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EL 30/2003 Near Bowry Creek

Annual Report

19 June 2018

to

18 June 2019

Publication date: May 24 2019

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Grange Resources Tasmania

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ABSTRACT:

Exploration Completed on EL30-2003 during the Reporting Period (18 June 2018-18 June 2019) consisted of;

a) Baseline water sampling and environmental chemistry continued during the period, enabling the collection of regular high quality water samples for the development of a baseline of both water quality and water flow data. Water samples continued to be collected every six months during the period.
b) Monitoring of water bores to enable water quality and water level data to be monitored distal to the planned mine active areas.
c) Receipt of final report on the kinetic leach trials underway to evaluate waste rock characterisation for Long Plains.

WorkPlan for Extension of Term (Application accompanys this report)

The work planned for the next extension of term 19 June 2019- 18 June 2021 (a 2 yr term)) seeks to recommence the planned LP-DPEMP work at a measured pace for the next lease period which amounts to a planned expenditure of $93,314 in year 1 and 78,317 in year 2..

EL 30 / 2003 Long Plains			2020	2021
	Category	**Work Plan Item**	Jul19-Jun20	Jul20-Jun21
1.Geoscientific Costs	Geology	Geology labour	$ 15,600.00	$ 15,600.00
		Aquatic Science reports	$ 16,000.00	$ 16,000.00
	Geochemistry	Water Geochemistry	$ 26,716.80	$ 26,716.80
	Geophysics		-	-
	Remote Sensing		-	-
Total			-	-
2. Drilling & Gridding Costs	Gridding		-	-
	Drilling		-	-
Total			-	-
3. Land Access Costs	Land Access Costs	Re-establish tracks	$ 15,000.00	$ -
4. Rehabilitation Costs	Rehabilitation Costs		$ -	$ -
5. Feasibility Study Costs	Feasibility Study Costs	Traffic Survey (GHD)	$ 12,000.00	$ 12,000.00
	Feasibility Study Costs	Camera surveillance devils	$ 8,000.00	$ 8,000.00
				-
6. Other Costs	Other Costs		-	-
			-	-
			93,316.80	78,316.80

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INTRODUCTION

Exploration Rationale

Grange's interest is focussed on the Long Plains magnetic anomaly for a potential future source of magnetite ore as a feed material for its Savage River concentrator. EL30/2003 now contains the entire strike length of the Long Plains magnetic anomaly (aka "Long Plains").

The following report summarises exploration activities completed at EL30/2003 Near Bowry Creek during the eleventh year of tenure (2018/19). This document will report all activities using the GDA94 datum.

Licence Details

Exploration licence EL30\2003 "Near Bowry Creek"

Located at Bowry Creek, 10km south of Savage River Tasmania.

ID: 23550

Area: 38 sq km blocks

Status: Pending renewal

Reporting period: June 19 -2018 to June 18 -2019

Tenement Holder: Grange Resources (Tasmania) Pty Ltd

Product categories: Category 1 - Metallic Minerals, Atomic Substances, Category 5 - Industrial Minerals, Semi/Precious Stone.

Location

The Long Plains Prospect is located approximately 10km south by road of the Savage River Mine and concentrator. Savage River is located approximately 100km south west by sealed road from Burnie (Figure 2). The lease is accessed by the all-weather gravel road between Savage River and Corinna, and then by a bush track of approximately 2km.

Local topography surrounding the lease is rugged, with incised valleys and steep hills. The North and Central Zones of the anomaly is located on top of a prominent north-south trending ridge. The west flowing Bowry Creek is the main drainage in the area and runs past the northern boundary of the lease area before joining with Main Creek which drains much of the northern portion of the lease. The southern part of central zone is cut by a deeply incised tributary of main creek. Tne south zone continues on a prominent ridge south of the central zone.

Regional vegetation includes undisturbed rain forest, wet eucalypt, acacia and open heath land. The immediate area of the prospect has previously been logged extensively approximately 20 years ago, with almost no mature trees present in the working area. A bush fire not long after this time devastated the remaining vegetation, leaving the present vegetation as thick regrowth dominated by eucalypts with several rainforest species. Climate is wet temperate with an average annual rainfall of 1,950mm and mean monthly temperatures ranging from 3-19ºC.

Figure 1 Savage River Project Location

Tenure

Exploration Lease EL 30/2003 “Nine Mile Creek” was transferred to Goldamere Pty Ltd on 6th February 2008. Australian Bulk Minerals (ABM) was a wholly owned subsidiary of Goldamere and managed and conducted all exploration activities on this lease. ABM merged with Grange Resources Ltd (Grange) on the 1st January 2009 resulting in a name change for Goldamere to Grange Resources (Tasmania) Pty Ltd. Grange also manages the operation of the magnetite mine and concentrator at Savage River, and the pelletising plant and ship loading facilities at Port Latta on the North West coast. EL30/2003 was amalgamated with 2 other leases in 2010 and is now known as EL30/2003 Near Bowry Creek.

Grange’s Long Plains Prospect is held under an amalgamated lease EL30/2003 Near Bowry Creek as shown in figure 2 land tenure below.

EL30/2003 comprises an area of 38km^2. The amalgamated lease EL30/2003 encompasses the entirety of the Long Plains magnetic anomaly and provides continuous leasehold connecting EL30/2003 and the Savage River Mine Lease 2M/2001.

