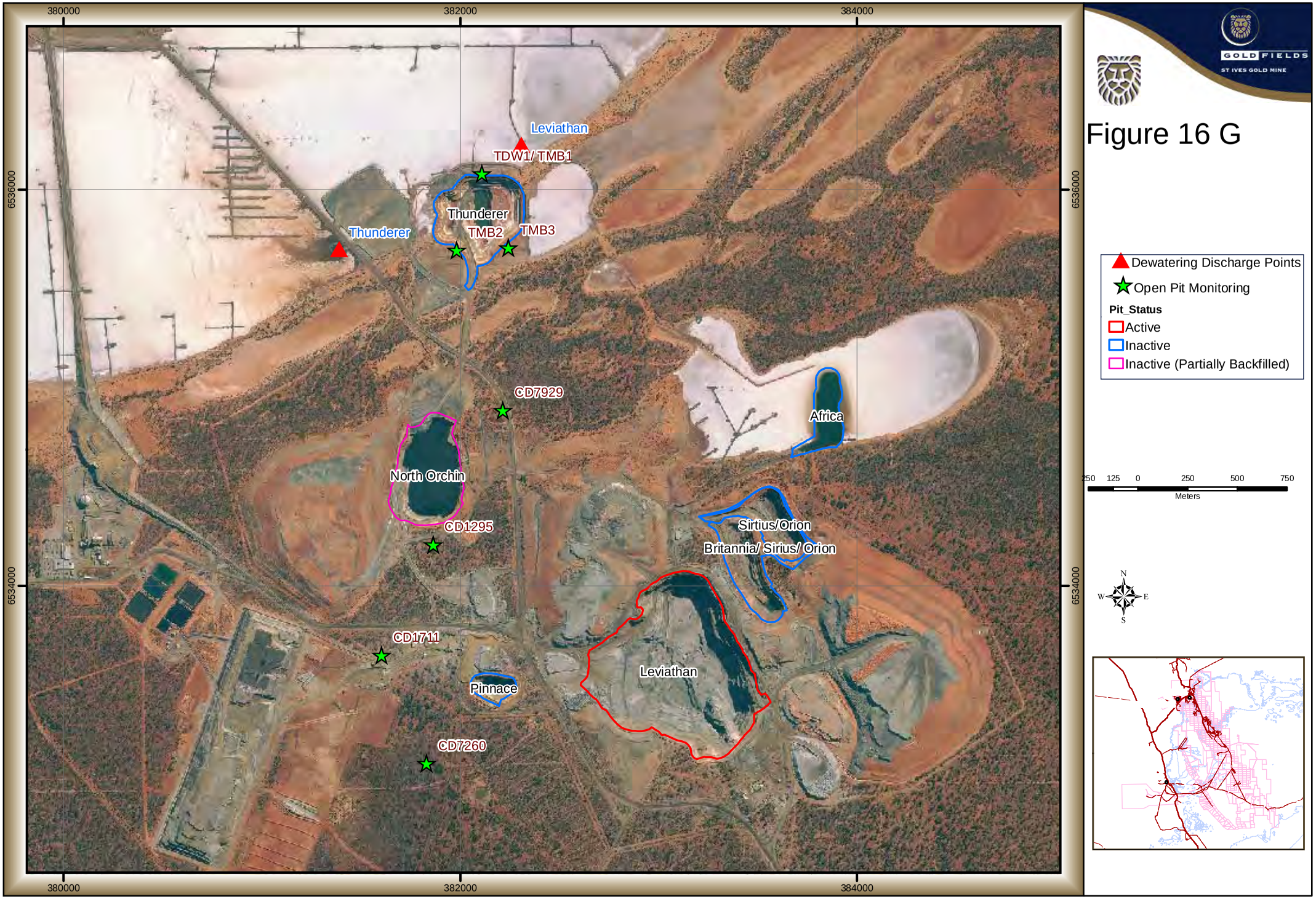
SCALE


380000
382000
384000
6536000
6534000
Leviathan
TDW1/ TMB1
Thunderer
TMB2
TMB3
Thunderer
CD7929
Africa
North Orchin
CD1295
Sirtius/Orion
Britannia/ Sirius/ Orion
CD1711
Leviathan
Pinnace
CD7260
GOLD FIELDS
ST IVES GOLD MINE
Figure 16 G
Dewatering Discharge Points
Open Pit Monitoring
Pit_Status
Active
Inactive
Inactive (Partially Backfilled)
250 125 0 250 500 750
Meters
N
W
E
S

GOLD FIELDS
ST IVES GOLD MINE

Figure 17G

Dewatering Discharge Points
Open Pit Monitoring
Pit_Status
Active
Inactive
Inactive (Partially Backfilled)

SCALE

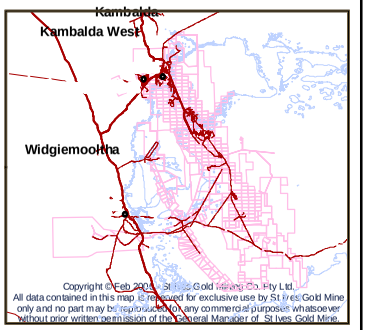
250 125 0 250 500 750
Meters

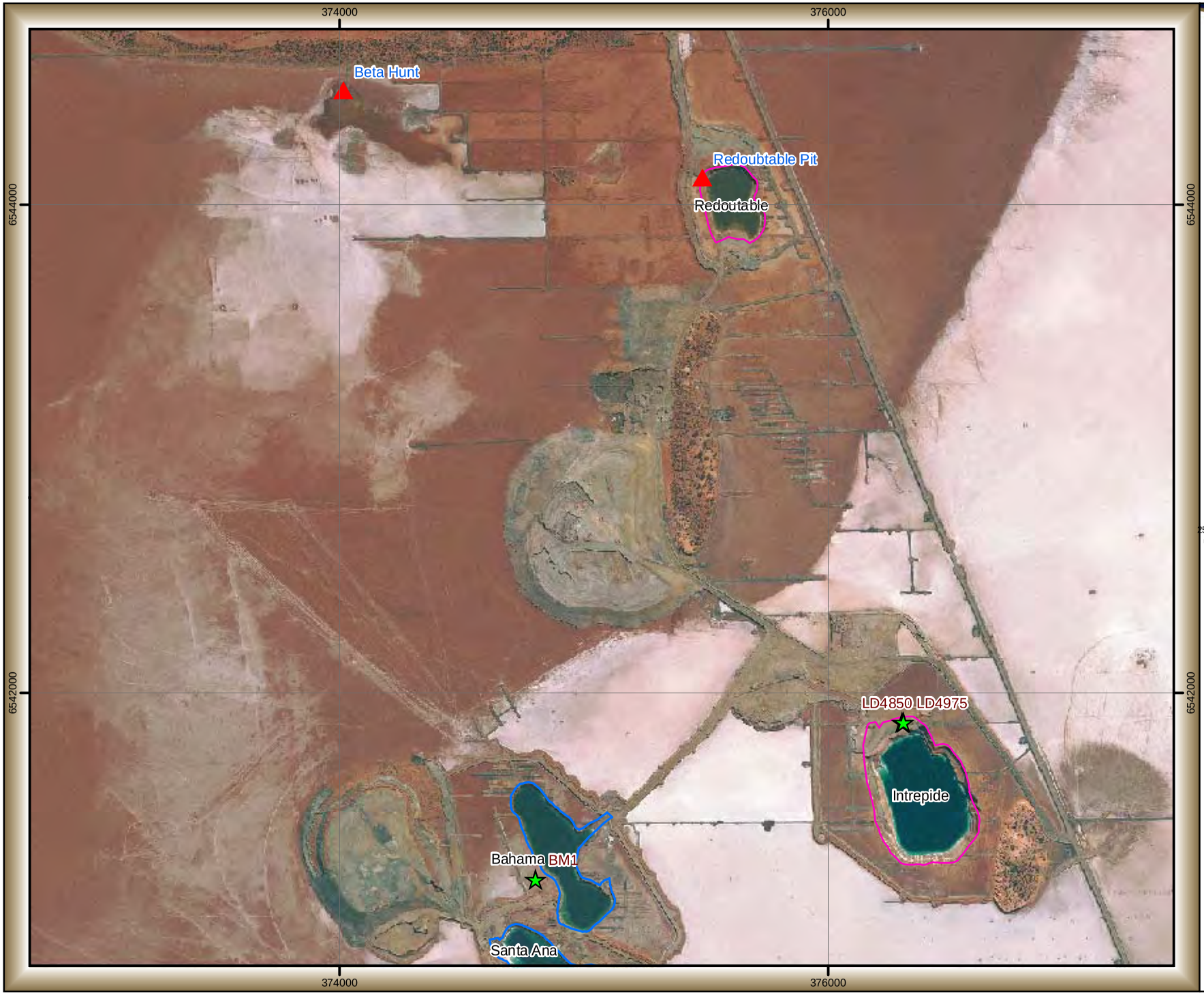
Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Date: Day Month 2006
Compiled: Engineer/Geo
Drawn: SIS Technician
Filename: .mxd

N
W E
S

SIG LEASE LOCALITY MAP





GOLD FIELDS
ST IVES GOLD MINE

Figure 18G

- Dewatering Discharge Points
- Open Pit Monitoring

Pit_Status
- Active
- Inactive
- Inactive (Partially Backfilled)

SCALE

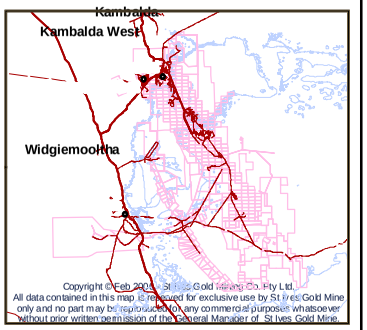
250 125 0 250 500 750
Meters

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Date: Day Month 2006
Compiled: Engineer/Geo
Drawn: SIS Technician
Filename: .mxd

N
W E
S

SIG LEASE LOCALITY MAP



GOLD FIELDS
ST IVES GOLD MINE

Figure 19 C

Dewatering Discharge Points
Open Pit Monitoring
Pit_Status
Active
Inactive
Inactive (Partially Backfilled)

SCALE

100 50 0 100 200 300
Meters

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Date: Day Month 2006
Compiled: Engineer/Geo
Drawn: SIS Technician
Filename: .mxd

