Attachment R3

Waste Rock and AMD Management Plan

May 2022

Vista Gold Australia Pty Ltd

Mount Todd Project Area

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1. Introduction

1.1 Purpose of this report

This report documents the Waste Rock and AMD Management Plan for the mining of the Batman Pit, and construction of the lifts to TSF1, construction of TSF2 and the Waste Rock Dump (WRD) at the Mt Todd Project Area (MTPA). This Plan forms part of the Environmental Management Plan (EMP) for the MTPA and is considered a working document. It has been updated following formal assessment by Department of Primary Industry and Resources (DPIR) as part of the mining authorisation process in 2020 and submitted as an updated plan May 2022 to Department of Industry, Tourism and Trade (DITT).

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Tailings management is detailed in the Tailings Management Plan.

1.2 Scope

This *Waste Rock and AMD Management Plan* applies to all activities conducted under the direction of Vista Gold at MTPA.

The nature and scope of activities conducted at MTPA aims to appropriately geochemically characterise waste rock to ensure best practice management of the waste rock associated with Batman Pit operational activities and the associated WRD, low grade ore stockpiles and other infrastructure across the MTPA.

1.3 Purpose

This Plan forms part of the Environmental Management System (EMS) for the MTPA and is considered a working document. It has been updated following formal assessment by Department of Primary Industry and Resources (DPIR) as part of the mining authorisation process in 2020 and submitted as an updated plan May 2022 to Department of Industry, Tourism and Trade (DITT).

The purpose of this plan is to ensure the ongoing protection of land and waterways from waste rock extracted under MTPA operations.

1.4 Context

The Vista Gold Environmental Policy commits to conduct business in a manner that minimises any potential environmental impacts. Day-to-day management is implemented through the procedures and plans across Vista Gold's operations. This plan aims to integrate and coordinate existing resources into a coordinated approach.

1.5 Objective

The objective of this management plan is to provide advice on methods of control and management of waste rock at the MTPA. Specifically, this includes

- Structural integrity of the existing constructed landform
- Surface and groundwater quality

- Acid and Metalliferous Drainage (AMD) from the WRD
- To recognise the NT EPA's Recommendations from the 2013 EIS.

1.6 NT EPA Recommendations

The following recommendations were made by the NT EPA after review of the MTPA EIS submitted in 2013.

Recommendation 1

The scope of the geochemical test work that has been done must be expanded to include a more rigorous assessment of the potential environmental risk posed by non-PAG material given the key role that this material is proposed to play in providing the outer cladding for the mine landforms.

Recommendation 3

The Proponent must undertake a rigorous evaluation of alternative WRD cover designs prior to authorisation of the Project. Modelling work underpinning the design of covers, and subsequent monitored trial covers, must demonstrate that the covers can meet the required cover objectives within the context of the wet- dry cycling environment of the Top End and other biophysical factors that have the potential to affect cover integrity in the long term. The modelling must be subject to rigorous peer review by an independent party with practical experience with the issues that affect the real-world performance of the modelled cover system/s.

Recommendation 4

In designing and constructing waste rock facilities for the Project, the following principles must be adhered to:

- Lining of the surface drainage channels that are to be covered by the WRD with NAF waste rock to ensure that any clean natural flow-through does not come into contact with PAF or uncertain waste rock;
- No PAF or uncertain waste rock to be placed beneath operational or final WRD slopes;
- NAF waste rock or soil is required over the relatively flat top and any benches of the WRD to form a low net percolation cover, which should preferably be based on the store and release principle to avoid shedding excessive rainfall runoff over the side slopes.

For the high PAF waste rock proportion expected at Mt Todd this will necessitate a relatively low level WRD covering a large area, rather than the high pyramid shape proposed.

Recommendation 6

The proponent should provide substantially more detail about the construction of the waste rock dump with emphasis on incorporating best practice strategies to mitigate as far as practicable the future AMD risk of this structure.

Recommendation 22

The Proponent must consider in detail the costs and the benefits of backfilling the pit with PAF waste rock and/or tailings and an appropriate cover at mine closure in accordance with leading practice mine closure principles. The benefit/cost analysis should include partial backfilling scenarios through disposal of the more reactive material as well as the full backfilling option. Details should be provided to the DME (now DPIR).

Recommendation 23

Consideration must be given in the conceptual closure plan to methods for improving the water quality of the pit lake after closure if backfilling cannot be achieved.

Recommendation 25

Active water treatment is to continue at the mine site until such time as it can be demonstrated that successful treatment of all site AMD using passive treatment options is occurring in accordance with Recommendation 24.

1.7 Legislation, Standards and Guidelines

1.7.1 Legislation

Applicable legislation to waste rock management within the MTPA includes:

- *Mining Management Act*
- *Soil Conservation and Land Utilisation Act*
- *National Environment Protection Council (Northern Territory) Act*
- *Environmental Assessment Act*
- *Territory Parks and Wildlife Conservation Act*
- *Environmental Offences and Penalties Ac*
- *Waste Management and Pollution Control Act*

1.7.2 Guidelines

Applicable guidelines for waste rock management include:

- Draft Guidance, Materials Characterisation Baseline Data Requirements for Mining Proposals, March 2016. Department of Mines and Petroleum, Government of Western Australia.
- Managing Acid and Metalliferous Drainage (DITR, 2007).

2. Existing Environment

2.1 Activities

MTPA will be an operational mine site with an open pit operation – Batman Pit. Operational and processing activities are undertaken on the surface as well as proposed further water treatment and rehabilitation activities.

General open pit mining activities will be undertaken upon recommencement of mining, these include:

- Maintenance of plant and equipment
- Construction of processing plant and associated water infrastructure
- Maintaining access tracks/road
- Asset protection-controlled burning
- Weed mapping
- Weed control/treatment
- Water treatment and management

2.2 MTPA WRD issues

A waste rock dump (WRD) from previous mining is located on-site north of RP1.

The primary issue in regard to the WRD is the generation of Acid and Metalliferous Drainage (AMD). AMD is not a significant issue for the MTPA as this area of historical waste storage currently produces manageable volumes of AMD which enter RP1. Waste rock will be produced from the Batman Pit upon commencement of mining.

Potential site-specific issues associated with waste rock within the MTPA include:

- Current AMD leaching from WRD
- Exposure of potentially acid forming (PAF) material from waste rock from erosion of covering material
- Reduction in surface water and groundwater quality from sedimentation and erosion of the WRD
- Surface water and groundwater impact from potential acid seepage from the WRD

Minimising the potential for AMD to occur and managing fate of waste materials, appropriate construction and rehabilitation of the WRD can assist with avoiding potential impacts upon the surface water downstream receiving environment and groundwater.

2.2.1 Exemptions – arsenic

Geochemical characterisation of samples conducted by Vista Gold using long-term kinetic testing show that arsenic is only present in very low concentrations with concentrations decreasing rapidly after 10 weeks. These results indicate that arsenic is not considered a chemical of concern in the WDR, this conclusion is supported by historical data that show that arsenic has not been detected in natural surface waters at the Mt Todd site.