Grange successfully applied to transfer EL30/2003 to Goldamere after negotiating with the holders, Gregory and Thorne. This transfer was granted on the 6th February 2008. It completes the coverage of the anomaly and incorporates ground adjacent to the anomaly necessary for extended exploration activities and potential mine infrastructure. In September of 2010 Grange requested an amalgamation of leases EL19/2005, EL46/2007 and EL 30\2003 into EL30\2003. This request was granted in February 2011.

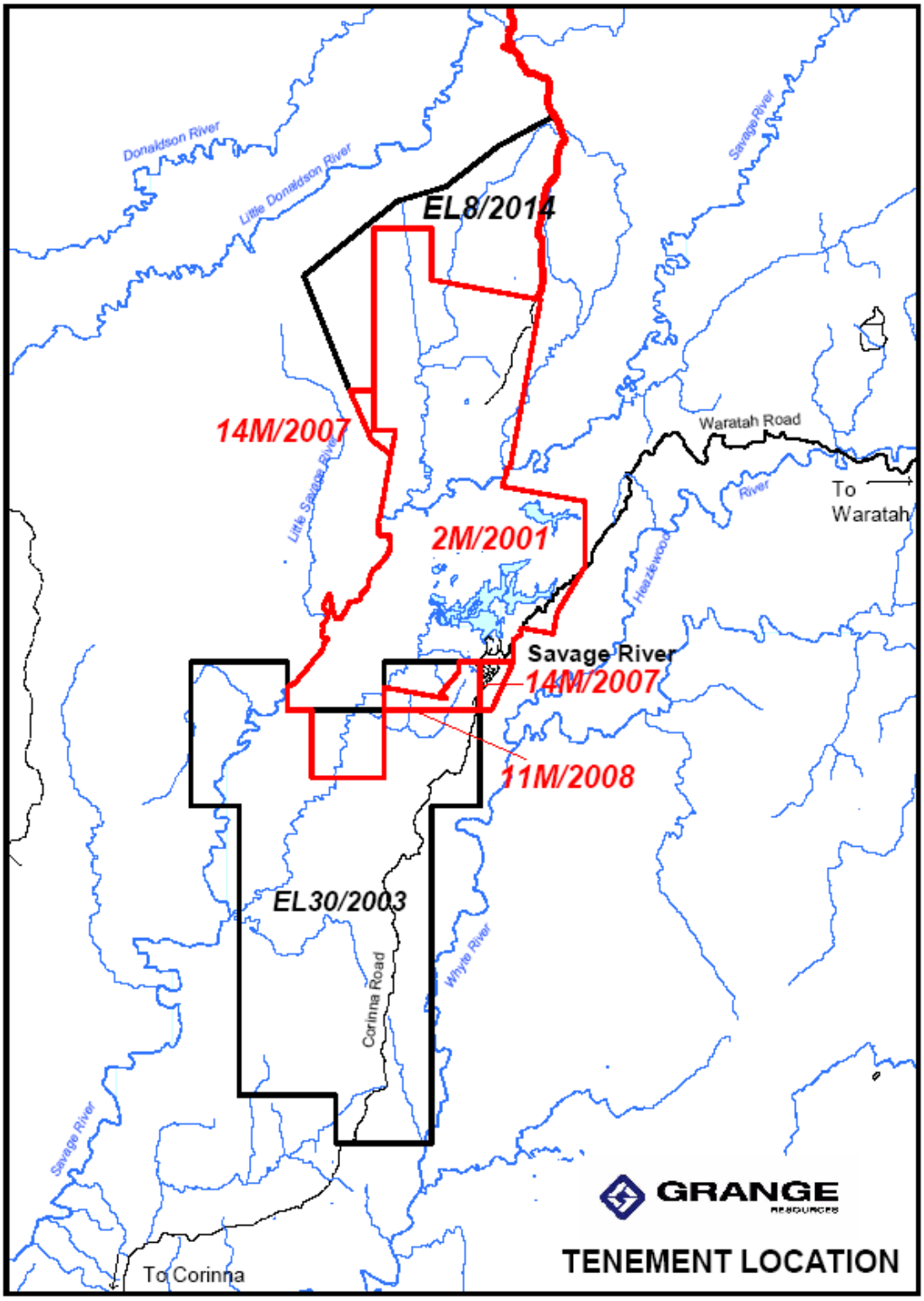

Figure 2 Land tenure as at May2019: EL30/2003, EL8-2014 and ML's 2M/2001 , 11M-2008 and 14M-2007

Geology

The Long Plains magnetite deposit lies within and near the eastern margin of the Proterozoic Arthur Metamorphic Complex in north-western Tasmania. The complex is exposed along a northeast-southwest trending structural corridor, the Arthur Lineament, which separates Proterozoic sedimentary rocks to the northwest from a variety of Palaeozoic rocks to the southeast (Figure 3).

The magnetite deposits at Long Plains represent a series of elongate, discontinuous magnetite lenses that extend over a three kilometre strike length (Figure 4). The deposit has been separated into three distinct zones on the basis of total magnetic intensity termed the Northern, Central and Southern Zones. The oblique view of the total magnetic intensity in Figure 4 illustrates the broad geometry of the Zones.

The magnetite zones are sub-vertical to strongly east dipping and hosted within ultramafic and mafic schists. A suite of late metabasalt and metadolerite intrusive dykes occur sub-parallel to the ore zones. Vein magnesite is developed at the western magnetite boundary with the contact marked by the strong weathering and the development of surface clays (Griffith, 2000, Internal memorandum).