N
W E
S

SIG LEASE LOCALITY MAP

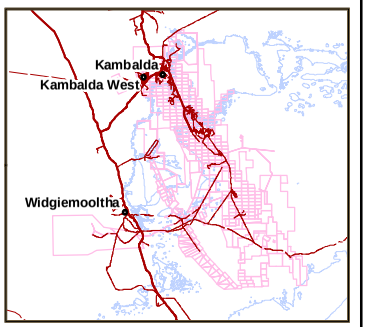


FIGURE 20 ARGO MINE: MONITORING BORE HYDROGRAPHS

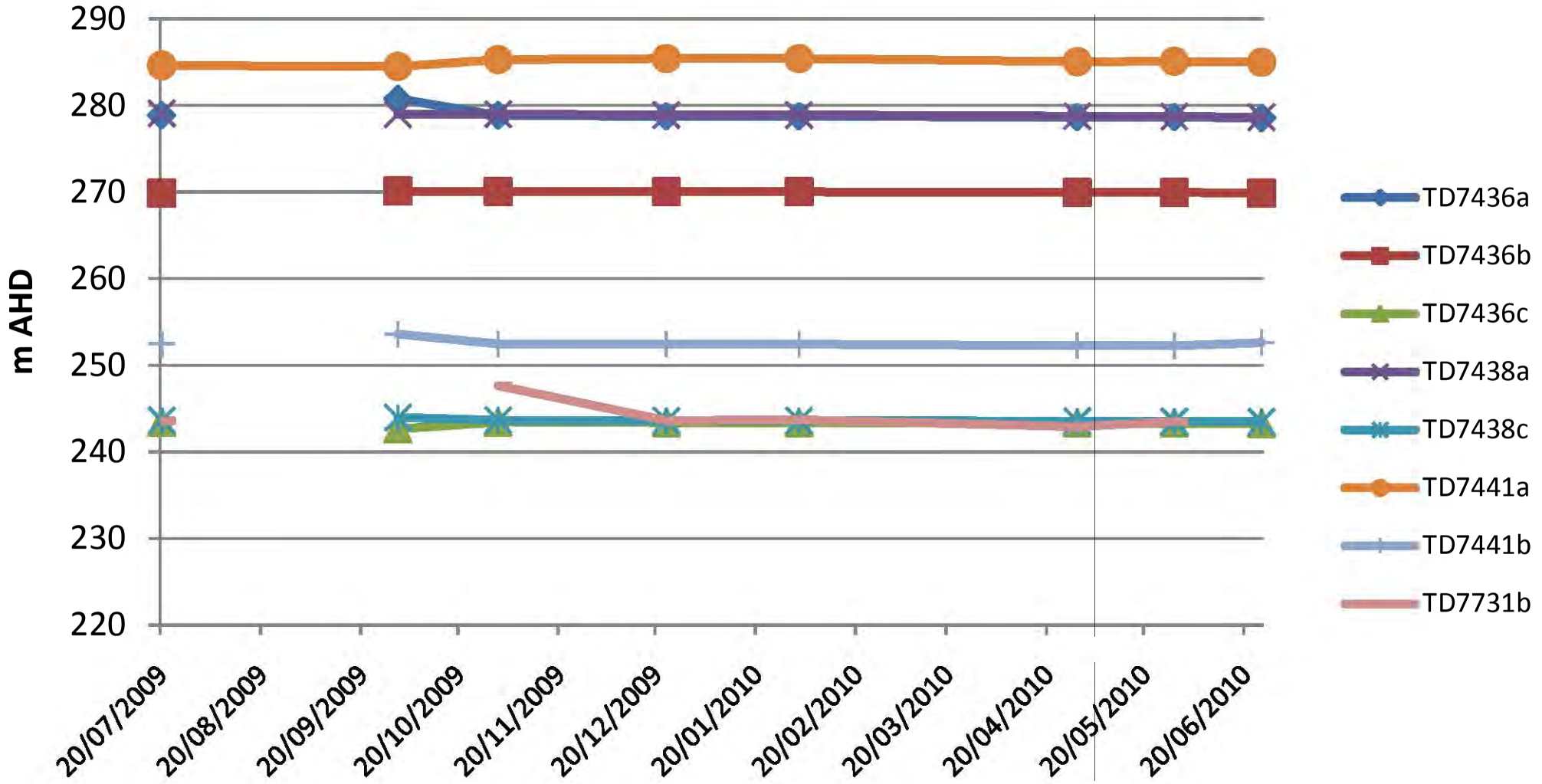


FIGURE 21 BAHAMA, INTREPIDE & MARS MINES: MONITORING BORE HYDROGRAPHS

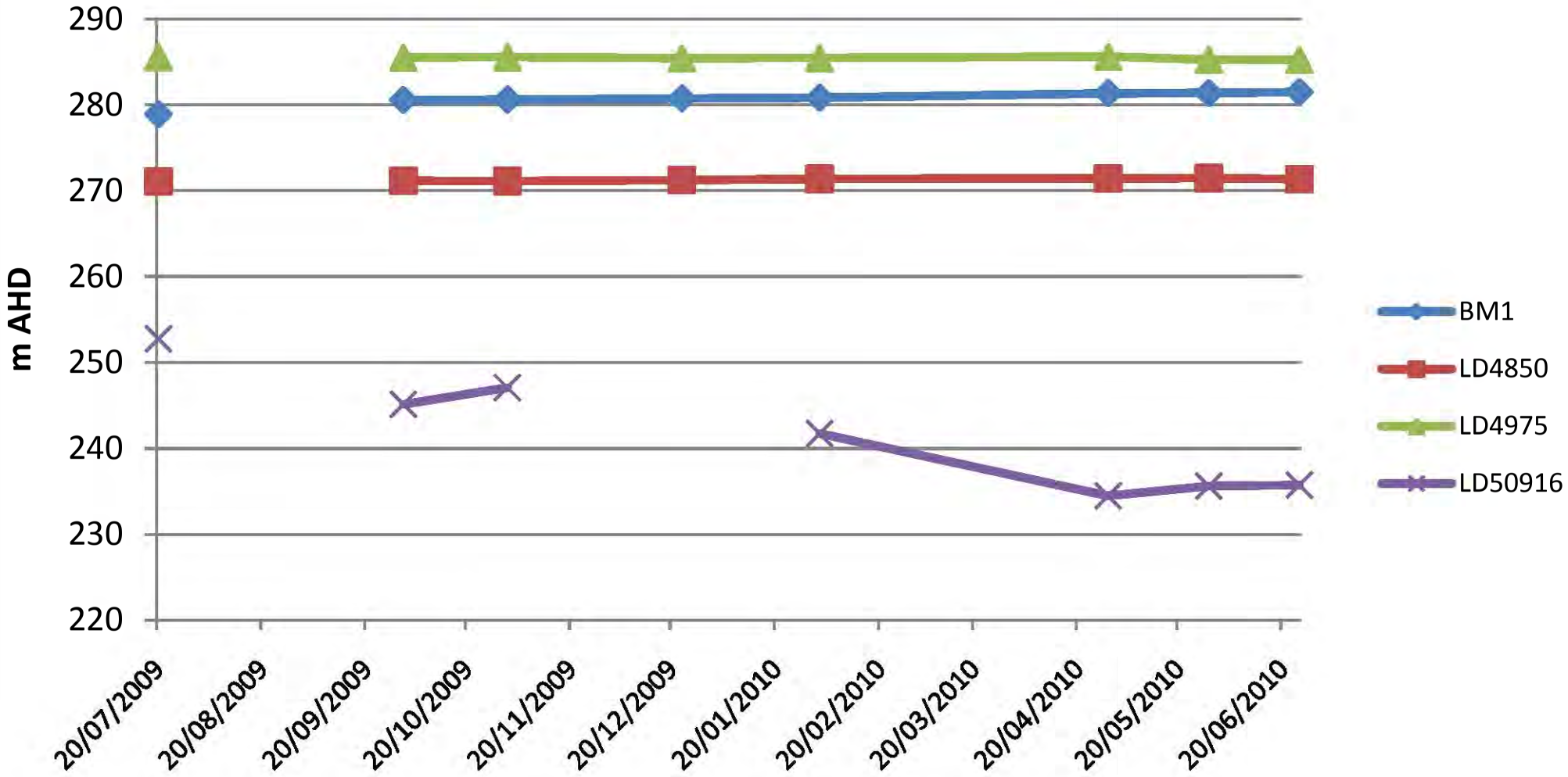


FIGURE 22 THUNDERER AREA: MONITORING BORE HYDROGRAPHS

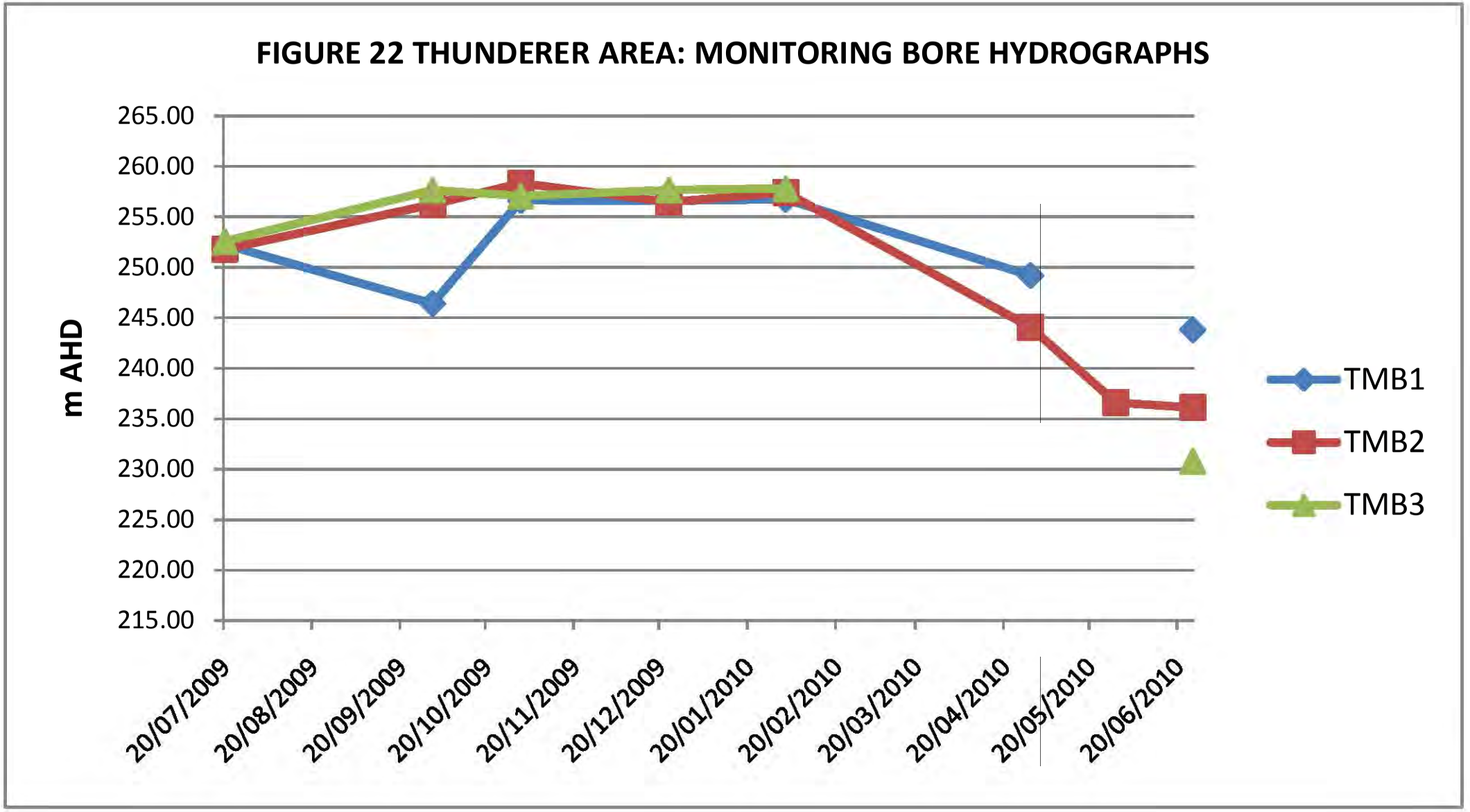


FIGURE 23 NORTH ORCHIN AREA & HEAP LEACH: MONITORING BORE HYDROGRAPHS

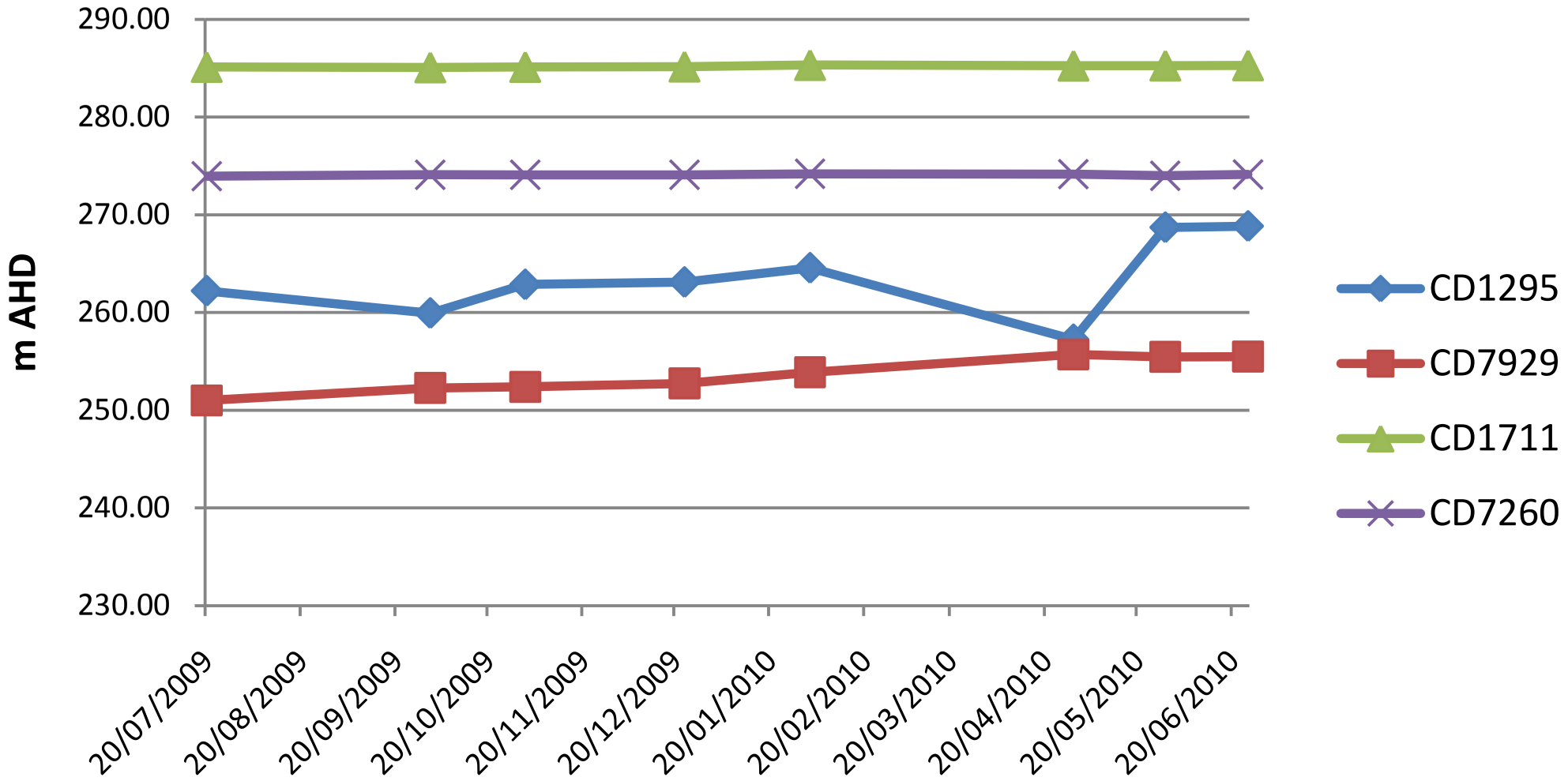


FIGURE 24 TAILINGS STORAGE TSF4 AREA: MONITORING BORE HYDROGRAPHS

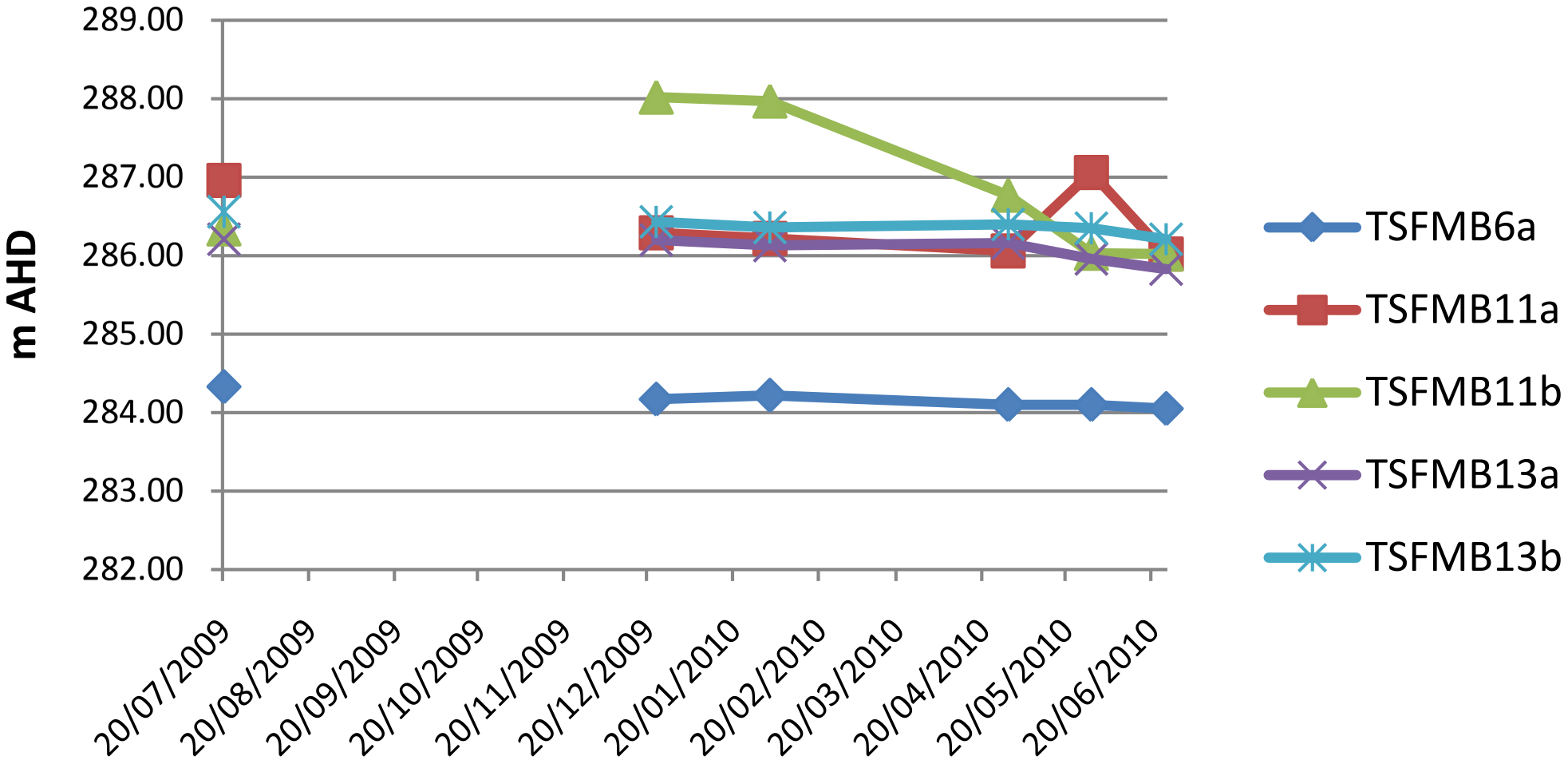


FIGURE 25 ATHENA AREA: MONITORING BORE HYDROGRAPHS

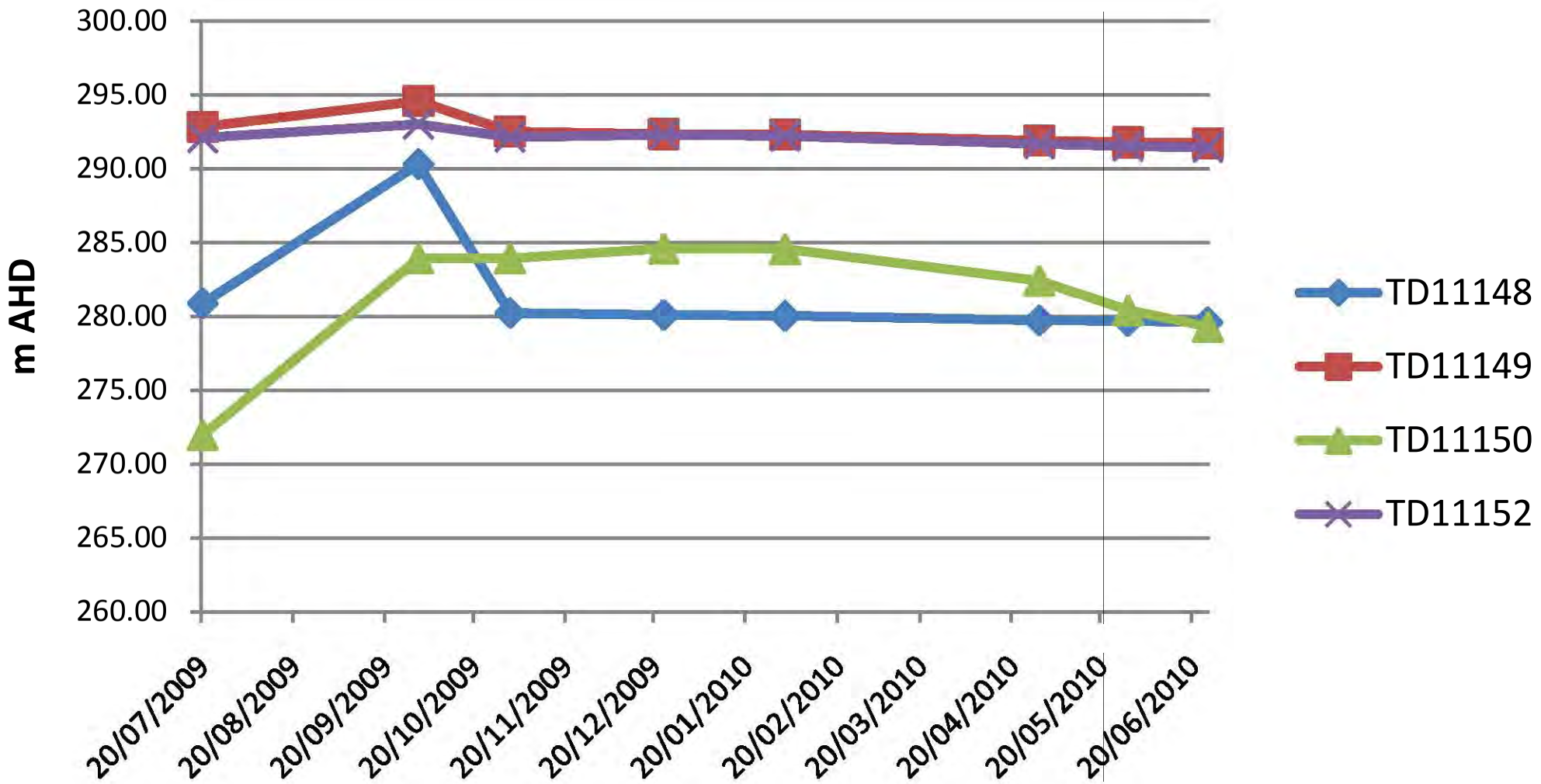


FIGURE 26 MINE DEWATERING DISCHARGE SALINITY

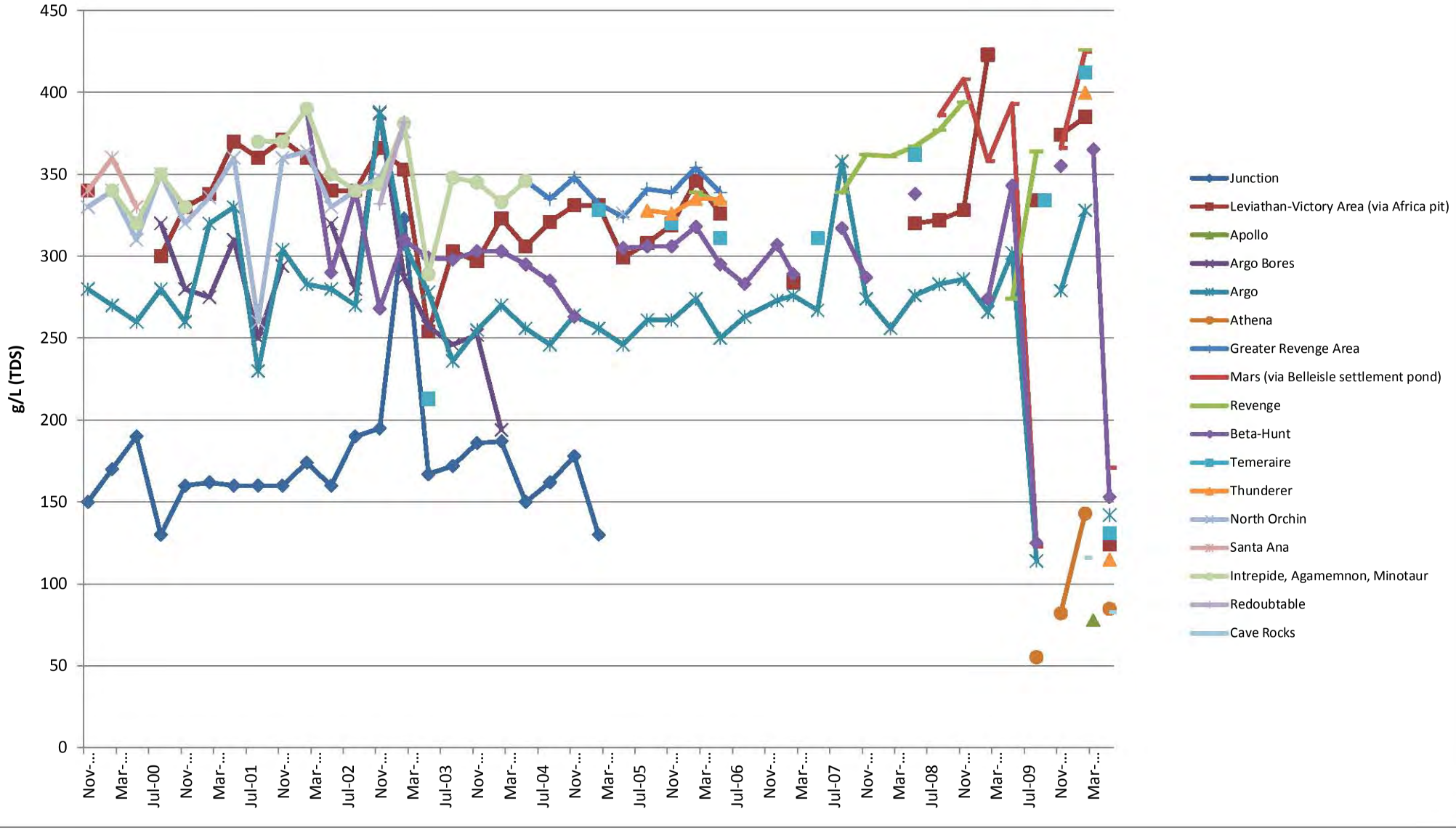
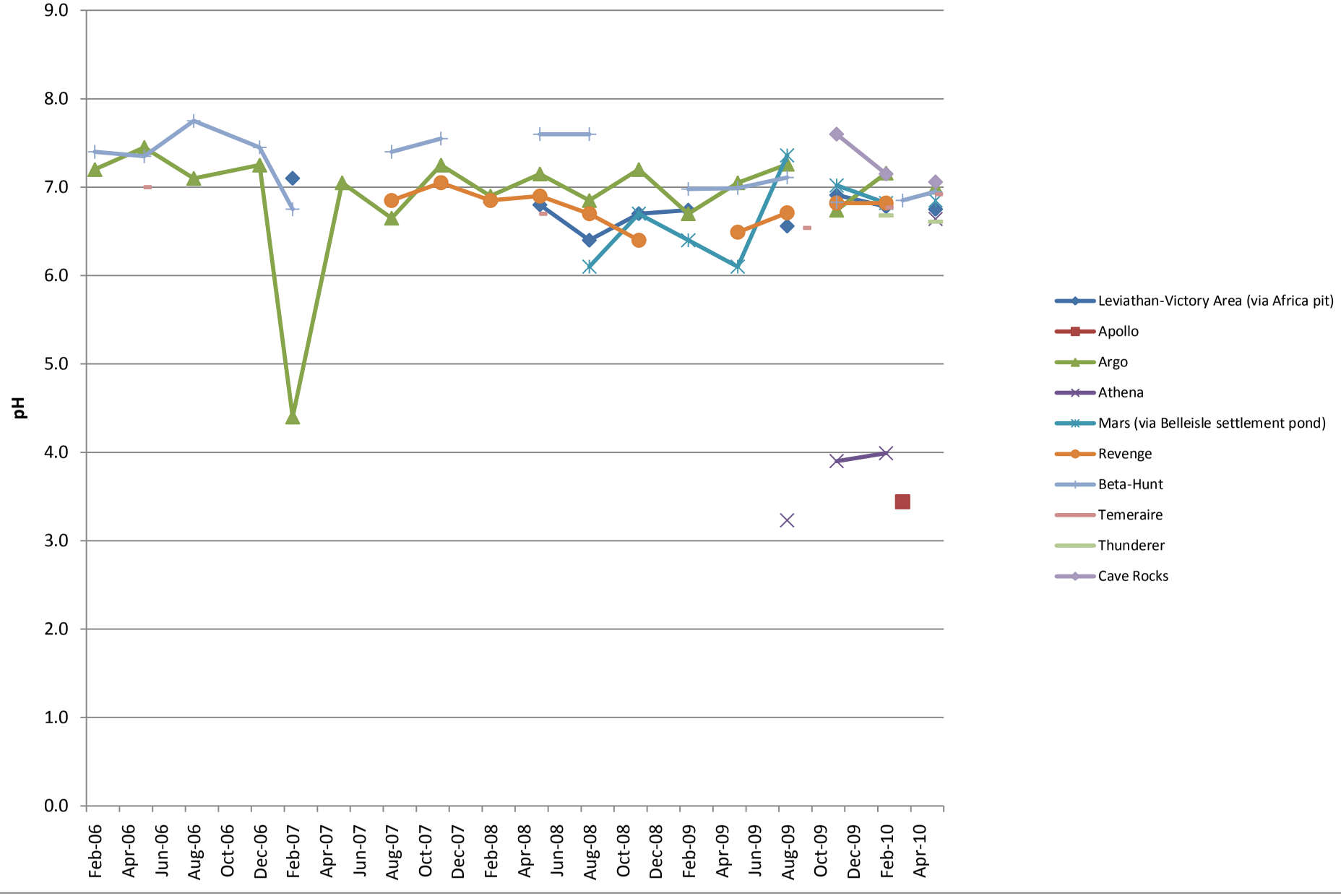


FIGURE 27 MINE DEWATERING DISCHARGE pH



APPENDIX

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		Transfer Tank (output from all operating bores)									
Parameter	Units	Jul-05	Jul-06								
EC	uS/cm	49000	49000								
TDS	mg/L	33000	36000								
pH		3.45	3.25								
CO3	mg/L										
Hardness	mg/L	5300	2800								
CO2	mg/L										
Na	mg/L	10000	5100								
K	mg/L										
Ca	mg/L	250	120								
Mg	mg/L	1100	600								
Mn	mg/L										
Fe	mg/L	7.8	2.8								
Cl	mg/L	18000	17000								
SO4	mg/L	2700	2800								
NO3	mg/L										
total P	mg/L										