3. Objectives and Targets

The objectives of this Waste Rock and AMD EMP are to:

- Ensure the existing WRD and future landform structural integrity and biological communities are not comprised; and
- Minimise the impacts to the surrounding and downstream ground and surface water quality.

Vista Gold have set key targets to drive and measure performance towards achieving the overarching strategy/objective of environmental protection. These targets are defined in **Table 3-1.** As part of continual improvement, Vista Gold will review and assesses performance against these targets.

Vista Gold will apply the following management strategies which present the objectives and targets for the 2019-23 period (**Table 3-1** Waste Rock and AMD Management Procedure).

Table 3-1 Waste Rock and AMD Management Procedure

Specific			Measurable		Achievable	Timely	Relevant	
Strategies (What)	Actions (How)	Explanation (Why)	Responsibility (Who)	Measurement (Deliverable)	Targets	Target Dates	Key Performance Indicators	Non Conformance and Corrective Action
Monitoring for any occurrences of erosion and seepage / salt efflorescence.	Conduct quarterly inspections of the WRD and prioritise areas based on risks to the environment.	To identify for potential sources of surface or groundwater contamination.	Quarterly field inspection/ checklist undertaken by the Environmental Officer.	Findings to be documented and discussed at Environment team meetings. A risk assessment will be conducted where required to determine the level of significance and action required. Assess the need for the action to be ear marked for the current or following years' budget.	Conduct quarterly inspections of the WRD and monitor for any occurrences of erosion and seepage / salt efflorescence. Quarterly monitoring to be undertaken in January, April, July and October.	Annual	Documented notes from inspections and follow up risk assessments and actions required from team meetings. Changes in landform will be assessed against the previous monitoring quarter and whether changes are considered to be a risk or potentially a risk to the environment.	A review of field and reporting systems and process will be undertaken. Items not addressed will be re-evaluated for their priority status and updated into the MMP commitments.
Investigate AMD potential of waste rock generated.	Geochemical characterisation including PAF, NAF and metals of waste rock material prior to exhumation.	To determine fate of waste rock material.	Exploration department to submit drilling samples for laboratory analysis of AMD potential tests and PAF, NAF and metals analysis.	Laboratory analytical results received and interpreted.	Geochemical characterisation including PAF, NAF and metals of waste rock material prior to exhumation.	Annual Continuous	Documented data review and interpretation of waste rock material results. Benign material may be used for WRD close out or for construction materials on-site. PAF or metalliferous waste rock to remain in pit boundaries. No incidents relating to erroneous identification of placement of NAF/PAF material.	

Specific			Measurable		Achievable	Timely	Relevant	
Manage any re-use of waste rock material.	Geochemical characterisation of waste rock material including PAF, NAF and metals prior to re-use on-site. PAF or metalliferous material not to be re-used at surface level.	To determine suitability of material for re-use within the MTPA.	Documented sampling notes, sample collection and laboratory analysis by Exploration Department prior to re-use waste rock material.	Laboratory analytical results received and interpreted.	Geochemical characterisation of waste rock material including PAF, NAF and metals prior to re-use on-site. PAF or metalliferous material not to be re-used at surface level.	Annual Prior to reuse on-site	Documented data review and interpretation of waste rock material results. No incidents relating to erroneous identification of placement of NAF/PAF material.	A review of field and reporting systems and process. Assess the need for the action to be ear marked for the current or following years' budget. Items not addressed will be re-evaluated for their priority status and updated into the MMP commitments.
	Validation waste rock materials which have been re-used on the site surface.	To determine suitability of material for re-use within the project area.	Environmental Officer	Laboratory analytical results received and interpretation.	Undertake in-situ geochemical characterisation (PAF / NAF and metals analysis) of waste rock materials which have been re-used on-site.	December	Documented data review and interpretation of waste rock material results. No incidents relating to erroneous identification of placement of NAF/PAF material.	
Monitor groundwater quality	Monitor groundwater bores as per MTPA Groundwater Monitoring Program	To detect any AMD impact upon groundwater.	Environmental Officer to log water quality data into a database that is available for ready interrogation.	Data to be documented and discussed at the Environment team meeting.	Monitor groundwater bores as per MTPA Groundwater Monitoring Program.	Annual As per water monitoring program.	Water quality database updated immediately following collection or receipt of data. Actions to address deterioration in water quality undertaken immediately. Periodic review of data collection methods to ensure that quality	If surface or groundwater quality data deterioration be detected (as determined by Environmental Officers on review of water data), an environmental incident will be logged. The

Specific			Measurable		Achievable	Timely	Relevant	
							assurance and control is adequate.	identification of an incident will trigger internal notifications, reporting requirements, investigations and associated corrective and preventative actions. The level of investigation and subsequent corrective actions will be dependent on the potential risk associated with the incident. Corrective and preventative actions that may result will depend on the root cause identified but may include: Increased sampling (both frequency and location) for waste rock characterisation; Increased sampling (frequency and location) of surface water,
Monitor surface water quality	Monitor surface water bodies as per the MTPA Surface Water Monitoring Program	To detect any AMD impact upon surface water.	Environmental Officer to log water quality data into a database that is available for ready interrogation.	Data to be documented and discussed at the Environment team meeting.	Monitor surface water bodies as per the MTPA Surface Water Monitoring Program	Annual As per water monitoring program.	As above.	

Specific			Measurable		Achievable	Timely	Relevant	
								groundwater, sediments in vicinity of impacted area; Remove incorrectly placed materials and place as per approved plans; Increase level of monitoring of fauna and vegetation conditions; Construction of drainage systems to capture seepage or runoff; Neutralising of PAF materials where practicable; Review of current management plan and procedures to assess the practicability of their implementation or to identify potential for improvement; and

Specific			Measurable		Achievable	Timely	Relevant	
								Reinforce to personnel correct waste rock management procedures. Notification of incident to relevant government authorities as per legislative requirements.
Establish surface and groundwater internal trigger values for action.	Engage consultant to identify thresholds for action (prior to compliance thresholds being reached).	Early detection of potential surface and groundwater impacts.	Environmental Officer	Threshold levels identified	Alerts within new water quality monitoring database for early threshold exceedance detection.	August	Early threshold levels determined.	A review of field and reporting systems and process. Assess the need for the action to be ear marked for the current or following years' budget. Items not addressed will be re-evaluated for their priority status and updated into the MMP commitments.

4. Management and Mitigation

4.1 Responsibilities

The management of the waste rock and associated AMD involves various team members with varying levels of responsibility. **Table 4-1** Responsibility matrixshows the requirements for managing the waste rock and AMD.