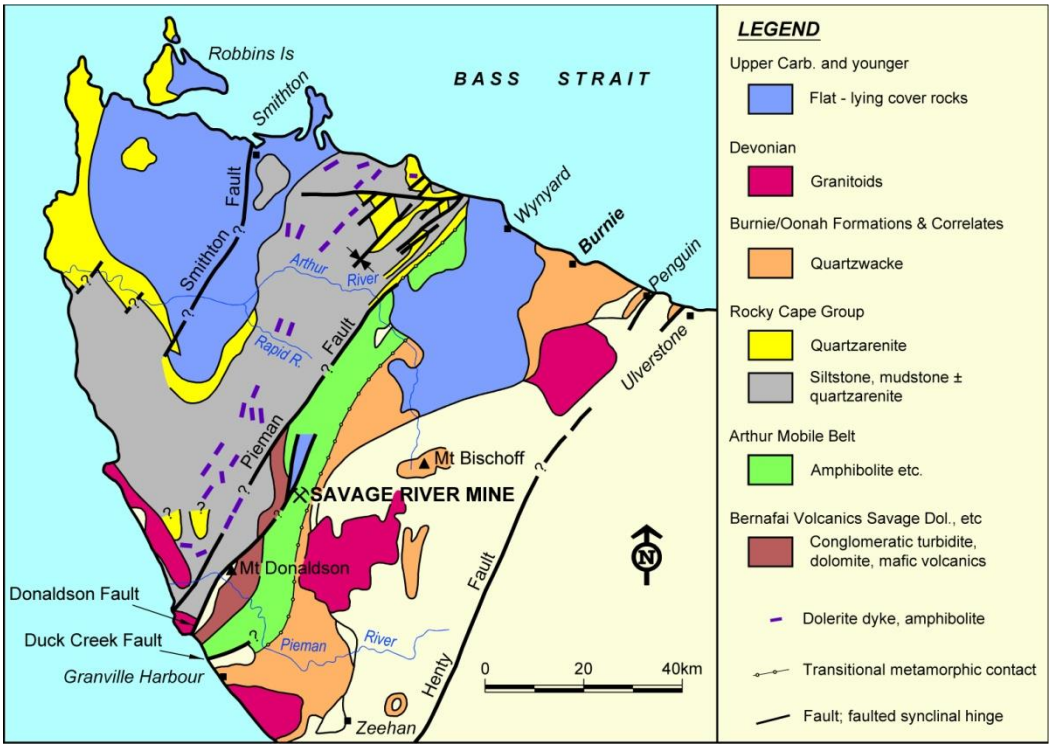

Figure 3 Regional Total Magnetic Intensity (TMI)

REVIEW OF PREVIOUS WORK

Processing and reporting of the ground magnetic survey by contactor Gap Geo was completed in 2011 as well as 2.15km of track construction and rehabilitation to enable the commencement of the drilling campaign in October 2011

Project drilling started 24th October 2011 with reverse circulation drilling and the last diamond –tail hole was completed on Thurs May 3rd 2012.

In total, 5,029m were drilled between July 2011-June 12 comprised of:

- 2,485m Diamond only
- 2,053m Reverse circulation
- 491.3m Diamond tails

A total of 5,029m were drilled vs 6,239m planned, with 4 of the planned holes in CZ (totalling 1,200m) were defferred to the next years (2012-2103) program.

June19 2012-June 18 2013

In October of 2012 funding of $1,837,920 over 12 months was approved by Grange Resources Tasmania Pty Ltd for the exploration of Long Plains during the tenure period to 18 June 2013.

The Exploration programme on EL30/2003 between 19June 2012 and 18June 2013 consisted of:

1. Geological mapping compilation at 1:10,000 scale of the entire EL30-2003 lease area

2. Construction of 450m of new tracks in North zone and 450m of new track in Central Zone.

3. Drilling of 12 new holes in North zone totalling 3,196.5m to convert as much as possible of the inferred resource to an indicated resource.

4. Drilling of 5 new holes in Central zone totalling 1,421.1m to establish an inferred resource at central zone based on the magnetic anomaly there.

5. Assaying and waste characterisation work to enable a revised resource estimate and conceptual mine planning.

6. Resource estimation in August 2012 based on the 2011-12 drilling to establish a maiden resource estimate for the entire Long Plains resource. Preliminary conceptual mine planning to evaluate the potential contribution of Long Plains to the life of mine plan (LOMP) for the Savage River operation.

Environment Activities :

In October of 2012 funding of $1,324,890 over 5yrs was approved by Grange for studies, investigations and works at Long Plains between January 2013 and January 2017 to provide the following:

- Baseline environmental surveys/studies.
- Referral to SEWPaC under the EPBC Act.

- Development and submission of a Notice of Intent to the Tasmanian EPA
- Technical studies into the impacts of a mining and ore beneficiation operation at Long Plains and management of those impacts
- Preparation and submission of a DPEMP to the Tasmanian EPA and the Waratah Wynyard Council.

June19 2013-June 18 2014

During the lease period (18 June 2013-18 June 2014), the following works were completed;

Water Bores:

Six water bores were monitored to enable water quality to be determined distal to the planned mine active areas.

Water Sampling:

A program of baseline water sampling (scoping) was completed with the following objectives:

a) establish the necessary analytes and parameters.
b) establish the necessary tracks and infrastructure to enable safe access to enable the collection of regular high quality water samples for the development of a baseline of both water quality and water flow data.

Water samples were collected every two months during the period.