		Bore DWT403 - Bore 2									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	43000	53000	58000	60000	63000	66000			73800	92000
TDS	mg/L	31000	37000	40000	41000	47000	46000			40800	87600
pH		3.25	3.4	3.5	3	3.55	3.5			3.6	5.5
CO3	mg/L	<1	<1	<1	<1	<1	<1			<1	<1
HCO3	mg/L	<1	<1	<1	<1	<1	<1			<1	4
CO2	mg/L	420	<1	680	510	750	710				
Na	mg/L	10000	10000	12000	14000	11000	18000			15800	20200
K	mg/L	200	230	390	360	270	420			365	409
Ca	mg/L	250	150	280	850	260	1300			707	1620
Mg	mg/L	1200	1300	1400	1700	1400	2300			1630	2250
Mn	mg/L	0.64	0.51	0.87	2	0.77	3			1.4	0.26
Fe	mg/L	10	10	20	78	35	110			66.2	12.1
Cl	mg/L	15000	21000	22000	23000	25000	24000			25400	35000
SO4	mg/L	4600	3300	2800	3300	3500	3200			3210	3200
NO3	mg/L	<1	<1	0.11	<4	<1	<1			<0.01	0.09
total P	mg/L	<0.01	<0.01	0.02	0.03	<0.01	<0.01			<0.1	<0.2

		Bore MND1175 - Bore 3									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	47000	48000	48000	48000	48000	49000	48600	50500	51700	50900
TDS	mg/L	34000	33000	33000	35000	35000	36000	38600	37500	36400	41600
pH		3.55	3.5	3.45	3.45	3.55	3.4	3.49	3.14	3.37	3.38
CO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
HCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CO2	mg/L	520	<1	590	520	590	510				
Na	mg/L	9700	9400	11000	8400	8400	9100	9710	10700	8940	11500
K	mg/L	190	220	350	220	210	210	360	262	266	257
Ca	mg/L	180	200	160	190	180	160	177	293	384	190
Mg	mg/L	1200	1200	1100	1200	1200	1100	1240	1240	1170	1220
Mn	mg/L	0.51	0.64	0.57	0.58	0.55	0.51	0.48	0.42	0.71	0.49
Fe	mg/L	11	15	11	15	12	12	8.91	5.3	10.5	12.3
Cl	mg/L	17000	18000	17000	15000	18000	19000	19000	19200	17600	17700
SO4	mg/L	2900	3100	2400	2400	3500	2400	2760	2270	2920	2950
NO3	mg/L	<1	<1	0.08	<4	<4	1.6	0.02	<0.01	0.02	0.02
total P	mg/L	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.05	<0.1	0.19	0.1

Laboratory analysis result assessed to be anomalous

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		MND1190 - Bore 4									
Parameter	Units	Dec-03	Nov-07	Nov-08				Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	48000	49000	48000				49200	48100	47300	47500
TDS	mg/L	33000	34000	35000				38600	35400	42000	33000
pH		3.65	3.5	3.4				3.46	3.29	3.39	3.43
CO3	mg/L	<1	<1	<1				<1	<1	<1	<1
HCO3	mg/L	<1	<1	<1				<1	<1	<1	<1
CO2	mg/L	490	490	480							
Na	mg/L	10000	8400	9500				10500	10200	8460	10800
K	mg/L	200	210	220				381	235	251	244
Ca	mg/L	200	200	180				238	242	234	224
Mg	mg/L	1200	1100	1100				1240	1170	1160	1180
Mn	mg/L	0.68	0.66	0.61				0.7	0.61	0.63	0.59
Fe	mg/L	1.2	9.5	8.6				9.41	9.93	9.17	8.67
Cl	mg/L	16000	18000	19000				18400	18100	16600	17200
SO4	mg/L	2500	3400	2700				2960	2260	2790	2880
NO3	mg/L	<1	<4	<1				0.03	0.02	0.02	<0.05
total P	mg/L	0.02	<0.01	<0.01				0.08	<0.1	0.3	<0.1

		Bore MND1220 - Bore 5									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	43000	48000	49000	49000	49000	48000	46700	50100	50700	49000
TDS	mg/L	31000	34000	34000	35000	35000	36000	37600	37000	37800	34000
pH		3.65	3.45	3.5	3.35	3.45	3.35	3.3	3.3	3.33	3.33
CO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
HCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CO2	mg/L	470	<1	460	610	610	510				
Na	mg/L	9300	9400	12000	8200	8700	10000	10600	10700	10600	11400
K	mg/L	180	230	360	230	230	250	429	245	274	266
Ca	mg/L	190	240	160	210	200	180	259	248	242	230
Mg	mg/L	1200	1200	1100	1100	1100	1100	1280	1200	1170	1180
Mn	mg/L	0.58	0.76	0.75	0.64	0.65	0.62	0.72	0.61	0.62	0.59
Fe	mg/L	9.5	12	4.3	10	10	9.2	13	10.5	9.69	9.35
Cl	mg/L	16000	19000	16000	16000	19000	19000	19000	18600	18000	18200
SO4	mg/L	2700	2400	2400	2900	3600	2900	3120	2700	2850	2960
NO3	mg/L	<1	<1	0.04	<0.5	<4	1.5	<0.01	<0.01	0.02	0.01
total P	mg/L	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.05	<0.1	0.19	0.16

		Bore MND1867 - Bore 6a									
Parameter	Units		Nov-04	Nov-05		Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm		49000	48000		48000	49000	50700	49300	50700	49500
TDS	mg/L		34000	33000		34000	36000	47400	37800	37700	38200
pH			3.45	3.4		3.45	3.5	3.54	3.3	3.36	3.32
CO3	mg/L		<1	<1		<1	<1	<1	<1	<1	<1
HCO3	mg/L		<1	<1		<1	<1	<1	<1	<1	<1
CO2	mg/L		<1	520		560	530				
Na	mg/L		9400	12000		8500	9900	10400	10300	10300	11100
K	mg/L		230	360		220	250	375	239	260	266
Ca	mg/L		240	160		210	180	430	268	252	263
Mg	mg/L		1100	1100		1100	1100	1280	1130	1140	1170
Mn	mg/L		0.72	0.68		0.7	0.64	0.88	0.65	0.66	0.63
Fe	mg/L		5	3.6		9.4	8.6	23.2	10	9.4	10.4
Cl	mg/L		18000	15000		18000	19000	20400	17700	17200	17900
SO4	mg/L		3000	2300		3300	2700	2930	2610	2790	2990
NO3	mg/L		<1	0.04		<4	<1	0.01	<0.01	0.01	<0.05
total P	mg/L		<0.01	0.02		<0.01	<0.01	<0.05	<0.1	0.21	0.18

Laboratory analysis result assessed to be anomalous

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		MND1176 - Bore 7									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	43000	49000	51000	52000	49000	53000	50200	53100	57500	54800
TDS	mg/L	32000	35000	35000	37000	39000	40000	43100	38400	46400	39400
pH		3.45	3.55	3.45	3.45	3.5	4.25	3.32	3.37	3.37	3.38
CO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
HCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CO2	mg/L	540	<1	500	700	590	460				
Na	mg/L	11000	9800	14000	8600	9200	11000	11200	11300	9880	12500
K	mg/L	200	260	440	230	240	260	437	257	291	274
Ca	mg/L	330	140	300	500	260	440	516	537	740	634
Mg	mg/L	1200	1200	1200	1100	1100	1100	1280	1190	1200	1200
Mn	mg/L	0.77	0.7	0.83	0.79	0.72	0.74	0.51	0.75	0.9	0.77
Fe	mg/L	9.5	4	10	12	11	10	1.81	11.7	12.3	11.6
Cl	mg/L	17000	19000	17000	19000	20000	24000	21200	20300	18600	20100
SO4	mg/L	2600	3000	2500	3200	3100	2700	3030	2280	2760	2930
NO3	mg/L	<1	2	0.06	<4	<4	2.4	<0.01	0.01	0.02	<0.05
total P	mg/L	<0.01	<0.01	0.02	0.04	<0.01	<0.01	<0.05	<0.1	0.39	0.13

		Bore MND1178 - Bore 8									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm	40000			50000	49000	49000	46500	50500	52800	
TDS	mg/L	29000			34000	35000	36000	38100	37100	36700	
pH		3.5			3.5	3.5	3.75	3.49	3.36	3.38	
CO3	mg/L	<1			<1	<1	<1	<1	<1	<1	
HCO3	mg/L	<1			<1	<1	<1	<1	<1	<1	
CO2	mg/L	320			390	460	510				
Na	mg/L	10000			8600	9100	10000	10900	11500	9260	
K	mg/L	210			260	250	290	436	271	298	
Ca	mg/L	120			150	140	110	151	190	226	
Mg	mg/L	1200			1100	1100	1100	1220	1160	1140	
Mn	mg/L	0.59			0.65	0.66	0.63	0.71	0.56	0.69	
Fe	mg/L	8.1			13	11	10	8.26	6.12	12	
Cl	mg/L	17000			18000	19000	19000	19300	19000	17400	
SO4	mg/L	2500			2800	3400	2900	3040	2740	2790	
NO3	mg/L	<1			<4	<4	1.1	0.02	0.01	<0.01	
total P	mg/L	<0.01			0.04	<0.01	<0.01	<0.05	<0.1	0.11	

		Bore MND1868 - Bore 9									
Parameter	Units			Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			49000	49000	48000	49000	46600	50100	52000	46600
TDS	mg/L			35000	35000	35000	37000	38000	36700	36800	33800
pH				3.5	3.3	3.55	3.55	3.69	3.44	3.38	3.45
CO3	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
HCO3	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
CO2	mg/L			590	700	580	530				
Na	mg/L			13000	8400	9000	11000	10600	10900	8790	11500
K	mg/L			420	230	230	260	402	241	268	259
Ca	mg/L			140	200	180	160	241	241	224	209
Mg	mg/L			1200	1100	1200	1200	1320	1240	1200	1220
Mn	mg/L			0.6	0.6	0.59	0.61	0.88	0.6	0.57	0.53
Fe	mg/L			11	13	13	14	26.9	15	14.1	13.7
Cl	mg/L			17000	18000	19000	21000	19900	19200	17400	18100
SO4	mg/L			2500	3000	3300	3300	3130	2410	2830	3010
NO3	mg/L			0.05	<4	<4	5.4	0.04	0.02	0.02	0.02
total P	mg/L			0.01	0.04	<0.01	<0.01	<0.05	<0.1	0.22	0.71

Laboratory analysis result assessed to be anomalous

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		MND1869 - Bore 10									
Parameter	Units			Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			49000	48000	47000	48000	45600	48200	47900	46900
TDS	mg/L			32000	33000	34000	35000	38200	36900	38000	34500
pH				3.45	3.3	3.55	3.8	6.22	6.66	7.06	6.78
CO3	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
HCO3	mg/L			<1	<1	<1	<1	33	108	159	91
CO2	mg/L			390	520	550	340				
Na	mg/L			12000	8300	8600	9900	9750	9210	10600	10700
K	mg/L			370	220	220	260	364	205	238	245
Ca	mg/L			120	220	200	160	433	455	486	451
Mg	mg/L			1200	1200	1200	1200	1410	1210	1340	1380
Mn	mg/L			0.54	0.75	0.62	0.47	0.4	0.37	0.28	0.36
Fe	mg/L			4.4	16	11	2.5	6.82	7.36	5.44	2.27
Cl	mg/L			18000	17000	18000	20000	19100	18800	18200	17400
SO4	mg/L			2200	2800	3200	4200	2630	2160	2330	2600
NO3	mg/L			0.08	<4	<4	<1	0.01	0.01	0.02	0.01
total P	mg/L			0.01	0.03	<0.01	<0.01	<0.05	<0.1	0.13	0.69

		Bore MND1870 - Bore 11									
Parameter	Units	Dec-03	Nov-04	Nov-05	Nov-06	Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			48000	48000		47000				
TDS	mg/L			34000	34000		35000				
pH				3.45	3.5		3.4				
CO3	mg/L			<1	<1		<1				
HCO3	mg/L			<1	<1		<1				
CO2	mg/L			590	520		450				
Na	mg/L			13000	8100		20000				
K	mg/L			410	220		490				
Ca	mg/L			130	210		310				
Mg	mg/L			1100	1100		2200				
Mn	mg/L			0.59	0.65		1.1				
Fe	mg/L			8.4	11		17				
Cl	mg/L			16000	16000		21000				
SO4	mg/L			2300	2600		3000				
NO3	mg/L			0.09	<4		<1				
total P	mg/L			0.02	0.02		<0.01				

		Bore MND1822 - Bore 12									
Parameter	Units			Nov-05		Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			49000		48000	48000	45300	47400	48600	46800
TDS	mg/L			35000		34000	35000	37500	35000	39800	32800
pH				3.5		3.5	3.55	3.5	3.41	3.46	3.46
CO3	mg/L			<1		<1	<1	<1	<1	<1	<1
HCO3	mg/L			<1		<1	<1	<1	<1	<1	<1
CO2	mg/L			430		550	410				
Na	mg/L			13000		8600	10000	9830	10100	8270	10700
K	mg/L			410		210	240	368	215	243	244
Ca	mg/L			140		200	150	218	224	218	206
Mg	mg/L			1200		1200	1100	1250	1140	1190	1160
Mn	mg/L			0.63		0.66	0.61	0.71	0.62	0.61	0.6
Fe	mg/L			9.3		11	11	15	11.6	14	11.8
Cl	mg/L			17000		18000	19000	18200	18000	15600	17100
SO4	mg/L			2500		3400	3300	2970	2190	2820	3060
NO3	mg/L			0.03		<4	3.4	0.04	0.02	0.02	<0.05
total P	mg/L			0.39		<0.01	<0.01	<0.05	<0.1	<0.1	<0.1

Laboratory analysis result assessed to be anomalous

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		MND1827 - Bore 13									
Parameter	Units			Nov-05	Nov-06		Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			49000	48000		49000	46500	48600	51000	49500
TDS	mg/L			34000	33000		35000	40800	36900	43600	33700
pH				3.5	3.5		3.45	3.28	3.25	3.38	3.39
CO3	mg/L			<1	<1		<1	<1	<1	<1	<1
HCO3	mg/L			<1	<1		<1	<1	<1	<1	<1
CO2	mg/L			480	520		470				
Na	mg/L			14000	8300		10000	10000	10100	9040	11200
K	mg/L			440	220		260	412	229	274	273
Ca	mg/L			160	220		150	245	243	254	225
Mg	mg/L			1300	1100		1100	1250	1080	1190	1150
Mn	mg/L			0.69	0.67		0.59	0.71	0.62	0.65	0.61
Fe	mg/L			9.5	10		8.5	13.5	12	11.4	11.1
Cl	mg/L			18000	17000		19000	19100	19100	17700	18100
SO4	mg/L			2700	3100		2900	3030	2620	2850	3110
NO3	mg/L			0.11	<4		<1	<0.01	<0.01	0.02	<0.01
total P	mg/L			<0.01	0.03		<0.01	<0.05	<0.1	<0.1	<0.1

		Bore MND1843 - Bore 14									
Parameter	Units				Nov-06		Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm				46000		46000	45400	47600	49000	46500
TDS	mg/L				32000		34000	30600	35400	38200	39600
pH					3.5		3.45	3.26	3.26	3.43	3.37
CO3	mg/L				<1		<1	<1	<1	<1	<1
HCO3	mg/L				<1		<1	<1	<1	<1	<1
CO2	mg/L				480		420				
Na	mg/L				7700		9800	9810	10100	8240	10500
K	mg/L				210		240	376	239	250	258
Ca	mg/L				230		150	251	249	250	224
Mg	mg/L				1000		1000	1170	1110	1080	1090
Mn	mg/L				0.72		0.62	0.85	0.66	0.68	0.66
Fe	mg/L				7.6		6.1	18.2	8.2	7.91	6.72
Cl	mg/L				16000		19000	18800	17300	15900	17000
SO4	mg/L				2800		2700	2880	2630	2720	2920
NO3	mg/L				<4		1.4	<0.01	0.01	0.01	<0.05
total P	mg/L				0.02		<0.01	<0.05	0.11	0.18	<0.1

		Bore MND1854 - Bore 15									
Parameter	Units			Nov-05		Nov-07	Nov-08	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			46000		48000	47000			47700	46500
TDS	mg/L			32000		35000	35000			35100	30800
pH				3.5		3.5	3.45			3.41	3.4
CO3	mg/L			<1		<1	<1			<1	<1
HCO3	mg/L			<1		<1	<1			<1	<1
CO2	mg/L			530		560	440				
Na	mg/L			13000		8700	10000			10000	11200
K	mg/L			450		220	250			257	276
Ca	mg/L			150		220	150			266	243
Mg	mg/L			1100		1100	1000			1050	1100
Mn	mg/L			0.74		0.79	0.68			0.85	0.74
Fe	mg/L			3		10	9.4			13.8	10.5
Cl	mg/L			18000		18000	19000			16800	17100
SO4	mg/L			2300		3100	1500			2690	3030
NO3	mg/L			0.03		<4	6.5			0.01	<0.05
total P	mg/L			0.01		<0.01	<0.01			<0.1	<0.1

Laboratory analysis result assessed to be anomalous

Mt MORGAN BOREFIELD: PRODUCTION BORE WATER CHEMISTRY

		MND1861 - Bore 16							
Parameter	Units			Nov-05	Nov-06	Aug-09	Nov-09	Feb-10	May-10
EC	uS/cm			46000	46000	44600	45800	48400	46000
TDS	mg/L			31000	32000	30400	36200	37000	32500
pH				3.5	3.85	3.53	3.41	3.4	3.32
CO3	mg/L			<1	<1	<1	<1	<1	<1
HCO3	mg/L			<1	<1	<1	<1	<1	<1
CO2	mg/L			530	570				
Na	mg/L			13000	7700	9850	10800	9470	11000
K	mg/L			430	210	391	273	306	274
Ca	mg/L			150	220	263	250	261	243
Mg	mg/L			1000	980	1150	1110	1120	1080
Mn	mg/L			0.74	0.9	1.02	0.75	0.86	0.76
Fe	mg/L			7.4	14	3.85	9.85	10.8	9.59
Cl	mg/L			18000	16000	18000	18100	17800	17000
SO4	mg/L			2200	2800	2850	2650	2750	3030
NO3	mg/L			0.11	<4	0.02	0.02	<0.01	<0.05
total P	mg/L			<0.01	0.03	<0.05	<0.1	<0.1	0.11

Government of Western Australia
Department of Water

Instrument No. GWL62505(5)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	St Ives Gold Mining Company Pty Ltd		
Description of Water Resource	Goldfields Combined - Fractured Rock West - Fractured Rock	**Annual Water Entitlement**	24015000 kL
Location of Water Source	M15/1516, M15/1716 - St Ives, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1562, M15/1578, M15/1580, M15/1595, M15/1592, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1628, M15/1629, M15/1630, M15/1631, M15/1634, M15/1658, M15/1659, M15/1689, M15/1690, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701, M15/1710, M15/1713, M15/1715, M15/1517 M15/1540, M15/1556, M15/1565, M15/1564 M15/476, M15/1561, M15/1596, M15/1639, M15/1638		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Mineral ore processing	M15/1516, M15/1716 - St Ives, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1562, M15/1578, M15/1580, M15/1595, M15/1592, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1628, M15/1629, M15/1630, M15/1631, M15/1634, M15/1658, M15/1659, M15/1689, M15/1690, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701, M15/1710, M15/1713, M15/1715, M15/1517
	Dewatering for mining purposes	M15/1540, M15/1556, M15/1565, M15/1564
	Dewatering for mining purposes	M15/476, M15/1561, M15/1596, M15/1639, M15/1638
Duration of Licence	From 14 July 2009 to 30 June 2010	

This Licence is subject to the following terms, conditions and restrictions:

1 The annual water year for water taken under this licence is defined as 12:00 pm at 30 June to 12:00 pm at 30 June twelve months later.

2 In this licence the quantity of water that may be taken for dewatering and mining purposes is limited to 24,015,000kL per water year.

3 That should the drawing of water during dewatering operations adversely affect the aquifer and/or other users the Department of Water shall direct the licensee to take necessary action to make good the supply to the affected users.

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

This Licence is subject to the following terms, conditions and restrictions:

4 That should the licensee's draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn.

5 Should the monitoring at any time indicate a need for prompt action to prevent or reduce the effect of the licensee's draw on the underground resource, the licensee shall immediately report this to the Department of Water and advise the corrective measures proposed.

6 The licensee shall comply with the commitments or requirements of the operating strategy, as prepared by the licensee and approved by the Department of Water on 24th March 2005 including any modifications to the strategy as approved during the term of the licence.

7 Following consultation with the licensee, the Department may modify or direct the licensee to modify the strategy at any time.

End of terms, conditions and restrictions

File No: KG343

Water and Rivers Commission
Government of Western Australia

Instrument No. GWL160912(1)

LICENCE TO TAKE WATER

Granted by the Commission under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	St Ives Gold Mining Company Pty Ltd		
Description of Water Resource	Goldfields Palaeochannel - Palaeochannel	**Annual Water Entitlement**	300000 kL
Location of Water Source	M15/575, M15/300		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Dewatering for mining purposes	M15/575, M15/300
	Dust suppression Mineral ore processing Washdown Purposes	M15/575, M15/300, L15/61, L15/214

Duration of Licence	From 28 July 2006 to 10 May 2014

This Licence is subject to the following terms, conditions and restrictions:

1 That should the licensee's draw adversely affect the aquifer or other users in the area, the Water and Rivers Commission may reduce the amount that may be drawn.

2 That should the drawing of water during dewatering operations adversely affect the aquifer and/or other users the Water and Rivers Commission shall direct the licensee to take necessary action to make good the supply to the affected users.