Table 4-1 Responsibility matrix

Task Description	Employees & Contractors	Environmental Officers	Environment & Community Manager	Mine Manager	General Manager	All Managers
Understand and apply all required procedures and systems in regards to waste rock management	Y		Y			
Report any non-compliance with the waste rock management requirements through the Event/incident reporting system	Y	Y	Y			
Undertake surface and groundwater monitoring as identified in Table 3-1 Waste Rock and AMD Management Procedure		Y	Y		Y	
Ensure all employees and contractors are aware of all required procedures and systems to waste rock management and are provided with all required resources to implement the requirements effectively	Y	Y	Y		Y	
Ensure all employees and contractors are provided with appropriate waste rock management related training	Y	Y	Y		Y	
Undertake annual review of the waste rock and AMD EMP		Y	Y			
Liaise with the Mine Manager and General Manager to discuss MMP commitments			Y	Y	Y	
Regularly liaise with the Environment Manager and General Manager regarding any proposed activities at the MTPA			Y	Y	Y	
Maintain communications and progress on mine operations General meetings and as required				Y	Y	Y
Engage consultant to undertake adequacy review of waste characterisation data at MTPA and develop sampling plan		Y	Y	Y		
Submit consultant report and sampling plan to DPIR and continue investigation/rehabilitation negotiations			Y			

4.2 MTPA PAF Best Practice Principles

PAF management principles are incorporated into the management of PAF waste at the MTPA and form the basis of this Plan.

The principles below are general 'Best Practice Principals' which are applied on site. Other viable options may be applied on site specific bases and will be detailed. Appropriate options for placement of PAF material will be detailed in the MMP and this EMP after characterisation.

MTPA PAF Best Practice Principles –

- Implement an ongoing geochemical characterisation and investigation programme for all future and current mining operations
- In pit identification and marking out of geochemical rock types (PAF)
- Segregation and selective placement of AMD rock types to minimise the exposure of PAF rock to atmospheric oxygen and leaching
- Exclude PAF from the base of dumps and fill zones under final outer slopes. Note that exclusion of problematic materials from under slopes eliminates the need for engineered covers on slopes and significantly reduces rehabilitation, water management and post-closure costs
- Bottom up construction in 30 m lift heights to minimise the development of convective/advective gas movement within the dump, to minimise the exposure time of reactive PAF rock and facilitate selective placement of AMD rock types
- Traffic and machine compaction of the surface of each list to reduce permeability and control diffusive transfer of oxygen into the dump
- Cover all inactive PAF fill zones with a compacted NAF layer prior to commencement of the wet season
- Active PAF fill zones should be progressively covered with fresh PAF within the lag period (lag times to be estimated as part of the geochemical characterisation programme utilising column leach and kinetic NAG tests). Pending the results of these tests, assume a lag of not more than 3 months
- Construction of the waste dump designed to maximise surface runoff and minimise infiltration
- Diversion of clean upstream catchments or installation of underdrainage system to convey upstream run-on, storm water runoff and dump seepage
- Selective placement of low As NAF rock (<100 mg/L) on final dump top surfaces and slopes to ensure good quality runoff, control erosion and promote vegetation
- Only low As NAF rock should be used for general construction fill, engineering works or road base. Pending the findings of the proposed further geochemical investigations only NAF materials with less than 100 mg/kg As should be used for these purposes. For offsite use 30 mg/kg should be sued as a cut off.

4.3 Waste Rock Characterisation

During construction of the waste rock dump, potential acid forming (PAF) and uncertain waste materials will be deposited in the interior of each lift of the waste dump. Non-potential acid forming (non-PAF) material will be deposited to the outer edge of each lift. Predicted waste rock and ore quantities are provided in **Table 4-2** Annual Mine Production Schedule

At least a 10 m rind of non-PAF material will surround all uncertain and PAF type waste material. The proposed design incorporates an angle of repose slope of 1.5 vertical to 1 horizontal with catch benches of 8 m every 30 m in height. As each 30 m is finished, a geo-synthetic clay liner (GCL) will be laid on top of the outer 15 m of the lift at an outward slope of at least 1.5%. This will promote drainage to the outer portions of the dump where drainage channels will allow storm water to drain without contacting any of the PAF material.

Geochemical characterisation studies have been conducted on samples of waste rock to characterise waste rock in relation to its potential to generate acid metalliferous drainage (AMD) and this information will be used to inform the rehabilitation programs for the key on-site mine waste repositories (TSF1, TSF2 and the WRD). In general, PAF material dominates the western half of the pit with the non-acid forming (NAF) in the east (**Figure 4-1** Acid-base Accounting Criteria for the Proposed Batman Pit).

Some of the waste material at Mt Todd contains sulphide minerals, which can create issues with acid generation. Tetra Tech provided MDA with classification criteria for waste material so that the resulting production schedule can include the segregation of waste types for proper handling. Waste was classified into three classes based on total sulfur content as follows:

Non-PAG Total Sulfur <= 0.25%

Uncertain Total Sulfur > 0.25% and <= 0.40%

PAG Total Sulfur > 0.40%

Material classified as uncertain or potentially acid generating (“PAG”) material was scheduled so that it could be placed inside of the ultimate waste dump. Non-potentially acid generating material (“Non- PAG”) was scheduled to be used to encapsulate the uncertain and PAG material, and for reclamation cover and construction material for TSF1 and TSF2. Due to the scheduled timing of mining of Non- PAG material, some of this material will be stockpiled on the outer portions of the waste dump and rehandled as required.