Water Flow Gauging:

Two monitoring gauge sites were surveyed by a hydrographer from Entura (Hydro Tasmania). Stream profiles were calculated allowing a flow gauging curve to be established for each of site NF and Freeman Creeks at Long Plains. At these sites a guaging table , data-logger and probes have been installed which will allow the frequent acquisition of water flow data for use in establishing water run-off and hydraulic balance on the site.

Preliminary Groundwater modelling:

The findings of the preliminary set of groundwater investigations are summarised below:

1. Rock mass with a very high fracture density was encountered in some holes, with permeabilities around 5E-06 m/s and above.
2. Zones of high to medium density of fractures has permeabilities ranging between 1.1E-06 and 4.7E-06 m/s, whilst the fresher rock has permeabilities around 5.7E-07 m/s and below.
3. The weathered profile down to around 50 mBGL has permeabilities around 6.8E-07 m/s, but as low as 1E-09 m/s.
4. Water levels recorded with the instruments installed at depth are substantially different from the water level recorded before the start of the testing program. Mining One understand that VWPs which are now grouted in are recording water levels in the actual response zones as opposed to the combined aquifers.
5. At this stage of the investigations, it is likely that three separate aquifers can be distinguished at the site.

The development of a specific testing program to confirm these findings is recommended.

Ongoing monitoring should be set up to confirm the range of groundwater level variation

associated with the proposed pit water level over wet seasons to confirm the water level range and potential variations.

A Conceptual Site Model (CSM) should be developed to better define the number of aquifers and their respective hydraulic properties and water levels, and determine their interrelationship. The model should also establish the zones of high conductivities associated with fracturing and identify high conductance areas to enable the assessment of the expected mine inflows based on the current and future anticipated hydraulic gradients (Mining One proposal 37693).

18 June 2014-18 June 2015

During the lease period (18 June 2014-18 June 2015), the following works were completed;

Prospect-Based Exploration Activities.

Water Bores:

Six water bores were monitored to enable water quality to be monitored distal to the planned mine active areas.

Water Sampling:

A program of baseline water sampling (scoping) was continued to establish the necessary tracks and infrastructure to enable safe access and the collection of regular high quality water samples for the development of a baseline of both water quality and water flow data. Water samples continue to be collected every two–three months during the period. The water chemistry baseline data is given in the images below.

Water Flow Gauging:

Two monitoring gauge sites have been surveyed by a hydrographer from Entura (Hydro Tasmania) and stream profiles have been calculated allowing a flow gauging curve to be established for each of site NF and Freeman Creeks at Long Plains. (see maps fig 7 and 8) .

At these sites a guaging table , data-logger and probes have been installed which allow the frequent acquisition of water flow data for use in establishing water run-off and hydraulic balance on the site.

Mining Study:

A conceptual mine study , consisting of a whittle optimisation on North Zone, preliminary waste dump designs and analysis of viable material movement options including conveyor, road haulage and pipeline variants.

Karst Evaluation:

Identification and preliminary evaluation of potential risks of the interaction of mine and waste dump on listed karst features located at Bowry creek. (Preparation for and planning of the Karst survey)

18 June 2015-18 June 2016

a) Baseline water sampling and environmental chemistry continued enabling the collection of regular high quality water samples for the development of a baseline of both water quality and water flow data. Water samples continued to be collected every three months during the period.

b) Monitoring of water bores to enable water quality and water level data to be monitored distal to the planned mine active areas.

c) Drilling of two 90m deep pumping wells was completed. These will enable future pump tests to evaluate the recharge capacity to inform the numerical hydrogeological model.

d) A revised preliminary mine plan , consisting of a small pit in North zone, and conventional truck haulage with waste dumps located to the east and west of Bowry creek to avoid known karst features.

e) A flora and fauna survey over the preliminary development footprint.

f) Continuing work on the conceptual hydro-geological model

g) A report on karst entitled; “Bowry Creek – Magnesite Karst Assessment” that aided the identification and preliminary evaluation of potential risks of the interaction of mine and waste dump on listed and newly discovered karst features located at Bowry creek.

h) In Aug 2015 waste rock kinetic leach trials commenced and Grange received the first of three interim reports to evaluate waste rock characterisation for Long Plains.

18 June 2016-18 June 2017

During the lease period the following works were completed;

Prospect-Based Exploration Activities.

Ground Water Bores: Monitoring

The six existing water bores were monitored for water depth and water quality distal to the planned mine active areas. Water bore tables are listed in Appendix 4

Surface Water Sampling:

The program of baseline surface water sampling and stream flow data was continued at quarterly intervals to keep current the capture of regular high quality water data. The water chemistry baseline data is given in the Appendix 1.

Water Flow Gauging:

Two monitoring gauge sites were visited each quarter to measure stream flows and gather physical water samples. At these sites a guaging table, data-logger and probes have been installed which allow the frequent automated acquisition of water calculated-flow data for use in establishing water run-off and hydraulic balance on the site. (Fig 5)

Kinetic Leach Trials:

Column Leach tests commenced in August of 2015 and Grange received two interim reports #2 and #3 during the period (Appendicies 2 and 3) . Preliminary results at 12 and 18 month periods indicate that WD columns are NAF and two additional mineralogical and laser ablation tests are recommended to evaluate possible passivation of pyrite.

Geotechnical Evaluation:

Evaluation of the existing geo-technical data has found that mostly geotechnically logged holes are confined to the ore zone resulted in an inadequate database for waste rock and pit slope design. If a mine is to eventuate at Long Plains, a modest geotechnical drilling program to inform pit design parameters is recommended.