3 The licensee shall comply with the operating strategy as prepared by the licensee and approved by the Water and Rivers Commission on 8 May 2003, including any modifications to the strategy as approved during the term of the licence.

4 Should the monitoring at any time indicate a need for prompt action to prevent or reduce the effect of the licensee's draw on the underground resource, the licensee shall immediately report this to the Water and Rivers Commission and advise the corrective measures proposed.

5 The Water and Rivers Commission, at its discretion, may direct changes to be made to the monitoring programme at any time.

End of terms, conditions and restrictions

Appendix G

St Ives 2010 Operating Strategy

Report

Water Operating Strategy

St Ives Gold Mine

26 AUGUST 2010

Prepared for

St Ives Gold Mining Company Pty Ltd

42907263

URS

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Date: **26 August 2010**
Reference: 42907263/W0353.605/0
Status: Final

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Executive Summary

St Ives Gold Mining Company (SIGM) owns and operates a series of mines on and around Lake Lefroy, in the Goldfields Region of Western Australia. The mining area consists of a series of active pits, comprising both open cut and underground operations, which require the following groundwater scheme to operate efficiently and safely:

- Mine dewatering from open pits and underground mines using bores and sumps.
- Mine water discharge from the mining sites to Lake Lefroy.
- Process water derived from the Mt Morgan Borefield near Widgiemooltha.

This Operating Strategy addresses the issues involved with the abstraction and use of groundwater according to GWL62505(5), and covers the Mt Morgan Borefield and mine dewatering operations (including Cave Rocks). Specifics of the groundwater scheme operated under the licence are provided in Section 2 of this report.

The Operating Strategy has been written to comply with Operational Policy 5.08 '*Use of Operating Strategies in Water Licensing Process*' (DoW, 2010).

SIGM is planning to expand its existing mining activities, including gold mining developments on Lake Lefroy and land-based mining developments, which may influence Lake Lefroy. A total of nine new lake-based mining sites have been identified for development, five of which are expansions of already established lake operations. It is estimated that this expansion will increase the volume of dewatering abstraction to a maximum of 30 GL/annum.

An application was submitted to DoW in April 2010, to increase the allocation of GWL62505 to 30 GL/annum. This application is currently being assessed and this Operating Strategy presents an overview of likely bore network additions and locations associated with the future mining developments.

Upon approval of the allocation increase, this Operating Strategy will be updated to include specific details of all new bores and to reflect changes in allocation and any additional groundwater monitoring requirements.

1

Introduction

St Ives Gold Mining Company (SIGM) owns and operates a series of mines on and around Lake Lefroy, southeast of Kambalda, in the Goldfields region of Western Australia (Figure 1). The St Ives Operations are located in the Lefroy-Dundas Sub Area of the Goldfields Groundwater Management Area. Mining occurs within or near the margins of Lake Lefroy, a large playa salt lake located within the Lefroy Palaeodrainage system.

The mining area consists of a series of active pits, comprising both open cut and underground operations. Mining intersects variable thicknesses of Tertiary to Recent alluvial, lacustrine and aeolian deposits, which overlie mineralised Archaean bedrock.

The groundwater scheme at the St Ives Operations comprises the following:

- Mine dewatering from open pits and underground mines using bores and sumps.
- Mine water discharge from the mining sites to Lake Lefroy.
- Process water derived from the Mt Morgan Borefield near Widgiemooltha.

Groundwater abstraction is regulated by the Department of Water (DoW) Groundwater Well Licence (GWL) 62505(5) (Appendix A), which covers abstraction from all mine pits and the Mt Morgan Borefield. This licence allows the taking of water for dewatering and processing purposes, with an annual groundwater allocation of 24,015,000 kL.

A Groundwater Well Licence [GWL 160912(1)] allows for abstraction of 300,000 kL/annum for dewatering at the Cave Rocks operation (Figure 1). DoW is currently amalgamating this licence with GWL6250(5) and the resulting licence [GWL62505(6)] will incorporate the groundwater allocation for the Cave Rocks operations, with a new total allocation of 24,315,000 kL/annum.

The DoW is also in the process of separating the Mt Morgan Borefield and dewatering abstractions into separate licences. GWL62505(6), as described above, will cover dewatering operations including the Cave Rocks site, for a total abstraction of 24,315,000 kL/annum from the Lefroy-Dundas, Combined Fractured Rock West aquifer. GWL171060 will cover abstraction in the Mt Morgan Borefield, for a total of 4,015,000kL/annum from the Lefroy-Dundas, Palaeochannel aquifer. These licences will be issued upon receipt of this Operating Strategy.

This Operating Strategy addresses the issues involved with the abstraction and use of groundwater according to GWL62505(5), and covers the Mt Morgan Borefield and mine dewatering operations (including Cave Rocks). Specifics of the groundwater scheme operated under the licence are provided in Section 2. The Operating Strategy has been written to comply with Operational Policy 5.08 '*Use of Operating Strategies in Water Licensing Process*' (DoW, 2010).

SIGM is planning to expand its existing mining activities. This expansion is referred to as Beyond 2010 and includes gold mining developments on Lake Lefroy and land-based mining developments, which may influence Lake Lefroy (Figure 2). A total of nine new lake-based mining sites have been identified for development, five of which are expansions of already established lake operations. It is estimated that this expansion will increase the volume of dewatering abstraction to a maximum of 30 GL/annum.

An application was submitted to DoW in April 2010, to increase the allocation of GWL62505 to 30 GL/annum. This application is currently being assessed, however, this Operating Strategy presents an overview of likely bore network additions and locations associated with the mining developments described in Beyond 2010. Upon approval of the allocation increase, this Operating Strategy will be updated to include specific details of all new bores and to reflect any additional groundwater monitoring requirements.

2

Description of Groundwater Scheme

2.1 Mt Morgan Borefield

The Mt Morgan Borefield comprises 17 production bores (15 operational) and 11 groundwater monitoring bores and is located near Widgiemooltha, approximately 40km south of the St Ives Mill (Lefroy Mill). The borefield intersects an alluvial sand aquifer, which forms part of an east-west trending palaeochannel of the Lefroy Palaeodrainage system.

Saline groundwater (approximately 33,000 to 45,000 mg/L TDS) is abstracted and piped via a transfer tank to the St Ives Mill.

A schedule of the production and monitoring bores in the Mt Morgan Borefield is presented in Appendix B. Locations of the production and monitoring bores are shown in Figure 3.

2.2 Mine Dewatering (St Ives Site)

Because much of the ore at the St Ives mine site is located below the water table, dewatering of the superficial sediments and the bedrock ('the Fractured Rock Aquifer') is required for both open pits and underground operations in order to provide safe and efficient mining conditions. Dewatering is largely achieved through sumps and the water is then transferred to settlement ponds and finally discharged to a number of locations on Lake Lefroy.

Dewatering activities are currently occurring at the Argo, Mars (Belleisle underground), Agamemnon, Revenge, Temeraire, Thunderer, Leviathan, Apollo and Athena areas, as well as the Beta Hunt underground mine (operated by Consolidated Nickel Pty Ltd). Recent dewatering activities (during 2009) also occurred at the Grinder, Pluton, NRK and West Revenge pits. All dewatering abstraction (except from Temeraire) is discharged to Lake Lefroy.

Dewatering operations comprise the following:

- **Beta-Hunt**: underground mine (operated by Consolidated Nickel Pty Ltd). Hypersaline mine water is collected in sumps and then discharged to Lake Lefroy via a Turkey's nest.
- **Bahama Pit**: dewatering was undertaken through the use of in-pit sumps and then the groundwater discharged to the Santa Ana pit. Dewatering ceased in mid-2008.
- **Temeraire Pit**: dewatering is undertaken with sumps and the abstraction discharged into the Redoubtable Pit.
- **Agamemnon Pit**: in-pit sumps collect groundwater from both sedimentary and fractured rock aquifers. The water is then transferred to the Revenge Underground for settlement, before discharge to a Turkey's nest. Water is then discharged to Lake Lefroy at the Revenge discharge point.
- **Mars Pit**: dewatered using underground sumps with settlement at the base of the Mars Pit. Discharge is through a Turkey's nest at Belleisle onto Lake Lefroy.
- **Thunderer Pit Area:** dewatered using sumps with abstraction being transferred to a Turkey's nest before being discharged to Lake Lefroy at a point located north of the Thunderer Pit. Dewatering for mining ceased in late 2008. The pit has recently been dewatered to allow for water from the North Orchin Pit to be stored, with complete settlement before discharge to Lake Lefroy.
- **Leviathan-Victory Pit Area**: mine water is collected in in-pit sumps before being transferred to the old Africa Pit for settlement and then onto Lake Lefroy. The Leviathan underground dewatering system comprises three in-pit sumps, at the Sirius, Conqueror and East Repulse declines. These three sumps pump the mine water to the Sirius sump, from where it is transferred to the Africa Pit.

- **Argo Mine Area:** comprises a pit and an underground operation. Groundwater is abstracted from an in-pit sump and underground mine sumps. Following in-pit settlement, mine water is transferred, via a lined discharge trench, to Lake Lefroy.
- **Athena Mine Area:** comprises a pit and underground operation. Mine water is pumped from in-pit and underground mine sumps. Mine water is pumped to the lined discharge trench (near Argo) and is subsequently discharged to Lake Lefroy (following in-pit settlement).
- **Apollo Pit:** Commissioned in late 2009. Dewatered via an in-pit sump, with water transferred to the lined discharge trench (near Argo) and discharged to Lake Lefroy.

Groundwater abstracted from the St Ives dewatering operations is generally hypersaline (250,000 to 450,000 mg/L TDS). The discharge to Lake Lefroy is regulated by Department of Environment and Conservation (DEC) operating licence 4570/10 (Appendix A) and Ministerial Statement 548.

A schedule of existing groundwater monitoring bores for the dewatering operations is shown in Appendix C.

The locations of the current bores and the Lake Lefroy discharge points are shown in Figure 4.

2.3 Mine Dewatering (Cave Rocks Site)

The Cave Rocks mining operation is located approximately 8 km from the nearest margin of Lake Lefroy. The operation consists of three open pits (North Pit, Central Pit and South Pit) with an underground decline extending from the base of the North and South pits.

Until mid-2009, limited groundwater inflows (from fractured rock zones) entered the underground mine area. Any groundwater intercepted was used underground for dust suppression and drilling purposes, with water from the Water Corporation mains added to the system to make up the total water requirement. This mine water was recycled and there was probably little or no net gain or loss to the aquifer during dewatering. Since mid-2009 however, groundwater inflows to the mines have increased and groundwater abstraction volumes now exceed input scheme water.

Groundwater is abstracted via sumps, predominantly from the South Decline, with all water pumped to a large sump at the base of the South Pit. Some water re-circulates via pit wall fractures to the underground operations, whilst the majority is transferred to settlement dams before being re-used in underground mining operations.

3

Administrative Requirements

3.1 Duration of the Operating Strategy

This document replaces the existing Operating Strategy, dated 22 November 2004 (URS, 2004). It will be reviewed annually in October, coinciding with submission of the annual Groundwater Monitoring Summary and will remain in place until either of the following events takes place:

- There are further changes to the borefields, requiring significant amendments to the licensed allocation or groundwater scheme, or
- There is no further need to draw water from any of the groundwater schemes operated by SIGM.

As part of the Beyond 2010 project, changes to the licensed groundwater allocation are anticipated (Section 1). Accompanying this will be the need to alter the dewatering regime at several pits and underground operations around the site, which will include changes to the monitoring bore networks at specific sites.

This Operating Strategy will be updated to detail these changes as part of the annual review.

3.2 Responsible Person

The SIGM Environment Manager will be responsible for ensuring the implementation and maintenance of this Operating Strategy, including: (i) reporting; (ii) reporting of non-conformances and breaches of groundwater licence conditions; and (iii) Operating Strategy commitments.

The Environment Manager's contact details are as follows:

Environment Manager
Mr Peter Bayliss
P.O. Box 359
Kambalda, WA, 6442
Ph: 9088 1823
Fax: 9088 1112

Should there be any breach of this Operating Strategy, the Environment Manager will notify the DoW within 14 days of becoming aware of the breach.

3.3 Scheduled Reporting Commitments and Reviews

An annual Groundwater Monitoring Summary will be prepared by a competent hydrogeologist and will include data (both tabular and graphical) from the monitoring programme and a hydrogeological assessment of the data. The report shall include a compliance assessment of the operation with: (i) the Groundwater Licence (GWL) terms and conditions; and (ii) this Operating Strategy.

The annual Groundwater Monitoring Summary will be submitted to the DoW by 31 October each year and will include the monitoring data from 1 July to 30 June each year. The monitoring data presented will include monthly groundwater levels from monitoring bores, field EC and pH measurements, full chemical analysis results and monthly abstraction and water use volumes.

Every three years, a Groundwater Monitoring Review will be submitted in place of the Groundwater Monitoring Summary. This will present and comment in detail on the previous three years of monitoring data.

All reports will be prepared in accordance with the current guidelines "*Operation Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence*".

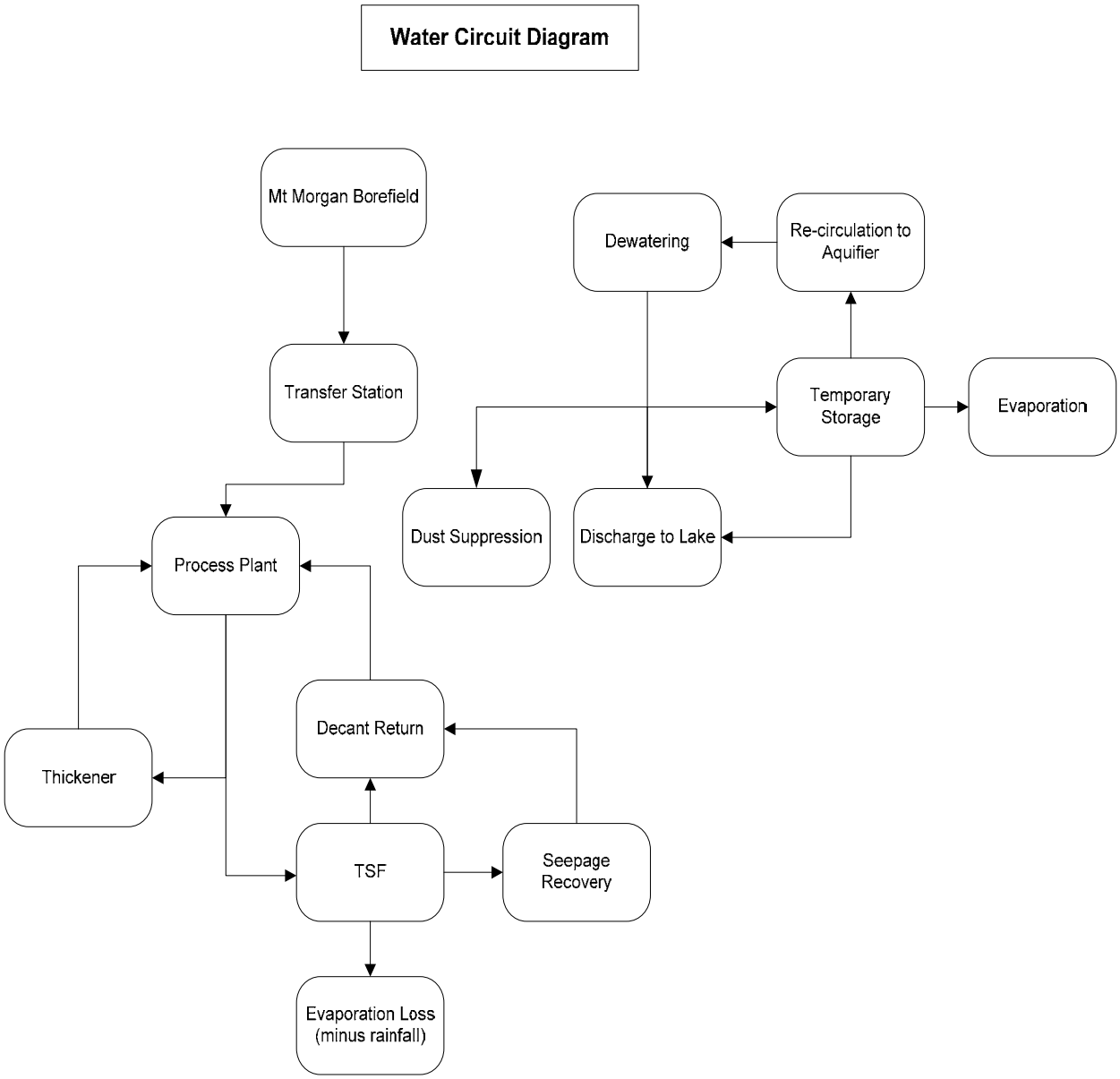
4

Water Circuit Diagrams

The water circuit diagrams shown below represent the water transfer processes at the Mt Morgan Borefield and SIGM dewatering operations. SIGM is in the process of upgrading flow meters at dewatering sites to more accurately quantify abstraction volumes. In addition, flow meters are being installed at discharge points. This will enable comparisons of volumes abstracted against volumes discharged, allowing the dewatering system water balance to be further quantified and refined.

Dust suppression volumes will also be monitored.

The numerical water balance will be presented in the annual Groundwater Monitoring Summary.



5

Operating Rules

5.1 Process Water Supply from the Mt Morgan Borefield

Saline groundwater is abstracted from the Mt Morgan Borefield for use in ore processing at the St Ives Mill. This water is used in preference to the dewatering mine water due to quality and economic constraints. The borefield is operated using a telemetry system (based at the St Ives Mill) to supply on-demand process water. The borefield currently comprises fifteen operational bores.

Individual bore construction details are provided in Appendix B. Where possible, groundwater abstraction is spread across the borefield to minimise excessive drawdown and the potential to draw hypersaline groundwater into the borefield from downstream. This means that bores are often pumped below their maximum capacities to maintain a balanced drawdown across the borefield.

Daily groundwater abstraction from the borefield is automatically recorded at the transfer tank. The borefield metering system is calibrated annually to maintain the accuracy of the measurements being made.

5.2 Mine Dewatering at SIGM Operations

Dewatering is necessary to maintain efficient and safe operating conditions in the mines. The salinity of the dewatering discharge (150,000 to 350,000 mg/L TDS) is too high to allow for economic use in ore processing and the mine water is therefore generally discharged to Lake Lefroy. Minor amounts of this water are used for dust suppression on mine roads and haulage ramps in active mining areas.

The mine water is pumped from in-pit sumps using electric diesel-driven transfer pumps. The underground mine water is pumped to the surface using electric centrifugal sump pumps and/or transfer staging pumps.

The quantities of mine water to be discharged from each mine site will vary, depending on the natural variability of the local aquifers and climatic events such as rainfall. Abstraction from individual sumps will be measured as appropriate to allow a site water balance to be maintained. The metering system will be maintained such that individual meters will be calibrated annually to ensure they remain within the manufacturer's normal operating specifications. SIGM is in the process of upgrading flow meters at dewatering sites to more accurately quantify abstraction volumes. In addition, flow meters are being installed at discharge points. This will enable comparisons of volumes abstracted against volumes discharged, allowing the dewatering water balance to be further quantified and refined.

Approval from the DoW will be obtained prior to the construction of additional or replacement dewatering bores. Any new or replacement bores will be constructed by a driller holding a current Class 1 Water Well Driller's Certificate issued by the WA Branch of the Australian Drilling Industry Association or other certification body approved by the DoW.

The result of drilling, construction and testing of any new or replacement bores will be reported to the DoW as outlined in the "*Operation Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence*". These reports will be submitted to the DoW within one month of the completion of the programme.

5.3 Establishing a New Dewatering Discharge Point

All dewatering discharge points will be operated in accordance with the SIGM Operating Licence (4570/10). If a new discharge point is required, the DEC will be advised of all details. No discharge point will become operational without approval from the DEC.

6

Monitoring Programmes

Monitoring programmes have been designed for both the Mt Morgan Borefield and dewatering operations. The key issues that are covered by the monitoring programmes include:

- Management of the drawdowns in the Mt Morgan Borefield to maximise efficiency and minimise adverse regional effects, such as hypersaline groundwater intrusion from eastern (downstream) areas.
- Management of mine water inflows to maintain safe and efficient mining conditions - by collecting sufficient data to allow ongoing hydrogeological and geotechnical assessments.
- Management of the quality and quantity of the mine water discharged to Lake Lefroy - by collecting sufficient data to assess environmental impacts to fringing vegetation areas.

The monitoring programmes will be reviewed annually and revised as appropriate to remain compatible with the operating and receiving environments.

6.1 Mt Morgan Borefield

The monitoring programme for the Mt Morgan Borefield is summarised in Table 6-1.

Table 6-1 Mt Morgan Borefield - Monitoring Programme

Measurement	Frequency	Locations
Abstraction Volume (kL)	Monthly	All operating production bores (Appendix B) Transfer Station (by telemetry)
Flow Meter Calibration	Annually	All operating production bores Transfer Station
Standing Water Levels (m AHD)	Quarterly	All monitoring bores (Appendix B)
Salinity Profiles	Annually	Monitoring bores DWT373 and DWT455.
pH, EC, TDS, WADCN, Na, K, Ca, Mg, Fe, Cl, SO4, NO3, HCO3, Al, Cd, Co, Cr (tot), Cr (III), Cr (VI), Cu, Mn, Ni, Zn, CO3, As, Pb, Hg, Se and Sr	Annually	All operating production bores
Water use volume (ie mineral processing, dust suppression, tailings volumes)	Monthly	All applicable infrastructure locations
Rainfall	Monthly	Bureau of Meteorology (BoM) Station No. 012038

DoW-approved flow meters have been installed at each operational production bore; therefore, comparisons of production bore volumes and the total volume recorded at the Transfer Station are now possible.