Table 4-2 Annual Mine Production Schedule

			Pre-Prod	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Total
Total Mined	*StkPl	K Tonnes	5,601	5,183	15,028	7,336	7,850	9,841	7,749	696	-	-	-	3,080	725	-	-	-	-	-	-	-	63,090
		g Au/t	0.81	0.48	0.52	0.44	0.44	0.47	0.48	0.48	-	-	-	0.47	0.49	-	-	-	-	-	-	-	0.51
		K Ozs Au	145	80	253	105	111	147	121	11	-	-	-	47	11	-	-	-	-	-	-	-	1,031
	Crusher	K Tonnes	1,587	13,033	15,550	12,360	7,368	17,750	17,750	12,532	7,779	13,866	14,523	17,750	17,799	11,307	13,829	9,149	-	-	-	-	203,931
		g Au/t	0.68	1.27	0.90	1.04	0.80	0.95	1.07	0.98	0.60	0.57	0.60	0.65	0.78	0.90	0.96	0.99	-	-	-	-	0.87
		K Ozs Au	35	534	451	413	189	542	611	394	150	253	280	373	446	328	426	292	-	-	-	-	5,716
	Total Ore Mined	K Tonnes	7,188	18,216	30,578	19,696	15,218	27,591	25,499	13,229	7,779	13,866	14,523	20,830	18,523	11,307	13,829	9,149	-	-	-	-	267,021
		g Au/t	0.78	1.05	0.72	0.82	0.61	0.78	0.89	0.95	0.60	0.57	0.60	0.63	0.77	0.90	0.96	0.99	-	-	-	-	0.79
		K Ozs Au	180	614	704	518	300	689	732	404	150	253	280	420	458	328	426	292	-	-	-	-	6,747
	NonPag_Wst	K Tonnes	1,869	13,139	8,983	34,996	31,023	17,205	36,983	42,426	30,746	17,312	10,139	4,747	331	82	4	-	-	-	-	-	249,986
	Pag_Wst	K Tonnes	9,522	8,716	21,720	18,373	25,260	36,707	25,906	20,701	27,463	29,623	28,073	24,248	10,735	3,923	1,852	412	-	-	-	-	293,234
	Un_Wst	K Tonnes	2,675	4,048	7,920	9,830	13,491	12,352	11,622	14,164	13,068	12,565	11,870	11,494	2,619	383	10	-	-	-	-	-	128,111
	Total Waste Mined	**K Tonnes**	**14,066**	**25,904**	**38,623**	**63,199**	**69,774**	**66,264**	**74,510**	**77,291**	**71,277**	**59,499**	**50,082**	**40,490**	**13,685**	**4,388**	**1,866**	**412**	**-**	**-**	**-**	**-**	**671,331**
	Total Tonnes Mined	**K Tonnes**	**21,254**	**44,120**	**69,201**	**82,895**	**84,992**	**93,856**	**100,010**	**90,520**	**79,056**	**73,365**	**64,605**	**61,320**	**32,208**	**15,695**	**15,695**	**9,561**	**-**	**-**	**-**	**-**	**938,352**
	Strip Ratio	W:O	1.96	1.42	1.26	3.21	4.59	2.40	2.92	5.84	9.16	4.29	3.45	1.94	0.74	0.39	0.13	0.05					2.51
Re-Handle Material	HG_StkPl	K Tonnes	-	2,553	-	633	-	-	-	369	-	-	-	-	-	166	-	-	-	-	-	-	3,721
		g Au/t	-	1.19	-	1.17	-	-	-	1.20	-	-	-	-	-	1.09	-	-	-	-	-	-	1.18
		K Ozs Au	-	97	-	24	-	-	-	14	-	-	-	-	-	6	-	-	-	-	-	-	141
	MG_StkPl	K Tonnes	830	515	-	3,209	-	-	-	1,045	-	-	-	-	-	404	-	-	-	-	-	-	6,004
		g Au/t	0.69	0.66	-	0.66	-	-	-	0.71	-	-	-	-	-	0.70	-	-	-	-	-	-	0.67
		K Ozs Au	18	11	-	68	-	-	-	24	-	-	-	-	-	9	-	-	-	-	-	-	130
	LG_StkPl	K Tonnes	1,115	1,649	2,200	1,548	10,431	-	-	3,804	10,019	3,884	3,227	-	-	5,872	3,921	5,694	-	-	-	-	53,365
		g Au/t	0.49	0.51	0.45	0.52	0.49	-	-	0.52	0.43	0.40	0.40	-	-	0.41	0.40	0.40	-	-	-	-	0.44
		K Ozs Au	18	27	32	26	163	-	-	64	138	50	41	-	-	77	50	73	-	-	-	-	759
	Leach Re-handle	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,907	10,447	-	-	-	13,354
		g Au/t	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	0.54	-	-	-	0.54
		K Ozs Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	181	-	-	-	232
	Total Re-Handle	**K Tonnes**	**1,945**	**4,717**	**2,200**	**5,390**	**10,431**	**-**	**-**	**5,218**	**10,019**	**3,884**	**3,227**	**-**	**-**	**6,443**	**3,921**	**8,601**	**10,447**	**-**	**-**	**-**	**76,444**
		g Au/t	**0.58**	**0.89**	**0.45**	**0.68**	**0.49**	**-**	**-**	**0.61**	**0.43**	**0.40**	**0.40**	**-**	**-**	**0.44**	**0.40**	**0.45**	**0.54**	**-**	**-**	**-**	**0.51**
		K Ozs Au	**36**	**135**	**32**	**118**	**163**	**-**	**-**	**102**	**138**	**50**	**41**	**-**	**-**	**92**	**50**	**123**	**181**	**-**	**-**	**-**	**1,262**
	Waste Re-handle	K Tonnes	0	-	668	-	-	-	-	-	-	-	-	-	1,169	1,298	1,456	2,140	1,420	-	-	2,156	10,308
	Sorter Rejects	K Tonnes	353	1,775	1,775	1,775	1,780	1,775	1,775	1,775	1,780	1,775	1,775	1,775	1,780	1,775	1,775	1,484	-	-	-	-	26,702
	Sorter Reject Re-handl	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28,164	28,164