Surface mapping/sampling -Resource definition:

Limited surface mapping and sampling during the period have both identified potential extensions to the ore to the north of existing wireframes. (Fig 4) The surface data available at this time supports the need for several more resource definition drill holes in the north, however, the existing resource is likely sufficient to support a decision to mine (pending the pre-feasability study), so the business case for the extra resource definition holes to support a decision to mine has not yet been demonstrated.

18 June 2017-18 June 2018

During the lease period the following works were completed;

Prospect-Based Exploration Activities.

As part of the acquisition of groundwater information for Long Plains Prospect, Grange Resources is developing a hydrogeological Conceptual Site Model (CSM) for Long Plains prospect. The scope of the CSM includes the characterisation of the aquifer hydraulic parameters encountered during the exploration, and likely to be intercepted in the future mining operation, together with the assessment of the potential mining impacts on the surrounding surface water and groundwater environment. The monitoring of groundwater, acquisition of water chemistry, flow guaging, and pump tesing are all components of this hydrogeological model.

Ground Water Bores: Monitoring

The six existing water bores were monitored for water depth and water quality distal to the planned mine active areas. Water bore tables are listed in Appendix 4

Surface Water Sampling:

The program of baseline surface water sampling and stream flow data was continued at quarterly intervals to keep current the capture of regular high quality water data. The water chemistry baseline data is given in the Appendix 1.

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Pump Tests North Pumping Bore:

Last year the field program included the installation of dual vibrating wire piezometers (VWP) on each tested hole and the installation of Open Piezometers (OP) at dedicated environmental bores and completion of falling head testing.

A constant rate pumping test was completed between 25th July and 5th August 2017, followed by a recovery test with the bore monitored until the 9th August 2017.

Kinetic Leach Trials:

Kinetic Leach Column (KLC) tests commenced in August of 2015 and in Feb 2018 Grange received the penultimate interim report #5 during the period (Appendix 3) . These KLC tests are due to conclude after 3 yrs (late 2018).

To date, waste Types A, B and D are non acid forming (NAF) - after 132 weeks of testing when using a cut-off criterion (PAF or NAF) of pH 4.5. Measurements of the bulk mineralogy confirm an abundance of neutraliser in Type A, so it is anticipated this will remain as NAF in the next 6 month period. Type B shows the most chemical activity with chlorite neutralisation and surface passivation reactions likely occurring, and therefore will also likely remain NAF. Type D appears to be decreasing and relative to a stricter cut-off criterion (i.e., pH 6.5) would in recent weeks, be considered as PAF.

Automated mineralogy and LA-ICPMS studies are scheduled to assist Grange with making a decision of whether or not to continue with the trials beyond week 156.

Geotechnical Evaluation:

Evaluation of the existing geo-technical data has found that mostly geotechnically logged holes are confined to the ore zone resulted in an inadequate database for waste rock and pit slope design. If a mine is to eventuate at Long Plains, a modest geotechnical drilling program to inform pit design parameters is recommended.

Surface mapping/sampling -Resource definition:

Limited surface mapping and sampling during the period have both identified potential extensions to the ore to the north of existing wireframes. (Fig 4) The surface data available at this time supports the need for several more resource definition drill holes in the north, however, the existing resource is likely sufficient to support a decision to mine (pending the pre-feasability study), so the business case for the extra resource definition holes to support a decision to mine has not yet been demonstrated.

18 June 2018-18 June 2019

During the lease period the following works were completed;

Prospect-Based Exploration Activities.

Ground Water Bores: Monitoring

The six existing water bores were monitored for water depth and water quality distal to the planned mine active areas.

Surface Water Sampling:

The program of baseline surface water sampling and stream flow data was continued at quarterly intervals to keep current the capture of regular high quality water data. The water chemistry baseline data is given in the Appendix 1.

Water Flow Gauging:

Two monitoring gauge sites were visited semi-annually to measure stream flows and gather physical water samples. At these sites a guaging table, data-logger and probes have been installed which allow the frequent automated acquisition of water calculated-flow data for use in establishing water run-off and hydraulic balance on the site. (Fig 5)

Kinetic Leach Trials:

Kinetic Leach Column (KLC) tests commenced in August of 2015 and in Sept 2018 Grange received the final report. (Appendix 3) . These KLC tests have concluded after 3 yrs (late 2018).

Surface mapping/sampling -Resource definition:

Limited surface mapping and sampling during the period have both identified potential extensions to the ore to the north of existing wireframes. (Fig 4) The surface data available at this time supports the need for several more resource definition drill holes in the north, however, the existing resource is likely sufficient to support a decision to mine (pending the pre-feasability study), so the business case for the extra resource definition holes to support a decision to mine has not yet been demonstrated.