Water use volumes, combined with abstraction volumes, will be used to produce a water balance for the borefield.

The results of this monitoring will be collated and reported annually in the Groundwater Monitoring Summary or Groundwater Monitoring Review.

6.2 Dewatering Operations

The monitoring programme for the dewatering operations is summarised in Table 6-2.

Table 6-2 Dewatering Operations - Monitoring Programme

Measurement	Frequency	Locations
Abstraction Volume (kL)	Monthly	Mine sumps at each dewatering operation
Abstraction Volume (kL)	Weekly	South Pit sump – Cave Rocks
Flow meter readings (kL)	Weekly	All Cave rocks flow meters
Discharge Volume (kL)	Monthly	All discharge points, including Cave Rocks
Dust Suppression Volume (kL)	Monthly	All dewatering operations
Flow Meter Calibration	Annually	All dewatering site flow meters
Standing Water Levels (m AHD)	Monthly	All monitoring bores (Appendix C), including Cave Rocks bores
Field pH and EC	Quarterly	Mine sumps at each dewatering operation
Standing Water Levels (m AHD)	Bi-annually	All lake surface shallow cored holes
Field pH and EC	Bi-annually	All lake surface shallow cored holes
pH, EC, TDS, WADCN, Na, K, Ca, Mg, Fe, Cl, SO4, NO3, HCO3, Al, Cd, Co, Cr (tot), Cr (III), Cr (VI), Cu, Mn, Ni, Zn, CO3, As, Pb, Hg, Se and Sr	Annually	All abstraction points (ie mine sumps or discharge points, where applicable) Monitoring bores BM1, LD4850, LD4975, TMB1, TMB3, NOMB04d, CD7270, TSF4-6A, TSF4-9A, TD7441a-b, APO-MB02, TD11152, ATH-MB01, ATH-MB02, BEL-MB01, BEL-MB02, WID-MB02, Cave Rocks bores (when drilled)
Water use volume (ie mineral processing, dust suppression, tailings volumes)	Monthly	All applicable infrastructure locations
Rainfall	Monthly	Bureau of Meteorology (BoM) Station No. 012038

Water use volumes, combined with abstraction, discharge and dust suppression volumes will be used to produce a water balance for the dewatering operations.

6 Monitoring Programmes

The results of this monitoring will be collated and reported annually in the Groundwater Monitoring Summary or Groundwater Monitoring Review.

6.2.1 Cave Rocks

The recent intersection of groundwater within the south decline at Cave Rocks has required a surplus of mine water to be abstracted, including that which is pumped in and lost to underground operations (drilling losses, ventilation losses, etc). The dewatering required to maintain safe and efficient dry mining conditions may therefore result in drawdown of the water table and impacts to groundwater supplies and the environment. Ongoing dewatering and mining may result in local areas of increased lowering of the water table.

URS undertook a hydrogeological assessment of the Cave Rocks operation in early 2010. As part of this assessment, a monitoring programme was recommended. That monitoring programme forms the basis of the programme summarised in Table 6-2.

Additions/variations from the general programme that apply to Cave Rocks are:

- Weekly monitoring of abstraction volumes.
- Weekly readings from all site flow meters.
- Arsenic to be included in annual laboratory analyses for sump and monitoring bore samples.
- Note the dates when South Pit sump levels reach the point of overflow, to enable re-circulation volumes to be accurately quantified and separated from groundwater abstraction volumes.

The Cave Rocks assessment also included recommendations for the installation of a monitoring bore network to determine drawdown impacts. SIGM is currently installing a network of four monitoring bores around the Cave Rocks operations. Upon completion, these bores will be added to the monitoring programme (Table 6-2). In addition, this Operating Strategy will be amended to include: (i) updated bore schedules with details of bore completion; and (ii) updated figures showing final bore locations.

6.2.2 Shallow Core Holes

The monitoring programme includes the bi-annual measurement of water levels and field water quality parameters in shallow cored holes on the lake surface. These holes are intended as a cost-effective replacement for groundwater monitoring bores and will monitor the impact of drawdown (in the deeper fractured bedrock and palaeochannel aquifers) on the shallow water table environment.

Holes will be drilled in transects (Figure 5), with locations based on current and future lake operations, including Pistol Club, Greater Santa Ana, Mars/Belleisle, Swiftsure and Neptune. The transects incorporate holes situated close to existing dewatering operations, shorelines and regional locations, in order to provide spatial coverage of possible water table impacts, resulting from the dewatering of deeper aquifers.

Holes will be drilled using a hand-held coring device, which removes core of approximately 40 mm diameter. Holes will be drilled on dry lake bed and core removed to 0.45 m depth. The water level below lake surface will then be measured and field water quality measurements completed. The holes will then be backfilled with the recovered core where possible. The holes will be surveyed to determine precise hole locations and the elevation of the standing water level (m AHD).

6.3 Infrastructure

All production-based water infrastructure including production bores, sumps and pipelines will be inspected monthly. Each inspection will be logged, along with details of any identified issues.

Any required repairs or maintenance works identified, either during the monthly inspection or at any other time, will be completed as soon as practicable.

7

Future Operations

As the Beyond 2010 Project will result in significant changes in the areas of mining, an upgrade of the groundwater monitoring network is required to continue to assess drawdown trends and identify subsequent impacts arising from a changed groundwater abstraction regime.

As part of the Beyond 2010 Project, groundwater monitoring bores will be required at all new mining operations. A desktop hydrogeological assessment of each site should be completed to determine bore locations, depths and slotted intervals. The primary aim of this assessment will be to determine the details of the new groundwater monitoring networks by perusing geological maps and cross sections, as well as reviewing existing bore locations. Each new mining area should have several nested monitoring bores intersecting each aquifer.

The Fractured Rock Aquifer should be the main target for groundwater bores at each new mining site, with bores primarily located along strike of mineralised shear zones within the aquifer. Nominally, two permanent bores will be drilled along strike on both sides of the pit, with one further from the pit than the other, to enable the lateral drawdown extent to be quantified. Bores should also be drilled across strike in the Fractured Rock Aquifer to quantify drawdown in this direction.

Where the palaeochannel sands are intersected, a similar network of bores is to be installed, with nominally one bore intersecting and monitoring the shallow Lake Sediments.

The desktop study should be undertaken with a view to assessing impacts on a local and regional (lake-wide) scale, with bores also placed in areas where drawdown overlap may occur between mining operations. The area from Mars to Bellerophon is particularly important, as it will contain numerous active dewatering operations. This will probably causing overlapping drawdown cones and result in a cumulative drawdown impact in the aquifers.

Regional monitoring bores will also be incorporated into the network.

For the Beyond 2010 Project, new/additional groundwater bore networks will be required in the following mining areas (Figure 2):

- Pistol Club/Beta Hunt/Temeraire,
- Greater Santa Ana,
- Swiftsure/Mars,
- Greater Revenge/Neptune, and
- New mining areas - Bellerophon, West Idough, Blue Lode and Hamlet.

Installation of new/additional groundwater bore networks will be undertaken in stages, aligned with the proposed SIGM mining schedule.

This Operating Strategy will be updated as each stage is undertaken, with new bores incorporated into the bore schedule (Appendix C).

8

Environmental Impact Management

8.1 Environmental Management

The St Ives Mine site and Mt Morgan Borefield are located within the Lefroy-Dundas Sub Area of the Goldfields Groundwater Area. Groundwater allocations for this region are normally set on a site-by-site basis, as often the sites are remote and the allocation does not involve the abstraction of any brackish or potable groundwater sources. Groundwater at the Mt Morgan Borefield is saline (about 35,000 mg/L TDS), while in the St Ives Mine area, the groundwater is hypersaline (>250,000 mg/L TDS).

As a result of these elevated groundwater salinities, there are no ecosystems in the mining areas that are directly dependent on the groundwater. Therefore, the SIGM abstraction poses minimal risk to the environment in terms of the effects of groundwater level lowering on groundwater dependent ecosystems. However, if degeneration of vegetation occurs, which may be attributed to abstraction from a particular bore or sump, an investigation will be commissioned to determine the actual cause of the vegetation degradation. If the degradation is attributable to groundwater abstraction from a particular SIGM mining operation then details of the investigation will be provided to the DoW and abstraction will cease immediately.

At the St Ives mine site, the lake bed is considered biologically inactive and the fringing vegetation does not rely on the lake water, either directly of indirectly. There are, however, potential indirect impacts of the mine water discharge on the fringing vegetation around the lake. Such impacts have been assessed and are subject to Ministerial Statement No. 548 and Department of Environment Operating Licence No. 4570/10. The conditions of these approvals to discharge the mine water onto the lake are stringent and require significant monitoring and reporting that are outside the scope of this document.

Other potential issues relating to the Mt Morgan Borefield pipeline and mine water discharge pipelines are also covered by these existing environmental approvals.

SIGM will act in accordance with the conditions relating to the protection of groundwater and surface water resources as specified in the DEC Operating Licence 4570/10.

8.2 Aquifer Protection

Historical groundwater level data for the Mt Morgan Borefield generally show a marginal decline; however, the data also show some groundwater level recovery during periods of reduced abstraction. Since May 1999, groundwater levels have ranged between 279 m AHD and 301 m AHD in all of the Mt Morgan monitoring bores.

It is important for the protection of the aquifer that the groundwater is abstracted at a sustainable rate. Therefore, taking into account the approximate aquifer thickness, a trigger level of 260 m AHD has been set as a minimum standing water level (SWL) in all bores. If this trigger level is reached, abstraction from part or all of the borefield will be reduced to maintain the groundwater level above 260 m AHD. Hydrogeological monitoring and assessment will be undertaken on a regular basis to review the applicability of the established trigger levels.

In addition, any significant migration of the hypersaline groundwater interface will trigger an investigation and the pumping regime will be modified in order to minimise further changes.

8 Environmental Impact Management

Trigger levels have not been set for the dewatering bore network as the purpose of such dewatering is to lower groundwater levels in order to maintain efficient and safe mining conditions. However, during dewatering operations, groundwater levels will not be lowered any more than is required. Hydrogeological assessment of recent data shows that once dewatering ceases groundwater levels recover quickly to pre-mining levels.

Each annual Groundwater Monitoring Summary will provide an assessment of any impact of abstraction activities, with recommendations provided where necessary.

9

Contingency Plans

9.1 Other Groundwater Users

Both the St Ives Mine and Mt Morgan Borefield are in remote locations and they represent a low level of risk to other users due to the saline to hypersaline quality of the groundwater throughout the areas.

Therefore, groundwater abstraction for mining is not expected to impact on any other groundwater users. However, if a decline in groundwater level is noted in any bores operated by other parties, which may be attributed to SIGM abstraction, an investigation will be commissioned to determine the actual cause of groundwater level decline. If the decline is attributed to SIGM operations, details of the investigation will be provided to the DoW and abstraction will cease immediately.

Operation of mine water pipelines and discharges are covered by the relevant environmental approvals.

9.2 Mt Morgan Borefield Contingency Plan

A contingency plan is required at the Mt Morgan Borefield should a significant migration of the hypersaline water interface occur. This will be determined by the EC profiles recorded in monitoring bores DWT373 and DWT455. If such a significant migration occurs, the response plan includes the following actions:

- Initiate an investigation into the possible causes of the noted changes.
- Alter the operating scheme for the borefield to minimise further significant changes. This may include stopping the pumping from some bores.
- Use of an alternative process water supply until the noted impact can be managed using a modified production scheme.
- Undertake an ongoing investigation into sustainable development initiatives for process water supply - such as de-salinisation technologies.

As stated in Section 7.2, a contingency plan will also be initiated in the event of a bore SWL being less than the trigger level of 260 m AHD. In this event, abstraction from part or all of the borefield will be reduced to maintain the groundwater level above 260 m AHD.

Water Use Efficiency

Water efficiency is important to SIGM for both environmental and economic reasons. As described in the Goldfields Pty Ltd Environment Policy, SIGM "*will strive to minimise the use of consumptive resources*". As a result, the following practices have been implemented to minimise the abstraction of groundwater for use on site:

- Water is recycled on site through the tailings return dams. No formal targets have been set as volumes are somewhat weather dependent (i.e. incident rainfall and evaporation rates can influence returns); however, reductions of 1 GL/annum have been achieved in the past.
- Wherever possible, dewatering discharge is used preferentially over Mt Morgan Borefield water; however, water quality issues limit the use of dewatering discharge to dust suppression.
- Rain water captured on the Heap Leach Facility is utilised in processing, as is the stormwater captured from around the processing infrastructure. Currently, it is not possible to estimate the volume of water captured.
- Regular inspection and maintenance of all mine water delivery pipelines to prevent leakage and water loss.

In addition, the following actions are recommended to increase water use efficiency:

- Reduce the demand for scheme (fresh) water where possible, in particular at the Cave Rocks operation.
- Establishment of a mine site water management committee that is responsible for:
  - Maintaining a site-wide water balance
  - The development of associated water-balance procedures for the operations
  - Maximising the effectiveness of mine dewatering and thereby minimise discharges to the environment, where possible.

11

Summary of Commitments

The SIGM Operations is a complex mining centre involving the abstraction of hypersaline groundwater from a number of pits and underground mines. As this water is of such poor quality, it is evaporated on the surface of Lake Leroy. Process water for the St Ives Mill is derived from a remote borefield (Mt Morgan) abstracting saline groundwater from palaeochannel sediments.

The environmental impacts of these activities are relatively insignificant and are approved under special environmental conditions as described in Ministerial Statement No. 548 and Department of Environment, Operating Licence No. 4570/10.

A summary of the commitments specific to this Operating Strategy is outlined below.

11.1 Mt Morgan Borefield

- The combined abstraction from the borefield shall be measured and recorded monthly at the transfer tank prior to transmission along the SIGM pipeline. Monthly abstraction will also be recorded at each production bore.
- Groundwater levels will be measured at the selected monitoring bores and production bores (where possible) every three months in February, April, August and November.
- Field groundwater electrical conductivity (EC) and pH readings will be measured monthly in each production bore.
- Comprehensive chemical analyses will be conducted on groundwater samples taken from each production bore (annually in November).
- *In-situ* (down hole) measurements of groundwater EC will be completed to compile salinity profiles in bores DWT373 and DWT455 (annually in November).
- The groundwater abstraction metering system will be calibrated annually to manufacturer's specification at the Mt Morgan Borefield transfer tank and each production bore. These results will be incorporated into the annual monitoring reports.

11.2 St Ives Mine Operations

- Abstraction volumes will be measured monthly from each dewatering operation; except Cave Rocks, where weekly flow meter readings and abstraction volumes will be recorded.
- Dewatering discharge volumes to Lake Lefroy will be measured and recorded monthly.
- Dust suppression volumes will be measured and recorded monthly.
- Groundwater levels in all monitoring bores will be measured and recorded monthly.
- Field groundwater pH and EC measurements will be undertaken monthly on abstracted groundwater at each dewatering operation.
- Groundwater levels and field groundwater pH and EC measurements will be undertaken bi-annually on all shallow cored holes.
- Comprehensive chemical analyses (Table 6-2) will be completed on water samples from all abstraction/discharge points and selected monitoring bores (annually in November).
- Flow meters will be calibrated to manufacturer's specification annually. These results will be incorporated into the annual monitoring reports.
- An annual water balance will be prepared and incorporated into the annual monitoring reports.

11.3 General Commitments

- The maximum groundwater abstraction, which upon receipt of new licenses will be 24,315,000 kL/annum for dewatering and 4,015,000 kL/annum from Mt Morgan Borefield, will not be exceeded.
- Annual Groundwater Monitoring Summaries will be prepared by a groundwater professional in accordance with the current guidelines "*Operation Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence*". Every three years, a Groundwater Monitoring Review will be prepared in accordance with the guidelines. These reports shall cover the water year between 1 July and 30 June and be submitted to the DoW by 31 October.
- Approval from the DoW will be obtained prior to the construction of additional or replacement dewatering bores. Any new or replacement bores will be constructed by a driller holding a current Class 1 Water Well Driller's Certificate issued by the WA Branch of the Australian Drilling Industry Association or other certification body approved by the DoW. The result of drilling, construction and testing of any new or replacement bores will be reported to the DoW as outlined in the "*Operation Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence*". These reports will be submitted to the DoW within one month of the completion of the programme.
- The water efficiency and contingency plans outlined in this Operating Strategy shall be maintained and enacted and continually improved, where possible, to meet SIGM Environmental Objectives and Targets.

12

References

Department of Water, 2010, **Use of Operating Strategies in Water Licensing Process**, Operational Policy 5.08, DWPF 5.08

URS. 2004. **St Ives Gold Mine Operating Strategy**. Prepared by URS Australia Pty Ltd. 42905650.1841/609-F6761.0

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of St Ives Gold Mining Company Pty Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated June 2010.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between July and August 2010 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Figures

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6550000 6540000 6530000 6520000

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0 1 2 3 4

Kilometres

Datum: GDA94

Projection: MGA94 Zone 51

Legend

Label

Offices / Current Operations

Roads

East Kambalda Office
Cave Rocks
Kambalda East
Kambalda West
Silver Lake
Temeraire
Redoutable
Intrepide
Santa Ana
Minotaur
Agamemnon
East Agamemnon
Mars
North Revenge Kapai
Agamemnon West
Revenge
West Revenge
South Delta
Pluton
North Orchin
Africa
Lefroy Mill
St Ives Gold Mine Administration
Leviathan U/G - Sirius Portal
Heap Leach
Leviathan U/G - Defiance Portal
Open Pits Office
Gold Plant
Administration Building 2
Argo Offices
Argo U/G
Athena U/G
Junction Offices
Junction U/G

DERBY
PORT HEDLAND
DAMPIER
Western Australia
PERTH
ESPERANCE

Client: **ST IVES GOLD MINING COMPANY**	Project: Water Operating Strategy 2010		Title: Current Operations
	Drawn: RNM / RM	Approved: DL	Date: 05/08/2010
	Job No.: 42907263	File No.: 42907263-GW-001_RB.mxd	Figure: 1
			Rev. A
			A3

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370000 380000 390000

6540000 6530000 6520000

N

0 1 2 3 4

Kilometres

Datum: GDA94

Projection: MGA94 Zone 51

Pistol Club
Temeraire
Formidable
West Intrepide Pit
Bahama Pit (Existing)
Swiftsure
Santa Ana Pit (Existing)
Greater Santa Ana
Neptune
Bellerophon
Thunderer (cutback)
Heap Leach Facility
West Idough
Blue Lode and Clifton
Apollo
Hamlet
Athena
Junction

Legend
- Beyond 2010 Pit Outline
- Beyond 2010 Infrastructure
- Roads

Client: ST IVES GOLD MINING COMPANY	Project: Water Operating Strategy 2010		Title: Beyond 2010 Pit Outlines and Infrastructure
URS	Drawn: RM	Approved: DL	Date: 05/08/2010
	Job No.: 42907263	File No.: 42907263-GW-009.mxd	Figure: 2
			Rev. A
			A3

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360000 365000 370000

6510000

6505000

N

0 1 2

Kilometres

Datum: GDA94

Projection: MGA94 Zone 51

MND1861
MND1854
WID4615
MND1843
MND 1822
MND1220
MND1240
MND1872
MND1190
MND1178
MND1243
MND1827
WID4616
MND1176
MND1867
MND1177
MND1237
DWT455
MND1175
DWT373
DWT390
MND1871
WID4617
DWT403
DWT376

Legend

- Monitoring Locations
- Roads

Client	Project		Title
ST IVES GOLD MINING COMPANY	Water Operating Strategy 2010		Mt Morgan Borefield
URS	Drawn: RNM / RM	Approved: DL	Date: 10/08/2010
	Job No.: 42907263	File No.: 42907263-GW-010_RB.mxd	Figure: 3
			Rev. A
			A3

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6540000 6530000 6520000

N

0 1 2 3 4

Kilometres

Datum: GDA94

Projection: MGA94 Zone 51

Beta-Hunt Discharge Point
R2
R1
BDW1
LD4975
LD4850
BM1
Bahama Discharge Point
Greater Revenge Area Discharge Point
Belleisle Discharge Point
SW Bore /LD-50916
Revenge Discharge Point
BEL-MB02
TDW1/ TMB1
BEL-MB01
TMB2
TMB3
NOMB01d
NOMB02d
NOMB09d
CD7929
Africa Discharge Point
NOMB04d
CD1295
NOMB03d
CD1711
TSF4-13B
CD7260
TSF4-14A
CD7270
TSF4-13A
WID-MB02
WID-MB01
TSF4-9A
TSF4-6A
ATH-MB02
TD7731a
TD7436a
TD7731b
TD11150
Argo Discharge Point
TD7436b
APO-MB02
TD7436c
ATH-MB01
TD7438a
TD11152
TD7438b
TD7438c
TD11149
TD7441a
TD11148
TD7441b
APO-MB03
APO-MB04
ATH-MB03s
ATH-MB03d
DIA-MB02
DIA-MB01
Junction Discharge Point

Legend

- Discharge Locations
- Monitoring Locations

Client: **ST IVES GOLD MINING COMPANY**	Project: Water Operating Strategy 2010		Title: Current Monitoring Bore and Discharge Locations
URS	Drawn: RNM / RM	Approved: DL	Date: 10/08/2010
	Job No.: 42907263	File No.: 42907263-GW-007_RB.mxd	Figure: 4
			Rev. A
			A3

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370000 380000 390000

6540000 6530000 6520000

N

0 1 2 3 4

Kilometres

Datum: GDA94

Projection: MGA94 Zone 51

Temeraire

Pistol Club

Formidable

West Intrepide Pit

Bahama Pit (Existing)

Swiftsure

Santa Ana Pit (Existing)

Greater Santa Ana

Neptune

Bellerophon

Thunderer (cutback)

Heap Leach Facility

West Idough

Blue Lode and Clifton

Apollo

Hamlet

Athena

Junction

Easting	Northing
377967	6542417
373503	6543183
374117	6542262
376070	6539203
372539	6544441
379082	6540801
381926	6539714
378272	6539675
379733	6535270
383605	6537858
383012	6538509
379022	6535797
376790	6538020
376672	6543642
375929	6545201

Legend

- Cored Hole Locations
- Beyond 2010 Pit Outline
- Beyond 2010 Infrastructure
- Roads

Client: ST IVES GOLD MINING COMPANY

URS

Project: Water Operating Strategy 2010

Title: Shallow Water Level (Cored Hole) Locations

Drawn: RM | Approved: DL | Date: 13/08/2010

Job No.: 42907263 | File No.: 42907263-GW-011.mxd

Figure: 5 | Rev. A | A3

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A

Appendix A DOW and DEC Licences

Government of Western Australia
Department of Water

Instrument No. GWL62505(5)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	St Ives Gold Mining Company Pty Ltd		
Description of Water Resource	Goldfields Combined - Fractured Rock West - Fractured Rock	**Annual Water Entitlement**	24015000 kL
Location of Water Source	M15/1516, M15/1716 - St Ives, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1562, M15/1578, M15/1580, M15/1595, M15/1592, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1628, M15/1629, M15/1630, M15/1631, M15/1634, M15/1658, M15/1659, M15/1689, M15/1690, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701, M15/1710, M15/1713, M15/1715, M15/1517 M15/1540, M15/1556, M15/1565, M15/1564 M15/476, M15/1561, M15/1596, M15/1639, M15/1638		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Mineral ore processing	M15/1516, M15/1716 - St Ives, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1562, M15/1578, M15/1580, M15/1595, M15/1592, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1628, M15/1629, M15/1630, M15/1631, M15/1634, M15/1658, M15/1659, M15/1689, M15/1690, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701, M15/1710, M15/1713, M15/1715, M15/1517
	Dewatering for mining purposes	M15/1540, M15/1556, M15/1565, M15/1564
	Dewatering for mining purposes	M15/476, M15/1561, M15/1596, M15/1639, M15/1638
Duration of Licence	From 14 July 2009 to 30 June 2010	

This Licence is subject to the following terms, conditions and restrictions:

1 The annual water year for water taken under this licence is defined as 12:00 pm at 30 June to 12:00 pm at 30 June twelve months later.