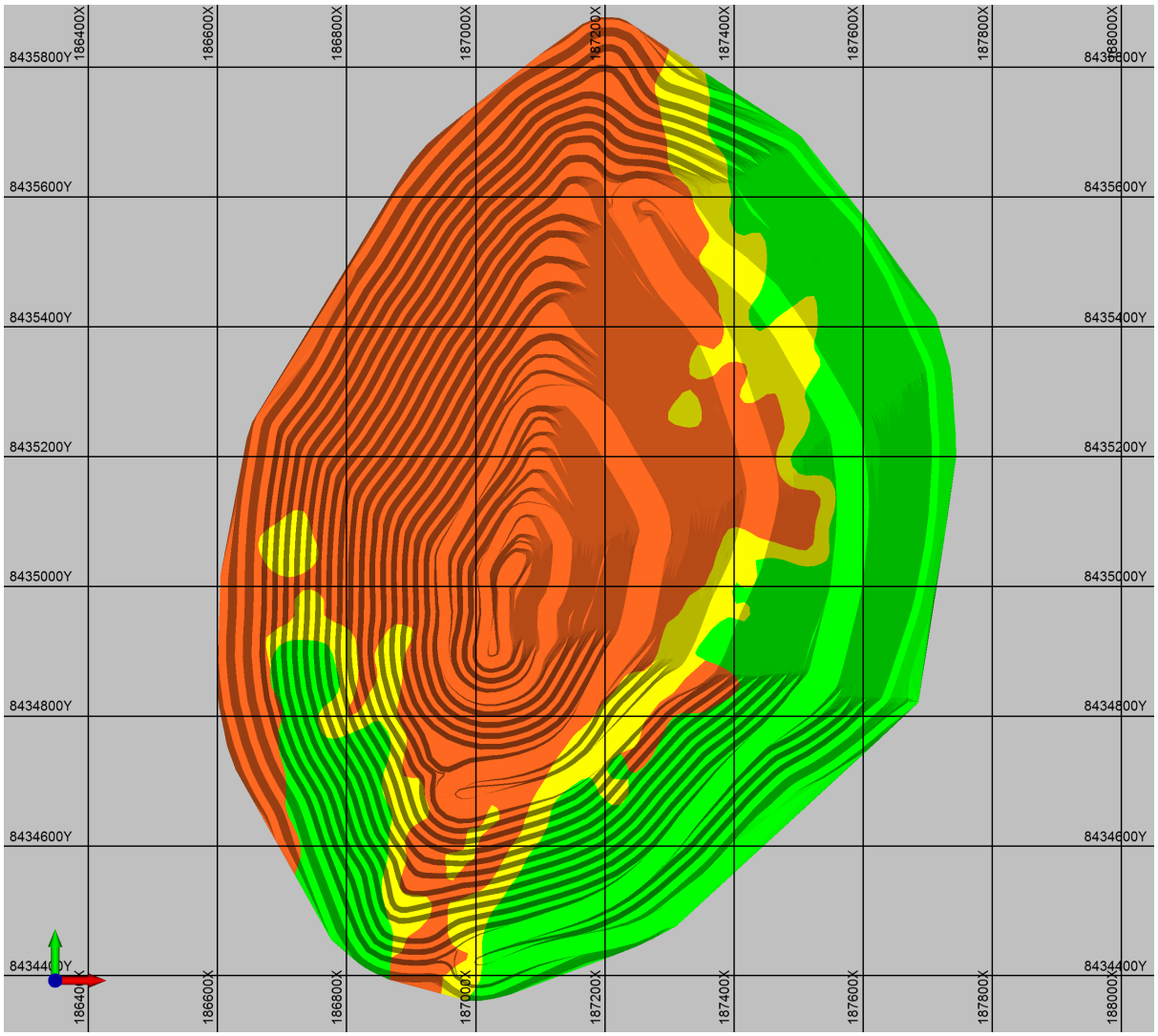

Figure 4-1 Acid-base Accounting Criteria for the Proposed Batman Pit

Orange = PAF, yellow = uncertain and green = NAF

4.4 Stockpiling of NAF (non-PAG)

It is highly unlikely that all NAG (non-PAG) material will be mined immediately when it is required for general construction, fill, WRD covers and rehabilitation works. Therefore, stockpiling and double handing NAG (non-PAG) will be inevitably required. A designated NAG (non) stockpile will be identified which may be within the existing dump foot print. When re-handling, a sacrificial 2 m layer at the base of any NAG (non) stockpile will be left in place to ensure no mixing with PAF (PAG), UC or unclassified material is possible.

Waste from ore processing (approximately 253 Mt) will be disposed to TSF1 and TSF2. The balance of the NAF material from the pit (approximately 51Mt) will be used for construction (TSF1 raising, TSF2 and site roads) and cover (HLP, TSF1 and TSF2) requirements.

4.5 Tailings Characterisation

Tailings characterisation from an AMD perspective was undertaken as part of the original EIS (NSR Environmental Consultants 1992), and Tetra Tech (2013). Historical methods for tailings characterisation include:

- static testing (ABA, elemental analysis) on the solids and supernatant, and kinetic testing on tailings with similar total sulfur content as later tailings
- a site investigation in 2011 focusing on tailings solids, porewater and supernatant to assess the affinity for acid generation and migration associated with the current tailings storage facility (RP7/TSF1)
- static testing in 2010 including Synthetic Precipitation Leaching Procedure, ABA and XRD assessments on tailings solids and water quality analysis on the supernatant
- Static testing in 2011/12 which included Synthetic Precipitation Leaching Procedure, ABA and XRD assessments on the tailings solids, water quality analysis on the supernatant and kinetic humidity cell testing

Similar testing is proposed to be undertaken when mining commences, however, techniques or methods maybe modified as additional analysis methods evolve.

Table 4-3 AMD Waste Rock Management Summary

Key Parameter for development of Waste Classification Criteria		
Material Colour Code	**Waste Rock Classification**	**Management procedure**
Green	NAF NPR > 2 Total S < 0.25%	General fill,
	Low NAF (1) NPR > 2 Total S <0.25% As < 100 mg/kg	Use in construction WRD covers and rehab for outer slopes
	Low NAF (2) NPR > 2 Total S <0.25% As < 30 mg/kg	NAF materials for offsite use
Colour to be determined	Uncertain NPR > 2 & Total S >0.25% NPR<2 & Total S<0.25%	Treat as PAF
Yellow	PAF (LC) 1 < NPR > 2 >0.25% Tot S <0.4 %	Treat as PAF
Red	PAF NPR < 1 Tot S >0.4%	No stockpiling Immediate placement in WRD within designated exposure times (3 months nominal)

4.5.1 Placement of NAF (non-PAG)

Like PAF (PAG) material, tracking the placement locations and dates by NAF blocks shall be undertaken when using NAF (non-PAG). This allows for auditable AMD management has applications for closure.

4.6 Mine Waste Facilities

Total contained waste tonnage is 671 million tonnes.

Non-PAG mine waste will be used for construction and final reclamation cover for the mine. The construction material will be used for tailings dam construction at the tailings storage facilities (“TSF 1” and “TSF 2”). Other Non-PAG material will be used for reclamation purposes covering tailings and other facilities at the end of the mine life. Sorter tailings will be generated from the process plant sorter and hauled to a temporary stockpile near the sorter. This material is considered Non-PAG and will be rehandled at the end of the mine life as part of the reclamation material.

The amount of material that would be required to be mined for construction and reclamation. Theses totals are shown in

Table 4-4 Non-Pag Construction and Reclamation Requirements and Schedule

Table 4-4 Non-Pag Construction and Reclamation Requirements and Schedule

	Units	Yr -1	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Total
Total TSF	K m^3	850	540	1,590	1,590	460	460	410	520	640	650	720	730	750	690	730	1,070	710	-	-	-	13,110
	K Tonnes	1,700	1,080	3,180	3,180	920	920	820	1,040	1,280	1,300	1,440	1,460	1,500	1,380	1,460	2,140	1,420	-	-	-	26,220
Reclamation Material Requirements	**Units**	**Yr -1**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16**	**Yr 17**	**Yr 18**	**Yr 19**	**Total**
Sorter Reject to TSF 1	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12,108	12,108
Sorter Reject to TSF 2	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16,056	16,056
Total Sorter Reject Rehandle	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28,164	28,164
Tsf1_Closure	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	288	1,056	1,344
Tsf2_Closure	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	388	1,100	1,488
Total NAF	K Tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	676	2,156	2,832

4.7 Proposed WRD Design

4.7.1 Existing WRD and RP1

RP1 is unlined facility with a clay and earthen wall initially constructed for the purpose of water supply for prior operations and to contain the WRD runoff. The quality of water within the pond is and has been historically poor with high metal contents and low pH ranges. At present, RP1 is exclusively an AMD containment pond, however during operations it will also be a source of water for the processing plant, via the WTP.

4.7.2 Expanded WRD

The existing WRD contains approximately 16 Mt of waste rock and this will be expanded to provide capacity of around 650 Mt. Most of the material to be placement in the WRD will come from the extension to the Batman Pit. Additional material destined for the WRD include existing materials from the process plant area and, potentially, sludge from the WTP. These additional sources will make up minor amounts in terms of volume.

A total of 286 Mt of PAF material is planned to be placed in the WRD. A further 124 Mt of waste rock classified as uncertain, along with the existing 16 Mt will form the core of the planned WRD.