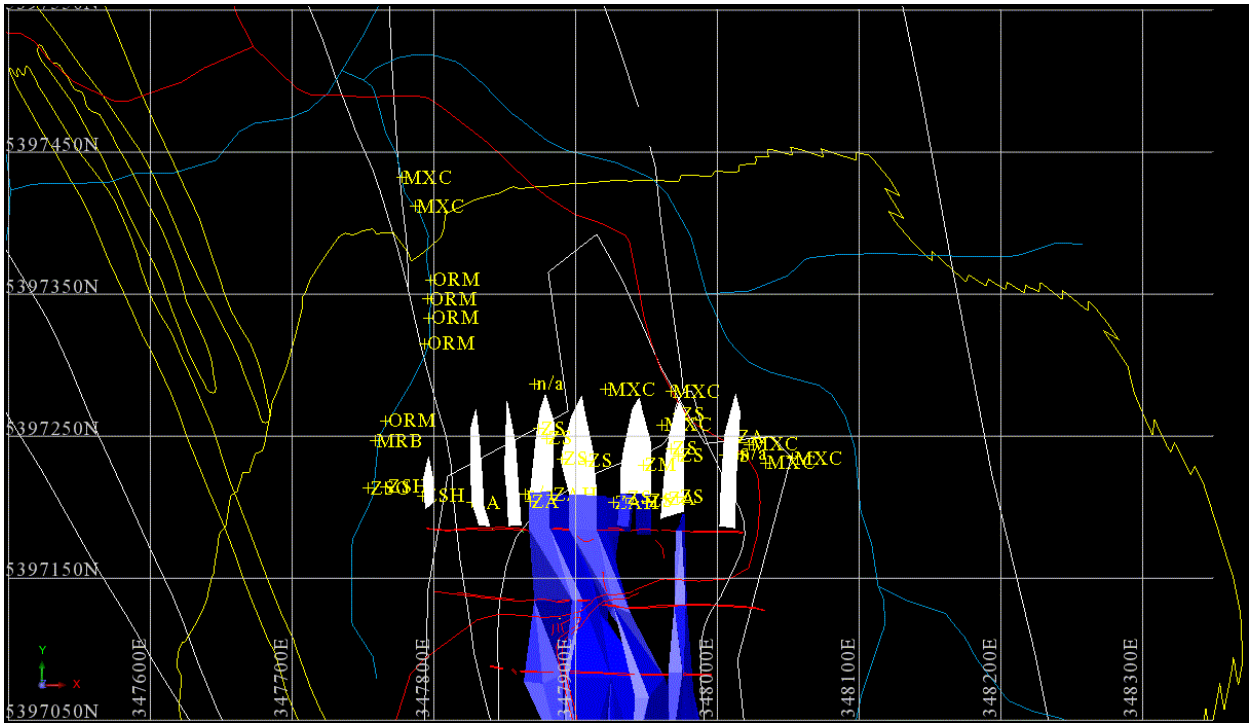

Figure 4 Plan View Long Plains North Zone -Inferred extension of low grade mineralisation within pit shell (white)