2 In this licence the quantity of water that may be taken for dewatering and mining purposes is limited to 24,015,000kL per water year.

3 That should the drawing of water during dewatering operations adversely affect the aquifer and/or other users the Department of Water shall direct the licensee to take necessary action to make good the supply to the affected users.

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

This Licence is subject to the following terms, conditions and restrictions:

4 That should the licensee's draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn.

5 Should the monitoring at any time indicate a need for prompt action to prevent or reduce the effect of the licensee's draw on the underground resource, the licensee shall immediately report this to the Department of Water and advise the corrective measures proposed.

6 The licensee shall comply with the commitments or requirements of the operating strategy, as prepared by the licensee and approved by the Department of Water on 24th March 2005 including any modifications to the strategy as approved during the term of the licence.

7 Following consultation with the licensee, the Department may modify or direct the licensee to modify the strategy at any time.

End of terms, conditions and restrictions

Department of
Environment and Conservation

Your ref:
Our ref: 4570
Enquiries: L9/88
Phone: Bronwen Smith
Fax: 9080 5555
Email:

The Manager
St Ives Gold Mining Company Pty Ltd
PO Box 359
Kambalda WA 6442

Dear Sir/Madam

ENVIRONMENTAL PROTECTION ACT 1986 - LICENCE
St Ives Gold Project,
M15/575, P15/3197, M15/300, M15/475, M15/1623, M15/1540, M15/1564, M15/1565, M15/1562, M15/1581, M15/1579, M15/1580, M15/1578, M15/1591, M15/1593, M15/1559, M15/1594, M15/1561, M15/1560, M15/476, M15/1635, M15/1529, M15/1512, M15/1695, M15/1702, M15/1699, M15/1609, M15/1612, M15/1611, M15/1615, M15/1614, M15/1665, M15/1659, M15/1658

You are advised that your application for a licence to operate the works prescribed under the *Environmental Protection Act 1986* at the above-mentioned location has been approved subject to the attached conditions. Enclosed is your licence number 4570/10.

If any aspect of the conditions of licence aggrieves you, you may lodge an appeal, accompanied by the $50.00 fee, with the Minister for the Environment within 21 days from the date on which this licence is received. Members of the public may also appeal conditions. Please contact the Appeals Registrar at the Office of the Appeals Convenor on 9221 8711 after the closing date of appeals to check whether any appeals were received.

Under Section 58 of the *Environmental Protection Act 1986*, it is an offence to contravene a licence condition. This offence carries a penalty of up to $125,000, with a daily penalty of up to $25,000. The Department considers that a breach of this section, or any other section, of the *Environmental Protection Act 1986* to be extremely serious.

If you have any questions relating to the licence or licence conditions, please do not hesitate to contact Bronwen Smith of the Department of Environment and Conservation, Goldfields Region, on 9080 5555.

Yours faithfully

Carissa Aitken
A/Manager Licensing Policy Section

5 October 2007

enc: copy to: Local Government Authority: City of Kalgoorlie/Boulder

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Environmental Protection Act 1986

LICENCE

LICENCE NUMBER: 4570/10 **FILE NUMBER: L9/88**

NAME OF OCCUPIER:

Goldfields Australia Pty Ltd

ADDRESS OF OCCUPIER:

PO Box 359
Kambalda WA 6442

NAME AND LOCATION OF PREMISES:

St Ives Gold Project
M15/575, P15/3197, M15/300, M15/475, M15/1623, M15/1540, M15/1564, M15/1565, M15/1562, M15/1581, M15/1579, M15/1580, M15/1578, M15/1591, M15/1593, M15/1559, M15/1594, M15/1561, M15/1560, M15/476, M15/1635, M15/1529, M15/1512, M15/1695, M15/1702, M15/1699, M15/1609, M15/1612, M15/1611, M15/1615, M15/1614, M15/1665, M15/1659, M15/1658

Environmental Protection Regulations 1987
CLASSIFICATION(S) OF PREMISES:

Category Number 05 – Processing or beneficiation of metallic or non metallic ore
Category Number 7 – Vat or 'In situ' leaching of material
Category Number 06 – Mine dewatering
Category Number 64 – Putrescible landfill site

COMMENCEMENT DATE OF LICENCE: Sunday, 7 October 2007

EXPIRY DATE OF LICENCE: Wednesday, 6 October 2010

CONDITIONS OF LICENCE:
As described and attached:
DEFINITIONS
GENERAL CONDITION(S) 2
AIR POLLUTION CONTROL CONDITION(S) 5
WATER POLLUTION CONTROL CONDITION(S) 17
SOLID WASTE CONTROL CONDITION(S) 5
ATTACHMENTS 1

.....
Officer delegated under Section 20
of the *Environmental Protection Act 1986*

Date of Issue: Friday, 5 October 2007

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Environmental Protection Act 1986

LICENCE NUMBER: 4570/10 **FILE NUMBER: L9/88**

PREAMBLE

The following statements in this Preamble either reflect important sections of the Environmental Protection Act 1986 or provide relevant background information for the licensee. They should not be regarded as conditions of licence.

Applicability

This licence is issued to St Ives Gold Mining Company Pty Ltd for St Ives Gold Project, located within mining tenements M15/575, P15/3197, M15/300, M15/475, M15/1623, M15/1540, M15/1564, M15/1565, M15/1562, M15/1581, M15/1579, M15/1580, M15/1578, M15/1591, M15/1593, M15/1559, M15/1594, M15/1561, M15/1560, M15/476, M15/1635, M15/1529, M15/1512, M15/1695, M15/1702, M15/1699, M15/1609, M15/1612, M15/1611, M15/1615, M15/1614, M15/1665, M15/1659, M15/1658 (Attachment 1), which is a prescribed premises within Schedule 1 of the *Environmental Protection Regulations 1987*, as outlined in Table 1;

Table 1: Categories under which St Ives Gold Project is prescribed.

Category number	*Category name*
5	Processing or beneficiation of metallic or non-metallic ore
6	Mine dewatering
7	Vat or 'In situ' leaching of material
64	Putrescible landfill site

The activities on the premises include but is not necessarily limited to, the following

- crushing plant;
- CIP/CIL process plant and associated infrastructure;
- tailings storage facility 1 (to a height of RL346m);
- tailings storage facility 2; (to a final height of RL 335m); uplifts to Tailings Storage Facility 2 will be managed under this licence, subject to the licensee demonstrating satisfactory environmental performance.
- tailings storage facility 3; (to a final height of RL 332.5m); uplifts to Tailings Storage Facility 3 will be managed under this licence, subject to the licensee demonstrating satisfactory environmental performance.
- heap leach operation of approximately 3,000,000 per annum and agglomeration facility;
- inert landfill;
- paste fill plants,
- Lefroy Mill processing plant treating up to 6,000,000 tonnes per annum,
- in-pit emergency tails disposal, and
- dewatering at Argo with discharge to Lake Lefroy, at Leviathan with discharge to Lake Lefroy, at Thunderer with discharge to Lake Lefroy, at Revenge with discharge to Lake Lefroy, and at Beta/Hunt with discharge to Lake Lefroy.

Dewatering from the mine into Lake Lefroy is covered by Ministerial Statement 548. this covers a total of 20.0 Gigalitres per annum (GL/a) that incorporates:

14.3 GL/a from lake-based mining pits on Lake Lefroy with in the defined project area (Value not to be exceeded); and

- 5.7 GL/a from land-based mining pits (including underground mining) within the St Ives Gold mining lease. (Value is approximate any may vary as long as total dewatering to Lake Lefroy does not exceed 20.0 GL/a).

At the reissue of this licence, the licensee will need to demonstrate that the discharge is not having a significant environmental impact (see Condition G2). Failure to do so may result in approval to discharge to Lake Lefroy being removed, or an increase in discharge fee.

Nominal Rated Throughput

The nominal rated throughput of the premises covered by this licence is in accordance with the following:

- Quantity of ore processed: 6,000,000 tonnes per annum

General Requirements

- The licensee should take all reasonable and practicable measures to prevent pollution of the environment.
- Noise emissions from operations on site are required to comply with the *Environmental Protection (Noise) Regulations 1997.*
- Licensee should take all reasonable and practicable measures to prevent or minimise the discharge of waste and the emission of noise, odours or electromagnetic radiation from the premises.
- The licensee should inform the Director at least 24 hours prior to the commencement of any planned non-standard operations, which may have the potential to cause pollution.

Emergency, Accident or Malfunction - Discharge of Waste

The licensee should inform the Goldfields Region office as soon as practicable of any discharge of waste which has occurred as a result of an emergency, accident or malfunction, otherwise than in accordance with any condition of this licence and has caused or is likely to cause pollution.

Alteration to Premises

Prior to making any alterations to the premises which may affect the air, water or noise emissions from the premises the licensee must submit an Application for Works Approval to the Director accompanied by supporting information and plans which allow the environmental impact of that change to be assessed.

Other Legal Requirements

The licensee should be aware that these conditions do not exempt the Premises/Licensee from other statutory obligations under the *Environmental Protection Act 1986,* or any other Acts.

CONDITIONS OF LICENCE

DEFINITIONS

In these Conditions of Licence, unless inconsistent with the text or subject matter:

"Director" means Director, Environmental Management Division of the Department of Environment for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;
"Director" for the purpose of correspondence means:

Program Manager, Goldfields
Swan Goldfields Agricultural Region
Department of Environmental and Conservation
32 Brookman Street Telephone: 9080 5555
KALGOORLIE WA 6430 Facsimile: 9021 7831

"inspector" means person appointed to be an inspector under Section 88 of the *Environmental Protection Act 1986.*

"Licensee" means St Ives Gold Mining Company Pty Ltd, ABN: 44 098 386 273

"premises" means Goldfields, St Ives Gold Mining Company located on mining tenements M15/575, P15/3197, M15/300, M15/475, M15/1623, M15/1540, M15/1564, M15/1565, M15/1562, M15/1581, M15/1579, M15/1580, M15/1578, M15/1591, M15/1593, M15/1559, M15/1594, M15/1561, M15/1560, M15/476, M15/1635, M15/1529, M15/1512, M15/1695, M15/1702, M15/1699, M15/1609, M15/1612, M15/1611, M15/1615, M15/1614, M15/1665, M15/1659, M15/1658 as shown in Attachment 1.

GENERAL CONDITIONS

ANNUAL REPORT

G1 The licensee shall prepare a report by **30 November each year**, an annual environmental report containing the monitoring data and other collected data required by any condition of this licence. This report shall cover the previous 12 month period from 1st July to 30th June. One copy of this report shall be provided to the Director.

This 'Annual report' condition is consistent with the Department of Mineral and Energy's 'Annual operational audit report'. With adequate consideration by the licensee a single report would meet the requirements of both public authorities.

DEWATERING DISCHARGE REPORT

G2 The licensee shall prepare an annual report which addresses the environmental effects of mine dewater discharge to Lake Lefroy. This report will form part of the Annual Report discussed in Condition G1, with one copy of the report provided to the Director. This report will cover the previous 12 months of operation.

AIR POLLUTION CONTROL CONDITIONS

DUST - GENERAL REQUIREMENT

A1 The licensee shall take all reasonable and practicable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities on the premises, to ensure that no visible dust crosses the premises boundary.

DUST - MAINTENANCE OF COLLECTION AND CONTROL SYSTEMS

A2 The licensee shall maintain all installed dust collection or dust control systems including:

(i) coverings on conveyors, transfer points and discharge points;
(ii) skirtings; and
(iii) dust filters,

to ensure that visible dust does not cross the premises boundary.

DUST SUPPRESSION

A3 The licensee shall ensure where saline water is used for dust suppression, damage to surrounding vegetation is avoided.

PRIMARY CRUSHER - DUST CONTROL

A4 The licensee shall, as equipment and weather conditions require, utilise water sprays and/or filters on the coarse and fine ore feed and/or discharge point(s) to the primary crusher(s), screen(s) and conveyor transfer(s) to control the generation of dust.

DARK SMOKE EMISSIONS - BURNING

A5 The licensee shall not burn waste oil at any time, except for fire-training purposes. Prior to any fire-training being conducted, the licensee shall notify the Goldfields Region office.

WATER POLLUTION CONTROL CONDITIONS

TAILINGS STORAGE FACILITIES - CONTAMINATED MATTER

W1 The licensee shall manage the storage of all matter containing saline, alkaline or cyanide constituents within tailings storage facilities in a manner which prevents pollution. Seepage of constituents of tailings storage facilities shall be managed to prevent damage to vegetation and pollution of surface waters or underground water.

FREEBOARD

W2 The licensee shall maintain a minimum top of embankment freeboard of 300 mm within all storage facilities containing saline, alkaline or cyanide constituents to accommodate extreme rainfall events, including 1 in 100 year, 72 hour rainfall events, to prevent overtopping. This condition includes, but is not limited to tailings dams, return water dams, process water dams and raw water dams.

STORMWATER DIVERSION AWAY FROM WASTE MANAGEMENT AREAS

W3 The licensee shall make suitable arrangements to divert stormwater run-off away from areas adjacent to waste management facilities to minimise the threat of accidental loss of stored matter due to flooding or erosion.

TAILINGS STORAGE VISUAL INSPECTIONS

W4(a) The licensee shall undertake visual inspections of the operational tailings storage facilities at least once every eight hours. As a minimum the following shall be inspected:

(i) tailings delivery lines;
(ii) return water lines;
(iii) tailings deposition;
(iv) ponding on the surface of the TSF;
(v) internal embankment freeboard;
(vi) the external walls of the TSF.

W4(b) The licensee shall ensure a log book is kept for all visual inspections. The log book shall be signed by the person undertaking the inspection and shall indicate any problems noted.

W4(c) The licensee shall ensure the log book is retained in the plant control room and is made available to an inspector on request.

INSTALLATION OF DRAINAGE BELOW WASTE STORAGE DAM

W5 The licensee shall maintain a perimeter drain or perimeter bund immediately downstream of the external toe of the waste storage dam(s), which shall be used to collect and recover any liquid matter resulting from seepage or breach of the embankments.

PIPELINE BUNDING

W6(a) The licensee shall ensure that all pipelines containing saline, alkaline or cyanide constituents are either buried or sited within appropriately bunded facilities. This includes but is not limited to tailings delivery lines, return water lines and saline water lines.

W6(b) The licensee shall ensure that where pipelines are bunded, the bunds are adequately constructed to ensure they are not breached during a spill.

W6(c) The licensee shall ensure that catch pits are sited at appropriate low points along the pipeline route to enable the containment of spills.

W6(d) The licensee shall keep a record of any incident, including the spill of liquid containing saline, alkaline or cyanide constituents, that escapes from pipeline bunding smaller than 5000L, and provide a summary of each incident in the annual report required.

BOREFIELD PIPELINE FLOW MONITORING

W7 The licensee shall monitor and maintain all installed telemetry systems and pressure sensors fitted with alarm systems along the borefield pipeline to ensure detection of leaks or failures of the pipelines during abstraction.

BOREFIELD PIPELINE VISUAL INSPECTIONS

W8 The licensee shall undertake regular inspections of the borefield pipelines, and pump stations on at least a daily basis, and maintain a log of any seepage, spills or leaks resulting from failures. The log shall include the date, approximate time, volume and areal extent of land affected by seepage, spills or leakages.

HAZARDOUS CHEMICAL STORAGE

W9(a) The licensee shall store hazardous chemicals including fuel, oil or hydrocarbons (where the cumulative volume of each substance stored in separate areas on the premises exceeds 250 litres) within low permeability (10^{-9} metres per second or less) compound(s) designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound.

W9(b) The compound(s) described in part (a) to this condition shall:

(i) be graded or include a sump to allow recovery of liquid;

(ii) be chemically resistant to the substances stored;

(iii) include valves, pumps and meters associated with transfer operations wherever practical. Otherwise the equipment shall be adequately protected (eg. bollards) and contained in an area designed to permit recovery of chemicals released following accidents or vandalism;

(iv) be designed such that jetting from any storage vessel or fitting will be captured within the bunded area [see for example Australian Standard 1940-1993 Section 5.9.3 (g)];

(v) be designed such that chemicals which may react dangerously if they come into contact, are in separate bunds in the same compound or in different compounds; and

(vi) be controlled such that the capacity of the bund is maintained at all times (eg. regular inspection and pumping of trapped uncontaminated rain water).

W9(c) The licensee shall immediately recover, or remove and dispose of, any liquid resulting from spills or leaks of chemicals including fuel, oil or hydrocarbons, whether inside or outside the low permeability compound(s).

W9(d) The licensee shall report to the Director any spills of hazardous chemicals greater than 250L outside of bunds that may adversely impact on the environment.

WATER MONITORING PROGRAMME AND REPORTING

W10(a) The licensee shall, at the frequencies stated, take measurement of standing water levels and take representative water samples from the following monitoring sites, and have them analysed for the parameters listed:

Monitoring sites	**Sampling Frequency**	**Parameters to be measured**
Monitoring Bores: Tailings Storage Facilities: CD5574, CD2535, CD2538, CD6194, SID597. Monitoring Bores: CD10099,CD10103 CD10105,CD10110 (Attachment 8).	Quarterly (February, May, August and November)	pH, total dissolved solids (TDS) standing water level (SWL)*, arsenic (As), copper (Cu), weak acid dissociable cyanide (WADCN).
SWL only : CD10097,CD10098, CD10100,CD10101, CD10102,CD10104, CD10106,CD10107, CD10108,CD10109, CD10111. (Attachment 8).	Quarterly (February, May, August and November)	SWL
Heap Leach Facility CD10114, CD10116, CD10118, CD9261, CD9263, CD9265, CD9267, CD9269,CD9271, CD9739, CD9471 Attachment 9	Quarterly (February, May, August and November)	pH, TDS, standing water level (SWL)*, Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Zinc (Zn), Magnesium (Mg) and Aluminium (Al).
Tailings Storage Facilities: All Monitoring Bores	Half yearly (May and November)	Na, Cl, Al, Cd, Cr, Co, Fe, Mg, Mn, Ni, Se, Zn
Water from the mine dewatering programme discharged to Lake Lefroy (Attachments 3, 4, 5, 6, 7)	Quarterly (February, May, August and November)	pH, TDS, Sodium, Potassium, Calcium, Magnesium, Manganese, Strontium, Chloride, Carbonate, Bicarbonate, Sulphate, Nitrate, Sum of ions, Soluble Iron

* SWL shall be determined prior to collection of other water samples.

W10(b) The licensee shall collect all water samples in accordance with AS/NZS 5667.1:1998, Part1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.