A geochemical model was produced of the proposed WRD to estimate water chemistry in RP1 during mining. The results indicated that seepage waters from the WRD would likely be acidic with an approximate pH 4. Modelled concentrations of surface water chemistry in RP1 (i.e. WRD leachate diluted by rainfall) revealed the following concentrations:

- Cobalt at 0.136 mg/L;
- Copper at 0.569 mg/L;
- Cadmium at 0.007 mg/L;
- Sulfate at 115.4 mg/L;
- Nickel at 0.173 mg/L; and
- Lead at 0.023 mg/L.

AMD discharge from the WRD will enter RP1 and provide a water source for the processing plant.

Three proposed WRD designs were modelled to estimate likely seepage rates post-closure and capping. The modelled designs produced acidic pH seepage due to the minimal alkalinity in the NAF rock to neutralise the acidity generated by the PAF rock.

The model indicated that by using the preferred closure design the amount of water that will travel through the facility is minimal (i.e. it reaches a steady state of 4 – 5 m^3/h in year three after closure). However, a thicker GCL cover could be placed on the WRD benches than was modelled (52 m rather than 25 m) so modelled seepage rates would be lower if this new cover was incorporated into the seepage model. This discharge water is likely to remain acidic and if not managed this AMD has the potential to contaminate surface water and groundwater.

Error! Reference source not found. details the proposed WRD design at the end of Phase 1, and **Figure 4-13** shows proposed WRD design at the completion of mining.