Yellow line = conceptual pit shell

White fill= inferred resource extensions of mineralisation

Yellow text- field geological mapping

Red= existing roads/tracks, Blue =drainage

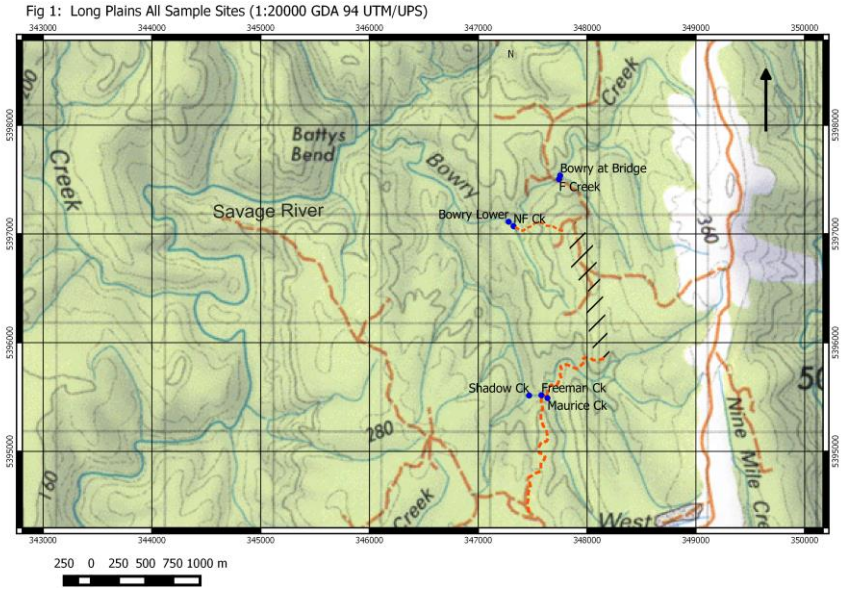

Figure 5 Water Sampling Sites All

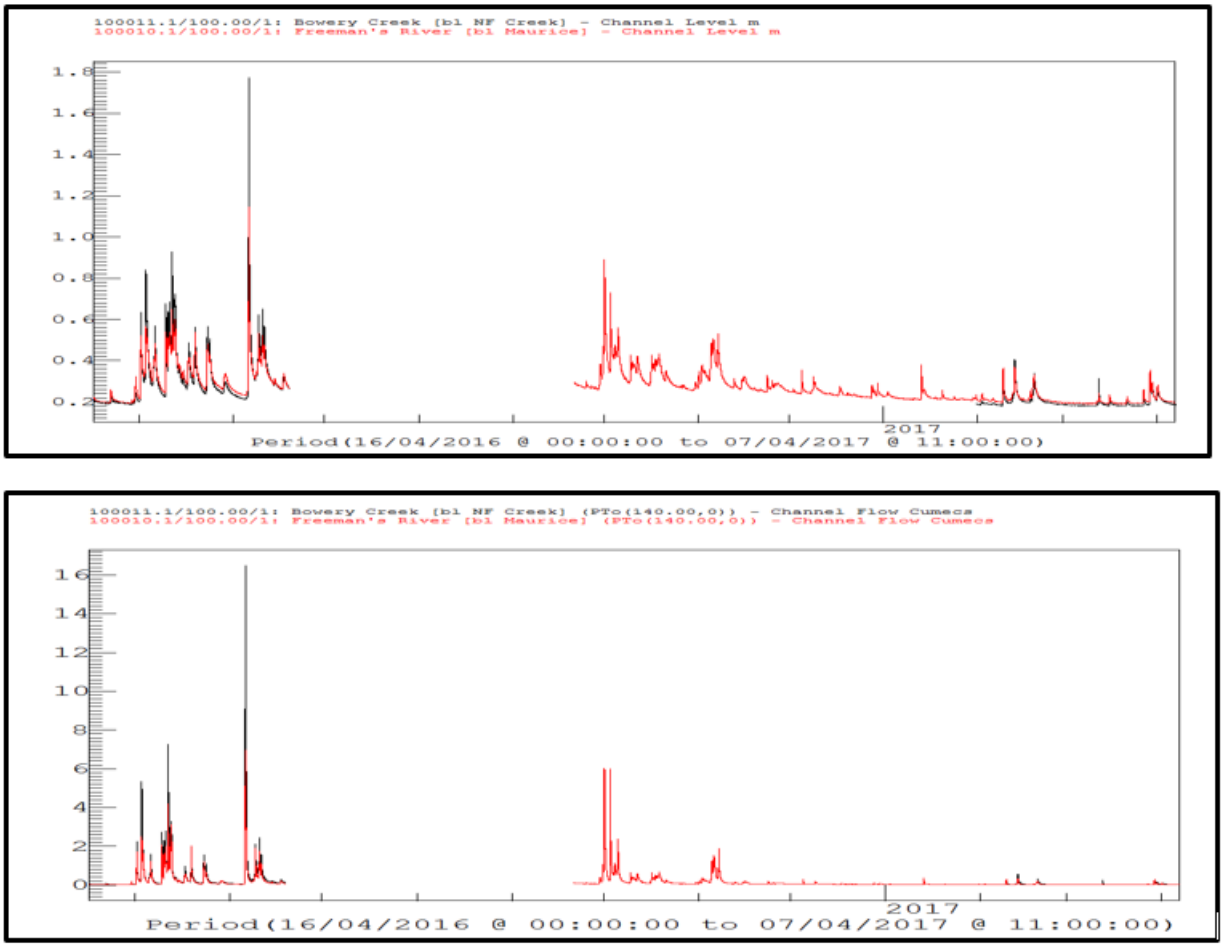

Figure 6 Channel level (m) and Flow (cum/sec) for Freemans and Bowry gauging sites- **Jun2016-Apr2017**

(This is past years data, note that we do not have flow data charted for 2018-9 yet.)

The surface water sampling sites in the north include ; Bowry Lower, Bowry Upper and F Creek with a flow gauging installation at NF creek. The surface water sampling sites were selected to capture data of the entire watershed runnning off of the northern end of the Long Plains ore body.

These are complimented by the ground water monitoring bores at sites Env A, B,C,D,E and F .

Table1 EL30-2003 Near Bowry Creek Expenditure by Quarter July 2018-June 2019

M:\Geology\Exploration Drilling\Exploration\Quarterly_Costs\2019\[MRT_costs_Jun19 forecast.xlsx]EL30-2003 FY 2018-9							
Exploration Quarterly Report	EL30/2003 near Bowry Creek	Actuals	Actuals	Actuals	Actuals		
4 Quarters Q3 2018 to Q2 2018		Q3 2018	Q4 2018	Q1 2019	Q2 2019	Total for	Total for
		Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	reporting period	reporting period
1.Geoscientific Costs	Geology	$ 5,994	$ 5,994	$ -	$ -		$ 11,988
	Geochemistry	$ -	$ -	$ 6,679	$ 6,679		$ 13,358
	Geophysics	$ -	$ -				$ -
	Remote Sensing	$ -	$ -				$ -
	Total	$ 5,994	$ 5,994	$ 6,679	$ 6,679	$ 25,347	$ 25,347
2. Drilling & Gridding Costs	Gridding	$ -	$ -	$ -	$ -	$ -	$ -
	Drilling Diamond m	0	0	0	0	0	0
	Reverse Circulation m	0	0	0	0	0	0
	Total (see note below)	$ -	$ -	$ -	$ -	$ -	$ -
3. Land Access Costs		$ -	$ -	$ -	$ -	$ -	$ -
4. Rehabilitation Costs		$ -	$ -	$ -	$ -	$ -	$ -
5. Feasibility Study Costs		$ -	$ 8,026.35	$ 9,992.00	$ -	$ 79,482.33	$ 18,018.35
6. Other Costs		$ -	$ -	$ -	$ -	$ -	$ -
	Totals	$ 5,994	$ 14,021	$ 16,671	$ 6,679	$ 43,365	$ 43,365
9. Cumulative Expenditure at time of last report		$ 6,263,889	$ 6,269,883	$ 6,283,903	$ 6,300,575	$ 6,307,254	$ 6,350,619
Total expenditure to date	(sum of 8 and 9)	$ 6,269,883	$ 6,283,903	$ 6,300,575	$ 6,307,254	$ 6,350,619	
Exploration Progress Report							
Q3 2018 Geology Labour and Quarterly stream water chemistry							
Q4 2018 Geology labour and Services-Long Plains Development Proposal and Environmental Management Plan (LPDPEMP) Kinetic Leach Columns 3 columns for 3 years							
Q1 2019 Quarterly stream water chemistry and final kinetic leach column report.							
Q2 2019 Quarterly stream water chemistry and report writing							
M:\Geology\Exploration Drilling\Exploration\Quarterly_Costs\2019\[MRT_costs_Jun19 forecast.xlsx]EL30-2003 FY 2018-9							