W10(c) All water samples shall be submitted to a laboratory with current NATA Accreditation for the analysis specified, and analysed in accordance with the current "Standard Methods for Examination of Water and Wastewater-APHA-AWWA-WEF", or by a method and laboratory approved by the Director.

WATER QUALITY CRITERIA

W11 The licensee shall not exceed the criteria identified below for any water samples drawn from the designated monitoring sites, specified in W10(a):

(i) pH in the range 3.0 to 9.0 and:

(ii) weak acid dissociable cyanide is not greater than 0.5 mg/L;

OILY AND SOLVENT WASTEWATER TREATMENT SYSTEM

W12 The licensee shall maintain systems for the management and control of oily and solvent wastewater such that:

(i) uncontaminated stormwater run-off shall not enter process areas or equipment where oily or solvent wastes are present; and

(ii) the "first flush" of stormwater run-off from washdown pads or other areas of likely hydrocarbon and/or solvent contamination is diverted to facilities to allow subsequent treatment and disposal/reuse.

SITE DRAINAGE REQUIREMENTS

W13 The licensee shall ensure that the premises is drained such that potentially contaminated stormwater or leachate from the heap leach pads and processing plant area is retained on the premises for recycling to the process plant or heap leach pad.

SEDIMENTATION BASINS - MAINTENANCE

W14 The licensee shall manage and maintain sedimentation basins at all potential offsite stormwater discharge points such that there is sufficient retention time within the basin to maximise removal of suspended solids prior to discharge.

PIPELINE FLOW MONITORING

W15 The licensee shall monitor and maintain all installed telemetry systems and pressure sensors fitted with alarm systems along the pipelines to ensure detection of leaks or failures of the pipelines during abstraction and/or delivery, this condition is not limited to but also includes tailings delivery and decant return pipelines.

STORM WATER PONDS-HEAP LEACH PROCESS AREA

W16 The licensee shall ensure that the stormwater ponds are lined with a high density polyethylene liner.

SOLID WASTE CONTROL CONDITIONS

PUTRESCIBLE LANDFILL - FILL METHOD

S1 The licensee shall place waste within a defined trench or within an area enclosed by earth bunds.

ACTIVE FACE

S2 The licensee shall ensure that the tipping area is less than 20 metres in length.

COVER FREQUENCY

S3 The licensee shall ensure that putrescible waste is covered with a minimum of 200 millimetres of cover material at least weekly.

COVER MATERIAL

S4 The licensee shall ensure that a stockpile of cover material is maintained to allow the covering of waste for a period not less than 2 weeks.

WINDBLOWN WASTE

S5 The licensee shall ensure that adequate measures are implemented to contain waste of the landfill site.

.....

Officer delegated under Section 20
of the *Environmental Protection Act 1986*

Date of Issue: Friday, 5 October 2007

WESTERN AUSTRALIA

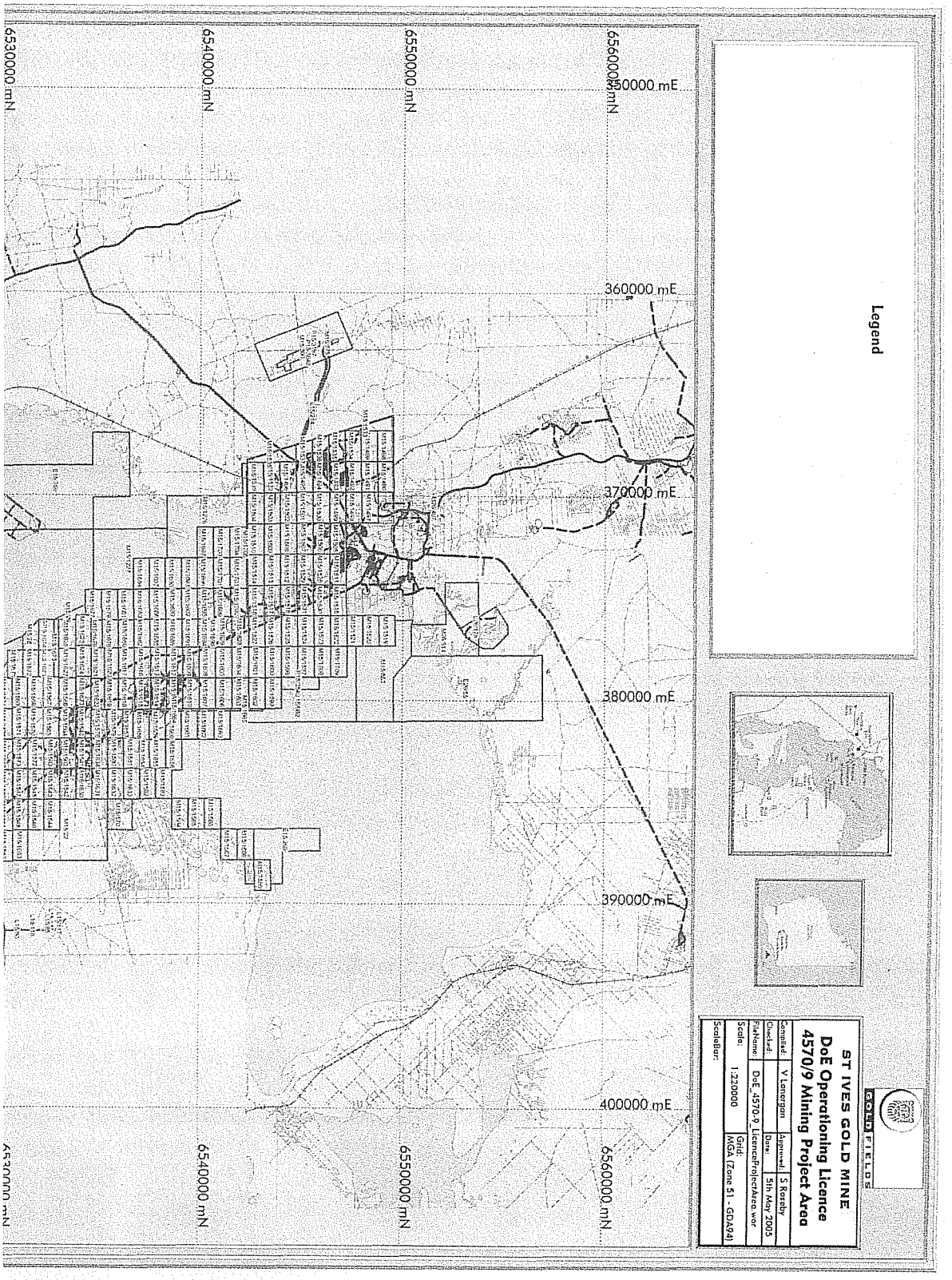
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

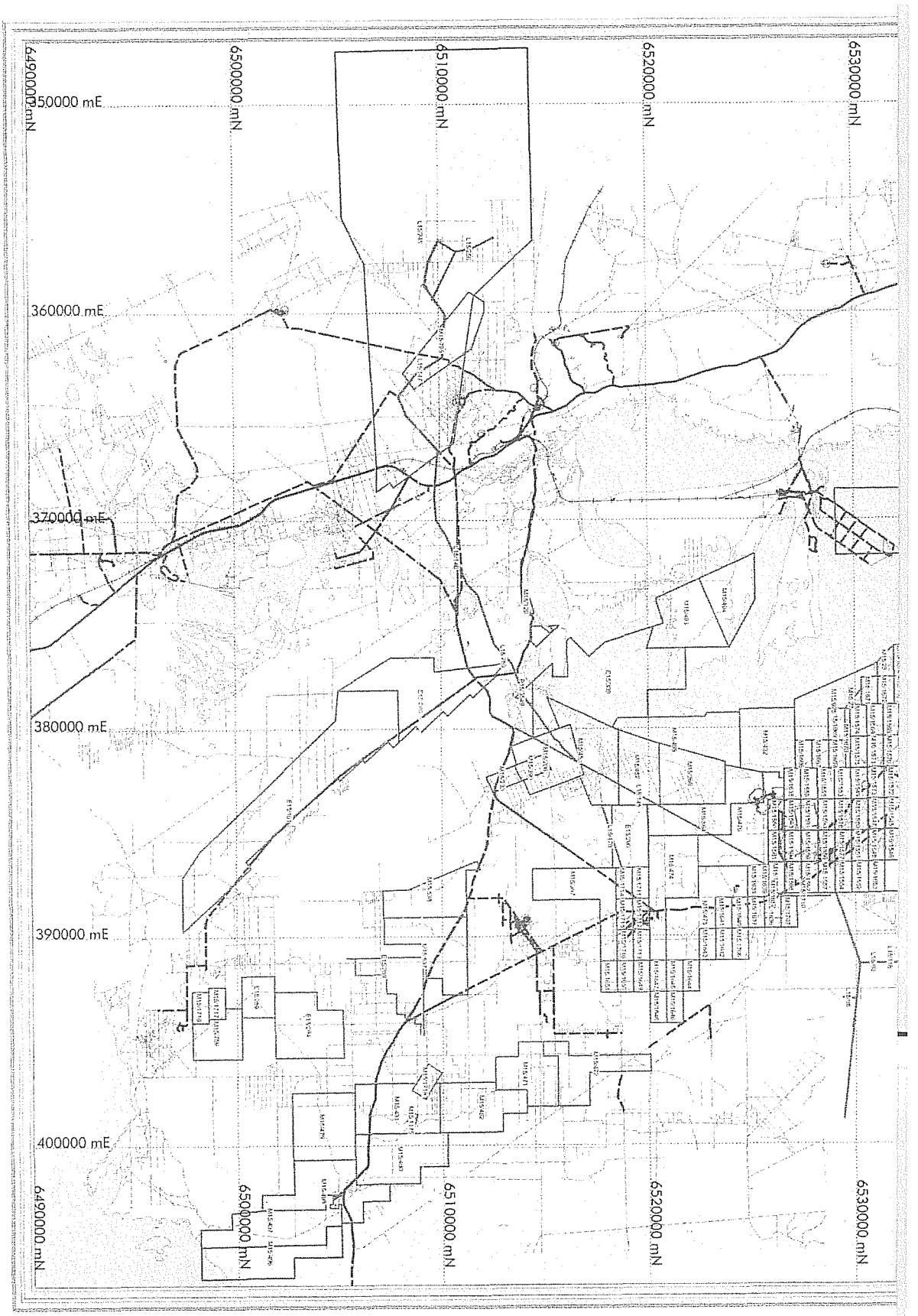
Environmental Protection Act 1986

LICENCE NUMBER: 4570/10 **FILE NUMBER: L9/88**

Attachment 1

St Ives Gold Mine DoE Operation Licence 4570/10 Mining Project Area

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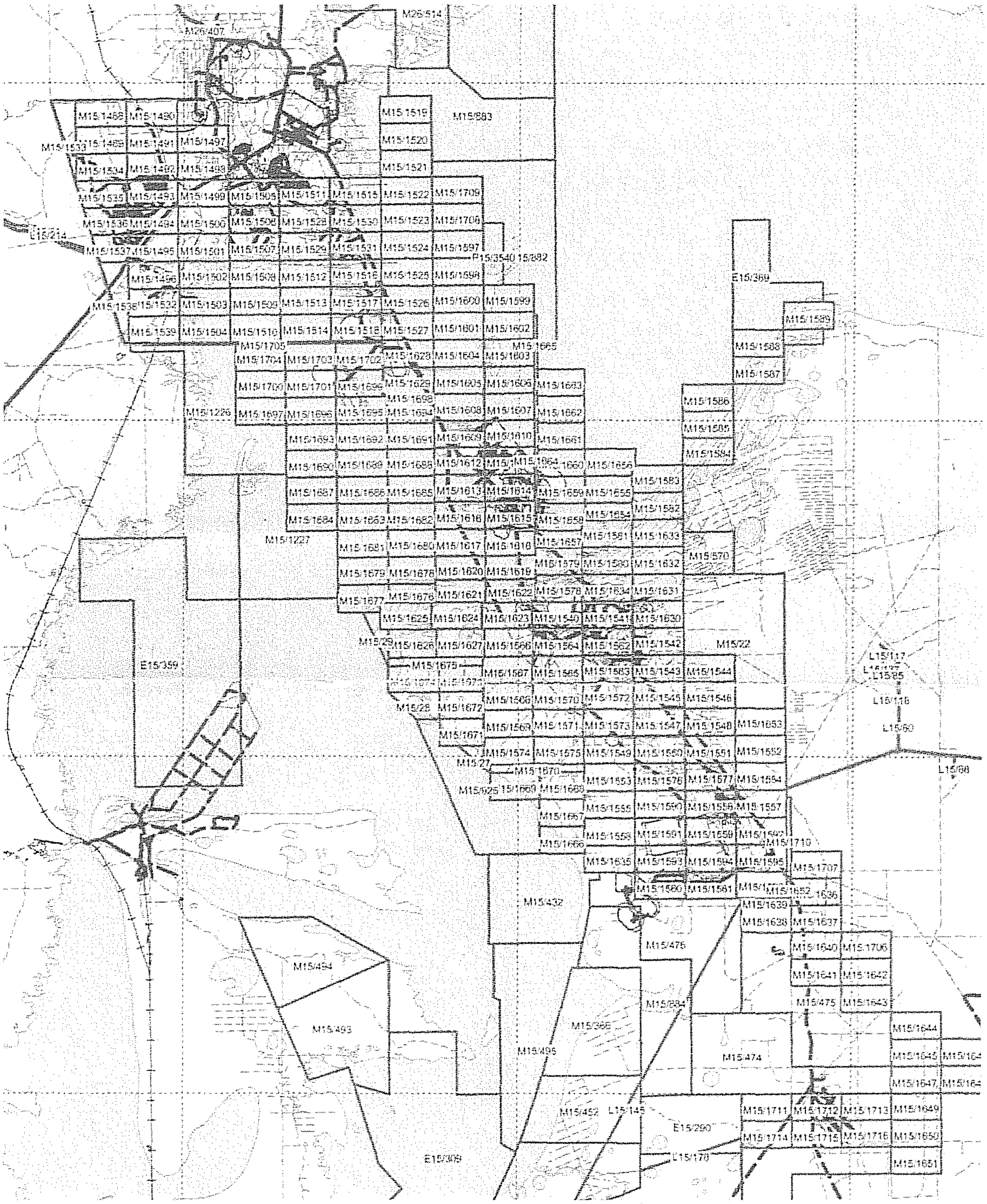
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M15/494
M15/493
M15/495
M15/476
M15/474
M15/452
E15/290
E15/309
M15/22
M15/570

B

Appendix B Mt Morgan Borefield Bore Schedule

Mt Morgan Production Bore Schedule

Bore Reference	Alternative Ref.	Ground Level (mAHD)	Initial SWL		AMG		Total depth (mbgl)	Top of Screen (mbgl)	Bottom of Screen (mbgl)	Status	Casing Type	Casing diameter (mm ID)
			mbtc	date	mE	mN						
DWT390	Bore 1	305.29	9.4	22/01/1991	364804	6508163	70	6	66	not operated	PVC	200
DWT403	Bore 2	307.22	11.5	22/01/1991	363887	6507821	69	9	69	operational	PVC	200
MND1175	Bore 3	310	14.2	22/01/1991	362841	6508670	68.5	18	68	operational	PVC	200
MND1190	Bore 4	319.28	17	22/01/1991	362024	6510018	78	18	78	operational	PVC	200
MND1220	Bore 5	315.6	14	22/01/1991	359934	6510441	66	11	66	operational	PVC	200
MND1177	Bore 6	315.52	15	22/01/1991	358503	6509140	67	18	66	not operated	PVC	200
MND1867	Bore 6a	315.46	35.86	17/12/2003	358633	6509309	68	44	68	operational	PVC	200
MND1176	Bore 7	315.67	16	22/01/1991	357412	6509349	70	14	68	operational	PVC	200
MND1178	Bore 8	316.37	16.8	22/01/1991	356408	6509838	70	16	70	operational	PVC	200
MND 1868	Bore 9	306.51	22.64	1/11/2003	6508479	363263	72.8	36.8	72.8	operational	PVC	200
MND 1869	Bore 10	317.19	33.87	1/11/2003	6509553	362734	68.4	44	68	operational	PVC	200
MND 1870	Bore 11	320.87	40.48	1/11/2003	6510710	361712	80	44	80	operational	PVC	200
MND 1822	Bore 12	311.8	49.12	2004	360771.95	6511474.4	84	64	82	operational	PVC	200
MND1827	Bore 13	326.26	32.43	2004	359361.01	6509704.2	72	50	71	operational	PVC	200
MND1843	Bore 14	332.08	41.2	2004	357064.94	6510861.6	78	56	77	operational	PVC	200
MND1854	Bore 15	334.03	42.49	2004	356894.03	6511707.9	69	47	68	operational	PVC	200
MND1861	Bore 16	329.19	42.08	2004	356399.96	6512679.8	79	54	78	operational	PVC	200

SWL: Static Water Level
mbtc: metres below top of casing
mAHD metres relative to Australian Height Datum
mbgl: metres below ground level

Mt Morgan Monitoring Bore Schedule

Bore Reference	Top of bore casing (mAHD)	Ground Level (mAHD)	Initial SWL		AMG		Total depth (mbgl)	Top of Screen (mbgl)	Bottom of Screen (mbgl)	Casing Type	Diameter (mm ID)	Comment
			mbtc	Date	mE	mN						
MND1237	315.27	315.16	21.9	1991	362552	6509495	60	18	60	PVC	40	
MND1240	316.73	316.59	20	1991	361052	6510345	38	18	38	PVC	40	
WID4616	313.09	312.68	28.3	8-Jan	359267	6509689	57	15	57	PVC	50	replaced MND1241 (dry)
MND1243	316.59	316.88	19	1991	356595	6509639	38	18	38	PVC	40	
WID4615	321.61	321.02	23	8-Jan	355894	6511252	56	8	56	PVC	50	replaced MND1244 (damaged)
DWT373	305.47	305.37	9.19	1991	364829	6508294	65	24	54	PVC	80	
DWT376	298.4	298.3	5.3	1991	370856	6507380	58	18	58	PVC	80	
DWT455	312.8	312.7	17.5	1991	365349	6508976	70	24	70	PVC	50	
MND1871	304.87	304.17	20.45	12-Mar	363836.3	6508107.8	70	48	68	PVC	50	
MND1872	318.28	317.61	33.57	12-Mar	361713.1	6510215.9	73	48	70	PVC	50	
WID4617	305.54	305.4	14.1	8-Jan	364325	6507975	24	6	24	PVC	50	replaced DWT497 (damaged)

SWL: Static Water Level
mbtc: metres below top of casing
mAHD: metres relative to Australian Height Datum l
mbgl: metres below ground leve