Figure 4-2 Waste Rock Dump Year -1

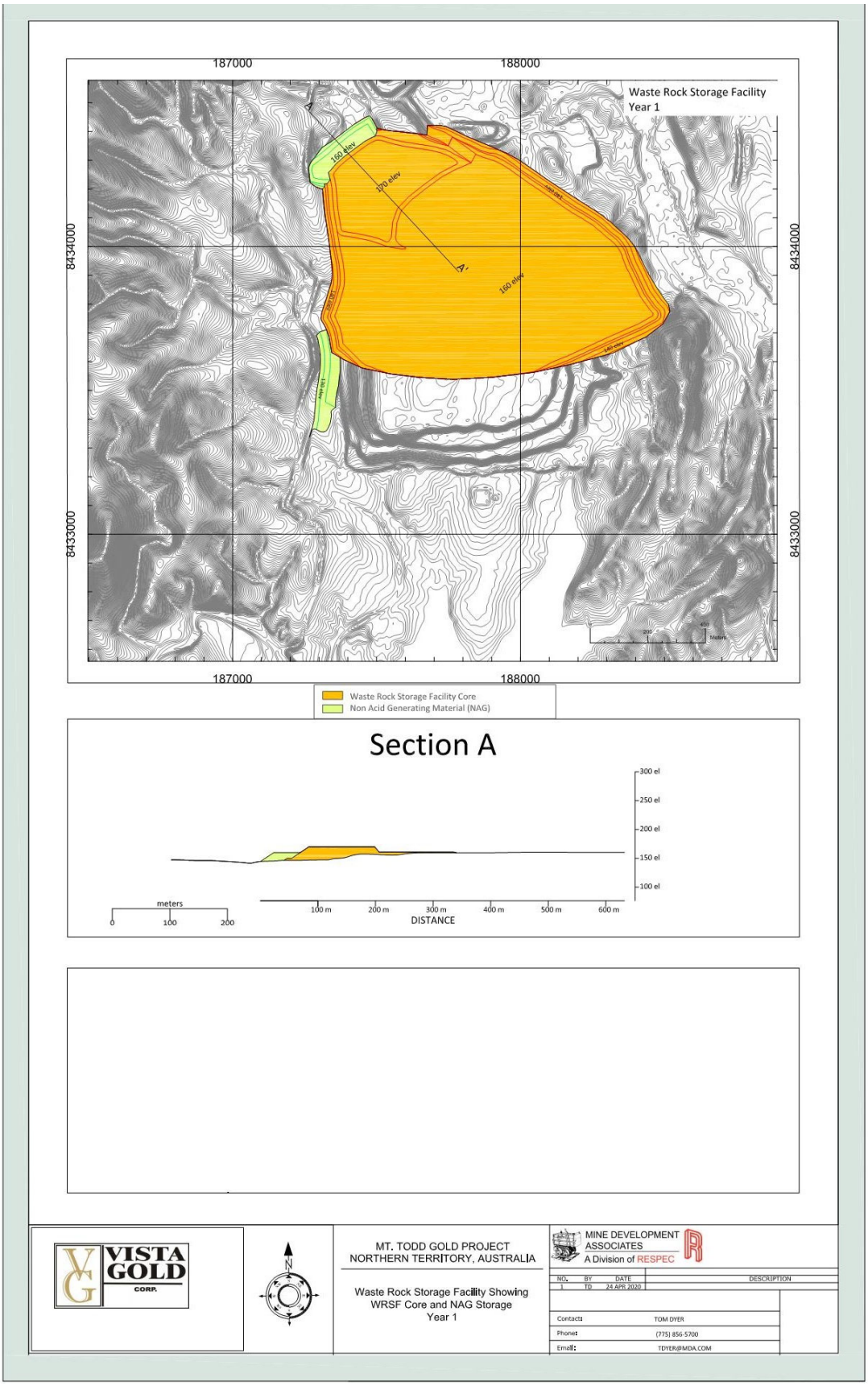

Figure 4-3 Waste Rock Dump Year 2

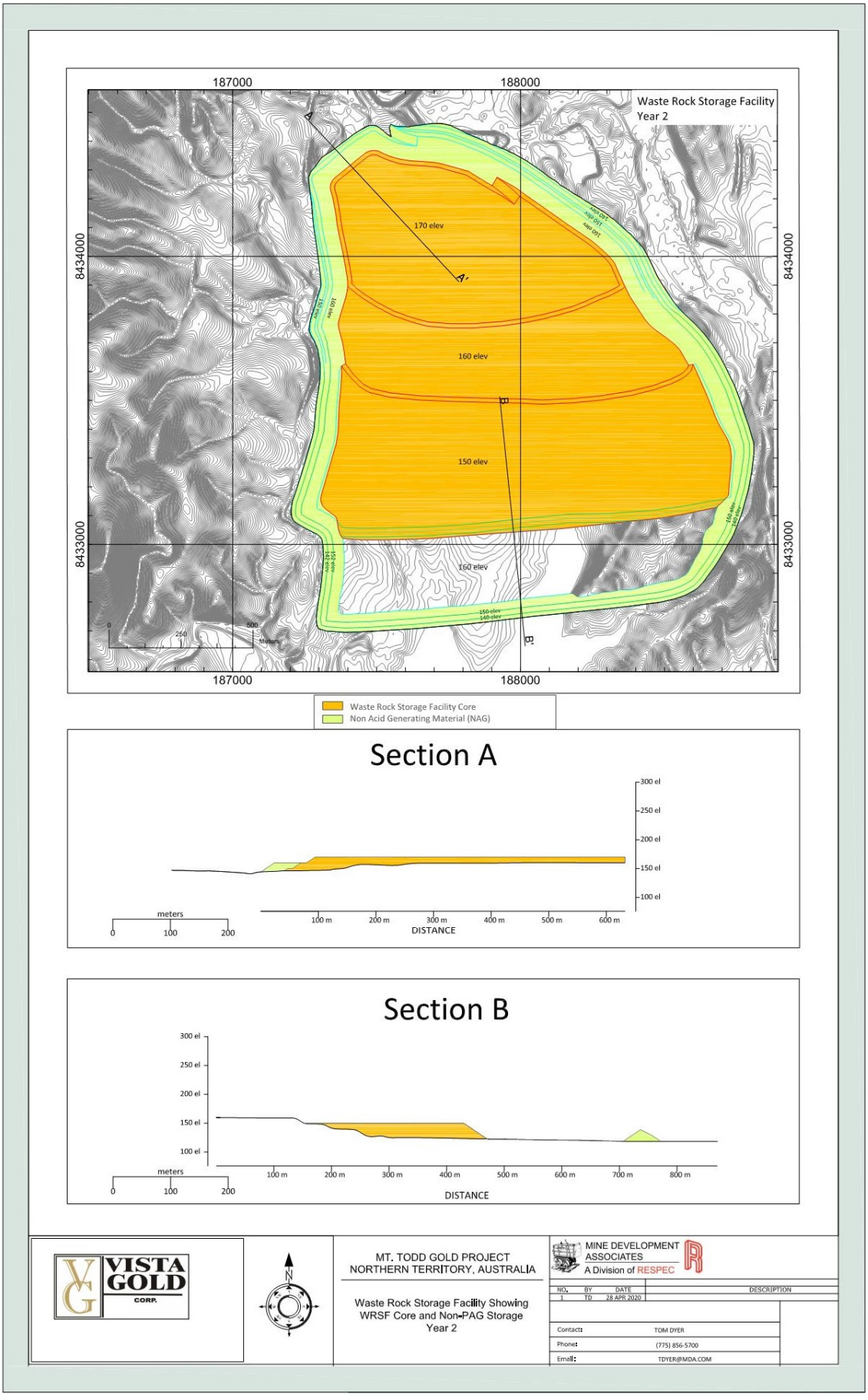

Figure 4-4 Waste Rock Dump Year 3