Proposed work plan for this two year extension of term; July 2019-June 2021

The work planned for the next extension of term 19 June 2019- 18 June 2021 (a 2 yr term)) seeks to recommence the planned LP-DPEMP work at a measured pace for the next lease period which amounts to a planned expenditure of $93,314 in year 1 and 78,317 in year 2..

EL 30 / 2003 Long Plains			2020	2021
	Category	**Work Plan Item**	Jul19-Jun20	Jul20-Jun21
1.Geoscientific Costs	Geology	Geology labour	$ 15,600.00	$ 15,600.00
		Aquatic Science reports	$ 16,000.00	$ 16,000.00
	Geochemistry	Water Geochemistry	$ 26,716.80	$ 26,716.80
	Geophysics		-	-
	Remote Sensing		-	-
Total			-	-
2. Drilling & Gridding Costs	Gridding		-	-
	Drilling		-	-
Total			-	-
3. Land Access Costs	Land Access Costs	Re-establish tracks	$ 15,000.00	$ -
4. Rehabilitation Costs	Rehabilitation Costs		$ -	$ -
5. Feasibility Study Costs	Feasibility Study Costs	Traffic Survey (GHD)	$ 12,000.00	$ 12,000.00
	Feasibility Study Costs	Camera surveillance devils	$ 8,000.00	$ 8,000.00
				-
6. Other Costs	Other Costs		-	-
			-	-
			93,316.80	78,316.80
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Summary of Kinetic Leach Columns

EXECUTIVE SUMMARY (Final report Sept 2018 -Attached)

Project objectives

The University of Tasmania were instructed by Grange Resources Ltd (Grange) to undertake 3-year column leach kinetic trials on waste rock materials (A, B and D type) from the Long Plains project at the Savage River Mine. The objectives of this study are as follows:

1. Evaluate the geochemical and mineralogical characteristics of the column feed material;

2. Evaluate the water quality evolved from the columns (pH and EC weekly) and metals (monthly); and

3. Record mineralogical changes periodically (i.e., every three months) to identify reaction products.

Waste class	Description
A-type	**Non-acid forming (NAF) alkaline waste rock with some level of acid neutralising capacity (ANC).** Typically, A-type contains the hard, durable, non-acid forming rocks of Type I & II. This type is intended to be used where water flow is to be encouraged to allow drainage of dump areas and to encourage alkalinity into the system.
B-type	**Neutral waste rock.** General dumping rock including all but the most reactive rocks, this particularly includes Type III rocks.
C-type	**Highly to extremely weathered, low-permeability clayey gravel.** Clay layers comprising compacted soft Type I and compacted soft Type II.
D-type	**Potentially acid forming (PAF) waste rock.** Reactive Rock - all Type IV rock and any unidentified rock types.

Figure 5 Waste Rock Material Types - Savage River mine

The work program commenced in August 2015, and is ongoing until 2018. Correspondence with Grange Resources (Roger Hill and Tony Ferguson) was undertaken to establish the project, followed by delivery of samples to UTAS Mineralogical evaluations of the column feed were performed (by XRD at UTAS) before homogenising each waste type, loading the cells and starting the experiments.

Scope of work

The scope of work undertaken to satisfy the research objectives were met by: (a) consulting with staff at Grange; (b) undertaking various geochemical techniques on the samples provided by Grange; and (c) evaluating all data collected to date to provide an update on the geochemical evolution of Long Plain waste materials. This interim report describes how the cells were constructed, documents the geochemical characteristics and presents kinetic trial results from the first eighteen months. The aim of this study is to provide Grange with an indication of the acid forming potential of the waste materials, to support the development of a best practice waste management plan for the Long Plains project.

Outcomes and recommendations

1 At the end of this investigation, waste Types A, B and D are NAF (after 156 weeks of testing) when using a cut-off criterion (PAF or NAF) of pH 4.5. Measurements of the bulk mineralogy confirm an abundance of neutraliser in Type A, so it is anticipated this will remain as NAF. For Types B and D results suggest that surface passivation reactions are likely occurring (enhanced by the presence of chlorite), and therefore will also likely remain NAF. Type B's neutralising properties will be enhanced if blended with Type A. Pyrite in Type D is larger in diameter and is encapsulated in silicates, it is likely that even on exposure it will remain NAF as the passivating layers appear to form quickly. Further investigations into the nature of the passivating layers and experiments to test their longevity are recommended to confirm their durability.

2 Further research investigations are being conducted outside of this project (with the University of Cape Town and Petrolab UK Ltd.) where the size fraction examinations of pyrite texture are being studied and a new biokinetic test. The results of these will be given to Grange Resources when finalised as this may be of use when planning future waste characterisation works.

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Summary of Baseline Water Quality Results

Executive Summary:

Water quality report for June 2018- June 2019 is not yet available (to follow when prepared)

(refer to the latest data Long Plains Water Quality Audit to June 2018. Attached to June 2018 annual report)

Prepared

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