C

Appendix C SIGM Bore Schedule

Open Pits Monitoring Bore Information

Bore Hole /Site Name	Bore Type	Northing MGA	Easting MGA	Drilled Depth	RL of Ground	Cased Depth	Casing Detail	Slotted Interval	Installed Date	Target area
Redoutable										
R1	Exploration/ Decommissioned Production	6,543,870	375,508	72	N.D.	N.D.	Cl 18 uPVC 155 mm	N.D.	N.D.	Regional/ Fractured Bedrock?
R2	Exploration/ Decommissioned Production	6,544,071	375,743	70	N.D.	N.D.	Cl 18 uPVC 155 mm	N.D.	N.D.	Regional/ Fractured Bedrock?
Bahama/Santa Ana Pit Area										
BM1	Monitoring	*6,541,235*	*374,805*	60	287.96	60	Cl 9 uPVC 50 mm	18 - 60	Aug-05	Fractured Bedrock (Alpha Island Shear zone)
BDW1	(Decommissioned Production)	*6,541,645*	*374,755*	67	287.96	62	Cl 12 uPVC 195 mm	38 - 60	Aug-05	Fractured Bedrock (Basalt)
Intrepide Pit Area										
LD4850	Monitoring	*6,541,878*	*376,305*	110	288.47	N.D.	N.D.	N.D.	Apr-97	Fractured Bedrock
LD4975	Monitoring	*6,541,878*	*376,310*	12	288.10	N.D.	N.D.	N.D.	N.D.	Sediment
Mars Pit Area										
SW Bore / LD-50916	Monitoring	6,538,897	378,619	80	287.39	63	Baseplate top 195 mm PVC	N.D.	Nov-01	Fractured Bedrock
Thunderer Pit Area										
TMB2	Monitoring	*6,535,695*	*381,981*	85	289.06	85	Cl 9 uPVC 155 mm	32 - 85	Aug-05	Fractured Bedrock
TMB3	Monitoring	*6,535,707*	*382,244*	79	288.57	79	Cl 9 uPVC 50 mm	49 - 79	Aug-05	Fractured Bedrock
TDW1/ TMB1	Monitoring	*6,536,081*	*382,109*	52	288.26	50	Cl 12 uPVC 195 mm	20 - 50	Sep-05	Palaeochannel sand
NOMB01d	Monitoring	6,535,459	381,997	79	289.12	79	Cl 12 uPVC 50 mm	41 - 47 73 - 79	Nov-06	Fractured Bedrock/ Saprock
North Orchin										
CD1295	Monitoring	*6,534,209*	*381,864*	277	293.42	N.D.	uPVC 20 mm	N.D.	1998	Fractured Bedrock
CD7929	Monitoring	*6,534,887*	*382,217*	162	291.46	162	Cl 9 uPVC 50 mm	48-54 144-156	1998	Fractured Bedrock
NOMB02d	Monitoring	6,535,108	382,036	55	294.47	55	Cl 12 uPVC 50 mm	30 - 36 49 - 55	Nov-06	Fractured Bedrock/ Saprock
NOMB03d	Monitoring	6,534,319	381,971	65	293.76	64	Cl 12 uPVC 50 mm	58 - 64	Nov-06	Fractured Bedrock/ Saprock
NOMB04d	Monitoring	6,534,287	381,781	85	295.91	84	Cl 12 uPVC 50 mm	72 - 84	Nov-06	Fractured Bedrock (Basalt)
NOMB09d	Monitoring	6534901	381,862	106		106	Cl 12 uPVC 50 mm	58 - 106	Aug-10	Fractured Bedrock
Heap Leach - Pinnace - TSF4										
CD7260	Monitoring	*6,533,105*	*381,830*	151	310.12	151	Cl 9 uPVC 50 mm	103 - 145	Dec-98	Regional bore S/W pinnace pit
CD1711	Monitoring	*6,533,651*	*381,603*	67	314.11	67	Cl 9 uPVC 25 mm	49 - 67	Before 1998	Regional bore S/W strike North Orchin
CD7270	Monitoring	6,532,862	381,714	152	312.52	152	55 mm uPVC	104 - 146	Dec-98	Fractured Bedrock
TSF4-6A	Monitoring	6,531,924	380,246	54	311.33	54	Cl 12 uPVC 50 mm	47 - 53	Mar-08	Regional/ Fractured Bedrock
TSF4-9A	Monitoring	6,531,803	378,991	42	N.D.	N.D.	Cl 12 uPVC 50 mm	N.D.	Mar-08	Regional/ Palaeochannel
TSF4-13A	Monitoring	6,532,964	377,557	30	292.57	29	Cl 12 uPVC 50 mm	14 - 29	Mar-08	Regional/ Sandstone-Laterite
TSF4-13B	Monitoring	6,532,964	377,557	30	292.57	14	Cl 12 uPVC 50 mm	3. - 9	Mar-08	Regional/ Palaeochannel Clay
TSF4-14A	Monitoring	6,532,932	376,617	19	N.D.	N.D.	Cl 12 uPVC 50 mm	N.D.	Mar-08	Regional/ Palaeochannel
Bellerophon Area										
BEL-MB01	Monitoring	6,536,535	384,800	52		49	Cl 12 uPVC 50 mm	37 - 49	2010	Saprolite
BEL-MB02	Monitoring	6,536,725	384,470	82		82	Cl 12 uPVC 50 mm	70 - 82	2010	Fractured Bedrock
West Idough Area										
WID-MB01	Monitoring	6,531,775	385,800	64		48	Cl 12 uPVC 50 mm	30 - 48	2010	Oxides/Transition
WID-MB02	Monitoring	6,531,750	385,600	64		64	Cl 12 uPVC 50 mm	46 - 64	2010	Fractured Bedrock/Shear Zone

Open Pits Monitoring Bore Information

Bore Hole /Site Name	Bore Type	Northing MGA	Easting MGA	Drilled Depth	RL of Ground	Cased Depth	Casing Detail	Slotted Interval	Installed Date	Target area
Argo Pit Area										
TD7436a	Monitoring	6,525,807	383,436	57	292.44	25	Cl 18 uPVC 25 mm	14 - 24	Jan-00	Spongolite - Aquifer
TD7436b	Monitoring	6,525,807	383,436	57	292.44	46	Cl 18 uPVC 25 mm	30 - 45	Jan-00	Palaeochannel Clay -Wall Stability
TD7436c	Monitoring	6,525,807	383,436	57	292.44	58	Cl 18 uPVC 25 mm	52 - 57	Jan-00	Sand Palaelochannel - Aquifier
TD7438a	Monitoring	6,525,729	383,369	60	292.55	28	Cl 18 uPVC 25 mm	15 - 27	Jan-00	Spongolite - Aquifer
TD7438b	Monitoring	6,525,729	383,369	60	292.55	43	Cl 18 uPVC 25 mm	32 - 42	Jan-00	Palaeochannel Clay -Wall Stability
TD7438c	Monitoring	6,525,729	383,369	60	292.55	61	Cl 18 uPVC 25 mm	47 - 60	Jan-00	Sand Palaelochannel - Aquifier
TD7441a	Monitoring	6,525,436	383,499	54	295.89	28	Cl 9 uPVC 50 mm	15 - 27	Jan-00	Spongolite - Aquifer
TD7441b	Monitoring	6,525,436	383,499	54	295.89	55	Cl 9 uPVC 50 mm	32 - 45	Jan-00	Palaeochannel Clay -Wall Stability
TD7731a	Monitoring	6,525,706	384,133	56	296.89	26	Cl 9 uPVC 50 mm	20 - 26	Feb-02	Spongolite - Aquifer
TD7731b	Monitoring	6,525,706	384,133	56	296.89	56	Cl 9 uPVC 50 mm	32 - 56	Feb-02	Fractured Bedrock -ex pit
Athena Area										
TD11148	Monitoring	6,525,362	386,022	45	302.00	45	Cl 12 uPVC 50 mm	39 - 45	Feb-09	Palaeochannel aquifer
TD11149	Monitoring	6,525,559	386,060	18	302.00	18	Cl 12 uPVC 50 mm	12 - 18	Feb-09	Quaternary deposits/ superficial formations
TD11150	Monitoring	6,525,758	386,002	90	301.00	90	Cl 12 uPVC 50 mm	84 - 90	Feb-09	Fractured Bedrock
TD11152	Monitoring	6,525,646	387,059	38	308.00	24	Cl 12 uPVC 50 mm	8.5 - 20.5	Feb-09	Saprolite
ATH-MB01	Monitoring	6,525,710	385,950	45		45	Cl 12 uPVC 50 mm	30 - 45	Aug-10	Palaeochannel aquifer
ATH-MB02	Monitoring	6,525,450	385,210	76		50	Cl 12 uPVC 50 mm	38 - 50	Aug-10	Weathered/Fractured Bedrock
ATH-MB03s	Monitoring	6,525,300	385,930	55		50	Cl 12 uPVC 50 mm	38 - 50	Aug-10	Palaeochannel aquifer
ATH-MB03d	Monitoring	6,525,300	385,930	100		100	Cl 12 uPVC 50 mm	82 - 100	Aug-10	Weathered/Fractured Bedrock
Apollo Area										
APO-MB02	Monitoring	6,525,910	384,405	64		60	Cl 12 uPVC 50 mm	45 - 60	2010	Weathered/Fractured Bedrock
APO-MB03	Monitoring	6,525,200	384,210	70		70	Cl 12 uPVC 50 mm	52 - 70	2010	Weathered/Fractured Bedrock
APO-MB04	Monitoring	6,525,300	384,010	55		55	Cl 12 uPVC 50 mm	40 - 55	2010	Weathered/Fractured Bedrock
Diana Area										
DIA-MB02	Monitoring	6,525,275	385,480	73		60	Cl 12 uPVC 50 mm	48 - 60	2010	Palaeochannel aquifer

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Appendix H

Groundwater Licence 62505

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	St Ives Gold Mining Company Pty Ltd		
Description of Water Resource	Goldfields Combined - Fractured Rock West - Fractured Rock	**Annual Water Entitlement**	24315000 kL
Location of Water Source	M15/575 & M15/300 - Cave Rocks M15/1713, M15/1715, M15/476, M15/1613, M15/1507, M15/1512, M15/1518, M15/1527, M15/1528, M15/1529, M15/1531, M15/1543, M15/1546, M15/1548, M15/1563, M15/1579, M15/1593, M15/1608, M15/1618, M15/1619, M15/1622, M15/1632, M15/1633, M15/1657, M15/1664, M15/1702, M15/1703, M15/1712, M15/1716, M15/22, M15/570, M15/884, M15/1516, M15/1517, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1561, M15/1562, M15/1578, M15/1580, M15/1592, M15/1595, M15/1596, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1629, M15/1628, M15/1630, M15/1631, M15/1634, M15/1638, M15/1639, M15/1658, M15/1659, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Mineral ore processing and other mining purposes	M15/1713, M15/1715, M15/476, M15/1613, M15/1507, M15/1512, M15/1518, M15/1527, M15/1528, M15/1529, M15/1531, M15/1543, M15/1546, M15/1548, M15/1563, M15/1579, M15/1593, M15/1608, M15/1618, M15/1619, M15/1622, M15/1632, M15/1633, M15/1657, M15/1664, M15/1702, M15/1703, M15/1712, M15/1716, M15/22, M15/570, M15/884, M15/1516, M15/1517, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1561, M15/1562, M15/1578, M15/1580, M15/1592, M15/1595, M15/1596, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1629, M15/1628, M15/1630, M15/1631, M15/1634, M15/1638, M15/1639, M15/1658, M15/1659, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701
	Mineral ore processing and other mining purposes	M15/575, L15/214, L15/61 & M15/300 - Cave Rocks Minesite
	Dewatering for mining purposes	M15/575 & M15/300 - Cave Rocks M15/1713, M15/1715, M15/476, M15/1613, M15/1507, M15/1512, M15/1518, M15/1527, M15/1528, M15/1529, M15/1531, M15/1543,

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

		M15/1546, M15/1548, M15/1563, M15/1579, M15/1593, M15/1608, M15/1618, M15/1619, M15/1622, M15/1632, M15/1633, M15/1657, M15/1664, M15/1702, M15/1703, M15/1712, M15/1716, M15/22, M15/570, M15/884, M15/1516, M15/1517, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1561, M15/1562, M15/1578, M15/1580, M15/1592, M15/1595, M15/1596, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1629, M15/1628, M15/1630, M15/1631, M15/1634, M15/1638, M15/1639, M15/1658, M15/1659, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701
	Dust Suppression for mining purposes	M15/575, L15/214, L15/61 & M15/300 - Cave Rocks Minesite
	Product Processing Washdown Purposes	M15/575, L15/214, L15/61 & M15/300 - Cave Rocks Minesite
Duration of Licence	From 20 September 2010 to 30 September 2012	

This Licence is subject to the following terms, conditions and restrictions:

1 The annual water year for water taken under this licence is defined as 12:00 pm at 30 June to 12:00 pm at 30 June twelve months later.

2 That should the drawing of water during dewatering operations adversely affect the aquifer and/or other users the Department of Water shall direct the licensee to take necessary action to make good the supply to the affected users.

3 That should the licensee's draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn.

4 Should the monitoring at any time indicate a need for prompt action to prevent or reduce the effect of the licensee's draw on the underground resource, the licensee shall immediately report this to the Department of Water and advise the corrective measures proposed.

5 The licensee shall comply with the commitments or requirements of the operating strategy, as prepared by the licensee and approved by the Department of Water on 2 September 2010 including any modifications to the strategy as approved during the term of the licence.

6 Following consultation with the licensee, the Department may modify or direct the licensee to modify the strategy at any time.

7 The licensee must install a cumulative water meter of a type approved under the Rights in Water and Irrigation (Approved Meters) Order 2009 to each water draw point under this licence.

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

This Licence is subject to the following terms, conditions and restrictions:

8 The meter(s) must be installed in accordance with the provisions of the document entitled "Guidelines for Water Meter Installation 2009" by 31st October, 2010.

9 The licensee must ensure the installed meter(s) accuracy is maintained to within plus or minus 5% of the volume metered, in field conditions.

10 The licensee must not, in any water year, take more water than the annual water entitlement specified in this licence.

11 The licensee must take and record the reading from each meter required under this licence at the beginning and another at the end of the water year defined on this licence.

12 The licensee must notify the Department of Water in writing of any water meter malfunction within seven days of the malfunction being noticed.

13 The licensee must obtain authorisation from the Department of Water before removing, replacing or interfering with any meter required under this licence.

14 The licensee must submit to the Department of Water the recorded meter readings and the volume of water taken within the water year by 7th July each year.

End of terms, conditions and restrictions

Appendix J

Letter of Approval – DoW: Groundwater licence 62505 and application for 30 GL water draw

Department of Water
Government of Western Australia

Our ref: RF3163 & RF3163-02
Enquiries: Amy Evangelista

St Ives Gold Mining Company Pty Ltd
PO Box 359
KAMBALDA WEST WA 6442

Attn: Peter Bayliss – Environment Manager

Dear Peter,

Re: Issue of two Licences to take water – GWL62505(6) & GWL171060

Mining tenements: M15/575, L15/214, L15/61 & M15/300 – Cave Rocks

M15/1619, M15/1622, M15/1632, M15/1633, M15/1657, M15/1664, M15/1702, M15/1703, M15/1712, M15/1716, M15/22, M15/570, M15/884, M15/1516, M15/1517, M15/1526, M15/1540, M15/1541, M15/1542, M15/1560, M15/1561, M15/1562, M15/1578, M15/1580, M15/1592, M15/1595, M15/1596, M15/1609, M15/1610, M15/1611, M15/1612, M15/1614, M15/1615, M15/1629, M15/1628, M15/1630, M15/1631, M15/1638, M15/1634, M15/1639, M15/1658, M15/1659, M15/1692, M15/1693, M15/1695, M15/1696, M15/1699, M15/1701, M15/1713, M15/1715, M15/476, M15/1613, M15/1507, M15/1512, M15/1518, M15/1527, M15/1528, M15/1529, M15/1531, M15/1543, M15/1546, M15/1548, M15/1563, M15/1579, M15/1593, M15/1608, M15/1618 – St Ives Gold Mine

L15/147, L15/256 & L15/279 – Mt Morgans Borefield

Please find enclosed two *Licences to take water*, issued under section 5C of the *Rights in Water and Irrigation Act 1914*. These licences entitle you to take water, subject to certain terms, conditions or restrictions. It does not absolve the licensee from responsibility for compliance with the requirements of all Commonwealth and State legislation.

It is important that you read the conditions of your licences carefully. If you do not understand your licences, please contact the department as soon as possible, as there are penalties for failing to comply with all of your licences' conditions.

GWL62505(6) restricts you to a total annual entitlement of **24,315,000 kilolitres**, which is the maximum amount of water that may be drawn over the irrigation year (defined as 12:00 pm at 30 June to 12:00 pm at 30 June twelve months later). This includes the entitlement of 300,000 kilolitres amalgamated from GWL160912. Please note that GWL160912 has been cancelled and should be returned to this office.

GWL171060(1) is a new *Licence to take water* which restricts you to a total entitlement of **4,015,000 kilolitres** at the Mt Morgan Borefield.

It is your responsibility to restrict your water usage to those activities authorised under these licences to ensure you remain within your annual water entitlements.

Swan Avon Region
7 Ellam Street Victoria Park Western Australia 6100
Telephone (08) 6250 8000 Facsimile (08) 6250 8050
www.water.wa.gov.au
wa.gov.au

The department acknowledges your application to increase the entitlement under GWL62505 up to 30GL per annum. Please note that the department has put on hold the issuing of this increase until EPA approval has been confirmed.

Under Section 26GG(2) of the *Rights in Water and Irrigation Act 1914*, you have a right to apply to the State Administrative Tribunal to request a written statement of reasons for the period for which the licences are granted or for a review of any term, condition or restriction included in the licences. You have 28 days from the date you received this letter to request that the decision be reviewed

For further information please contact the State Administrative Tribunal:

State Administrative Tribunal
12 St Georges Terrace
PERTH WA 6000

GPO Box U1991
PERTH WA 6845

Telephone: (08) 9219 3111
Toll-free: 1300 306 017
Facsimile: (08) 9325 5099
www.sat.justice.wa.gov.au

If you wish to continue taking water after these licences expire, it is your responsibility to apply to the Department of Water for their renewal. If the licences expire and you have not applied to renew them, then the taking of water must cease, or you will be in breach of *the Rights in Water and Irrigation Act 1914*. It is suggested that an application for renewal be made at least one month in advance of the licences' expiry dates.

Should legal access to the land cease, before the licence to take water expiry dates, you are required to inform the department using *Form I - Notice that Licence Holder is not or may not be Eligible to Hold a Licence* and return the enclosed licences within 30 days. Failure to comply is a breach of the *Rights in Water and Irrigation Act 1914*.

You may apply to amend or transfer the licences to take water at any time. The department may also amend, suspend or cancel these licences in certain circumstances.

An extract of these licences has been placed in the public register and is available for viewing by appointment at Department of Water offices.

If you have any queries relating to the above matter, please contact Amy Evangelista on telephone 6250 8020.

Yours sincerely,

Don Cummins
A/Regional Manager
Swan Avon Region

20/9/10

Encl.GWL62505(6) & GWL171060(1)

Appendix K

Ngalbain Location 68 Figures

380000

400000

6540000

6520000

Lefroy Mill complex

Lake Lefroy

Argo Mining Operation

Disposal site within Ngalbain Location 68

SIGM Landfill site

0 3,350 6,700 13,400 Meters

N

W E

S

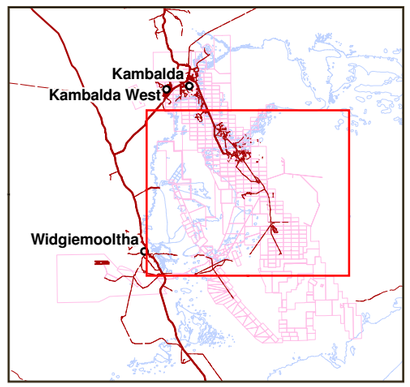
GOLD FIELDS
ST IVES GOLD MINE

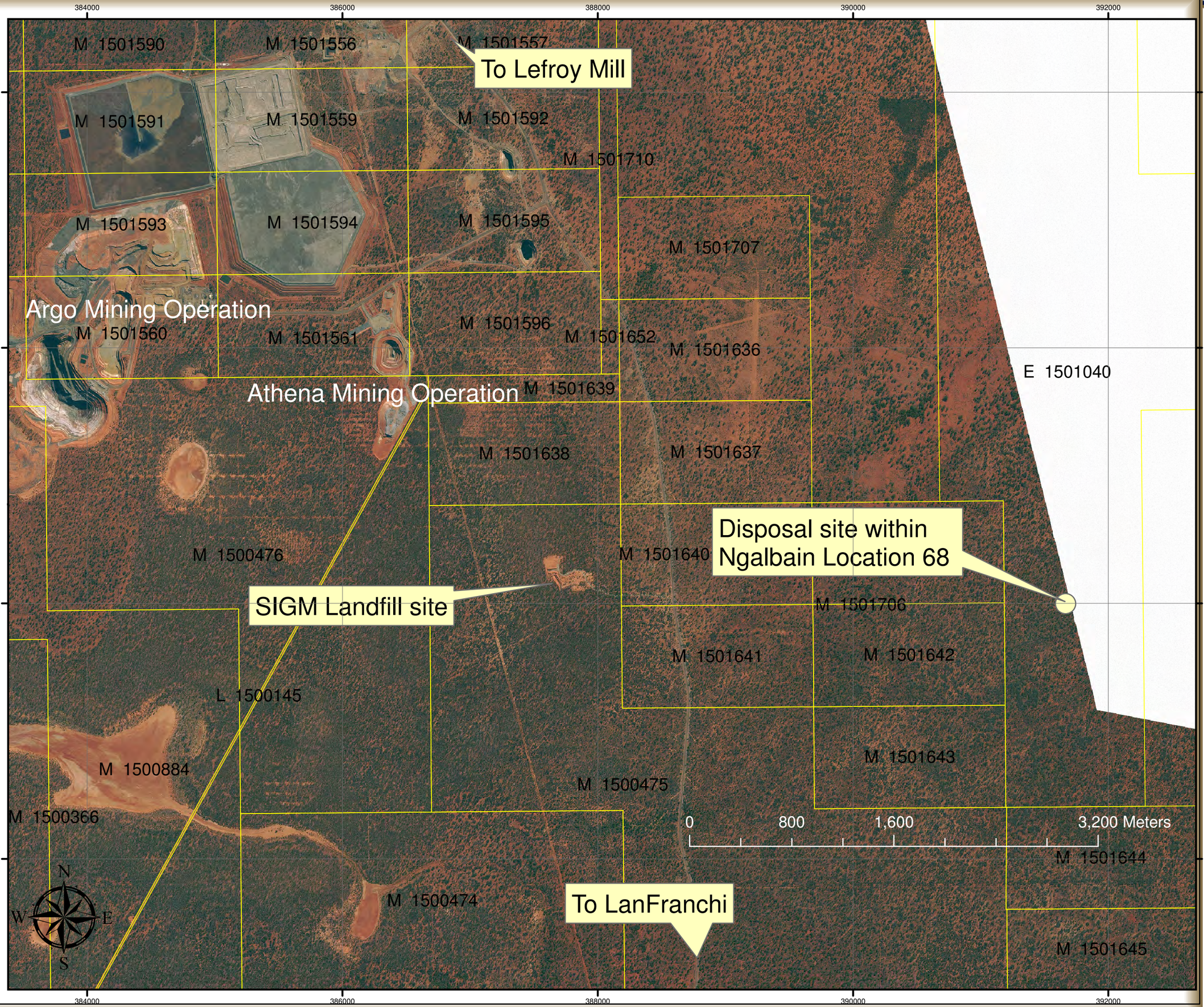
Location context - Ngalbain Location 68

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

DATE: 3/2/2011
COMPILED: P Bayliss
DRAWN: P Bayliss
FILENAME: Location context - Ngalbain Location 68

SIG LEASE LOCALITY MAP





Ngalbain Location 68

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