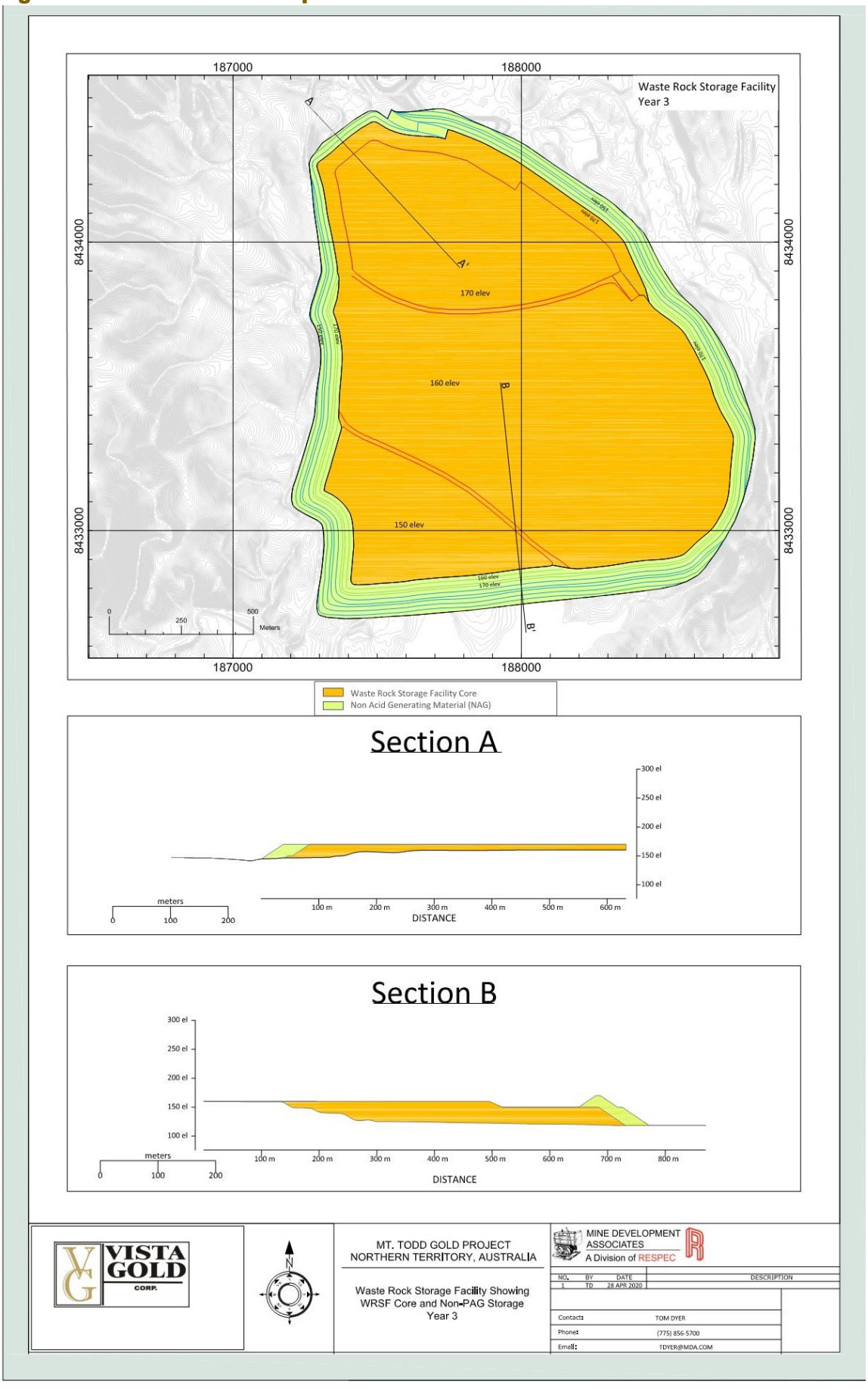

Figure 4-5 Waste Rock Dump Year 4

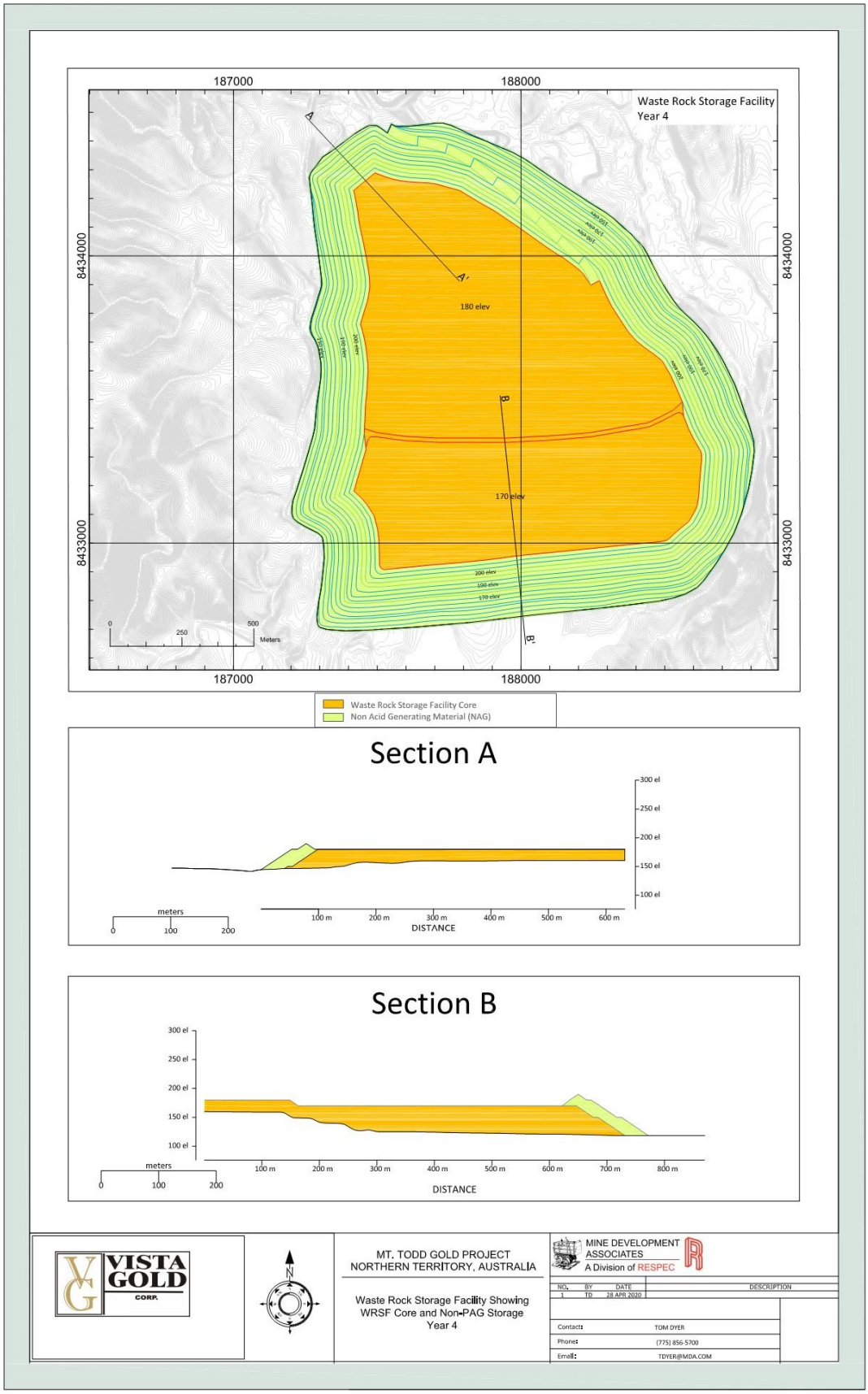

Figure 4-6 Waste Rock Dump Year 5

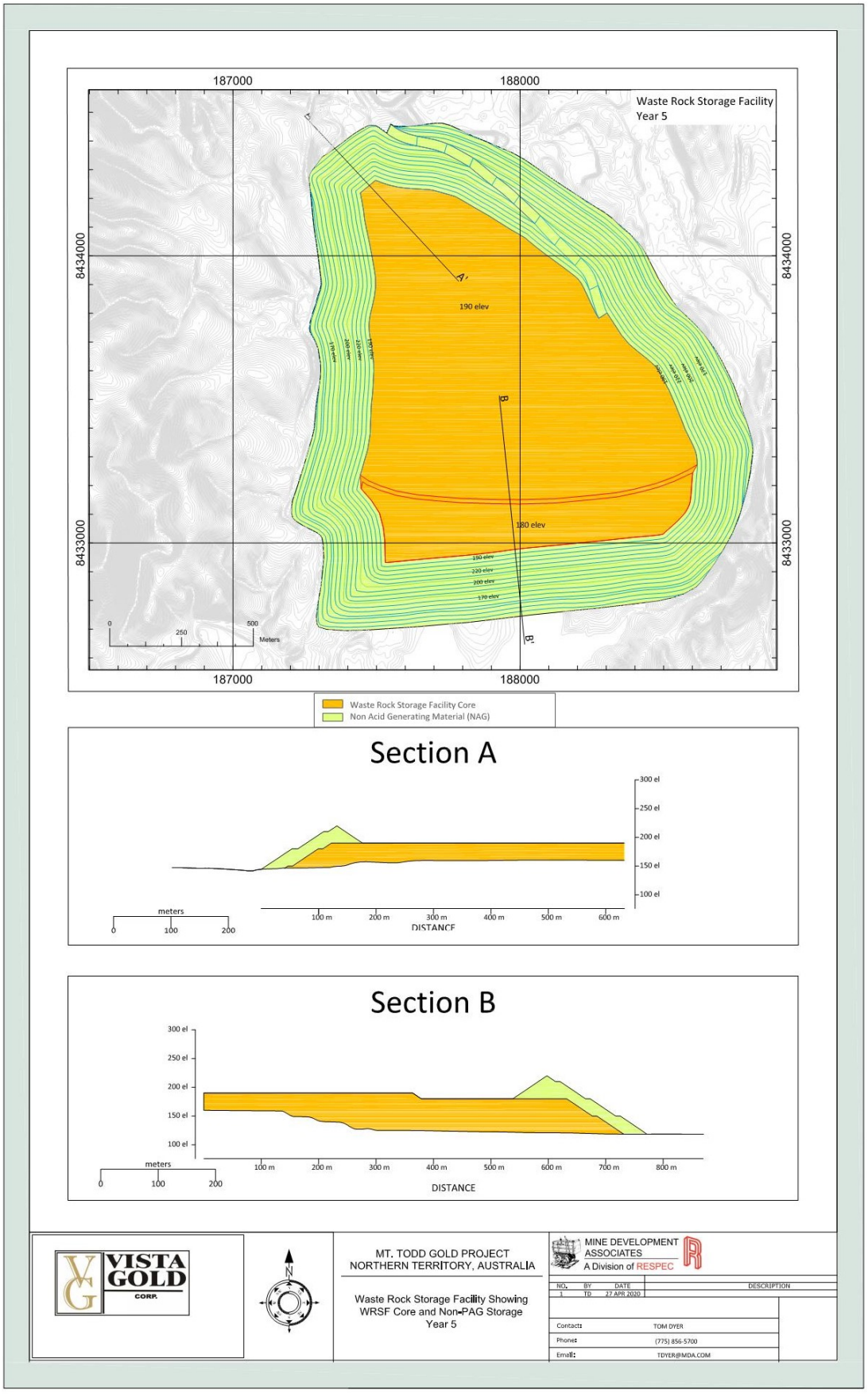

Figure 4-7 Waste Rock Dump Year 6

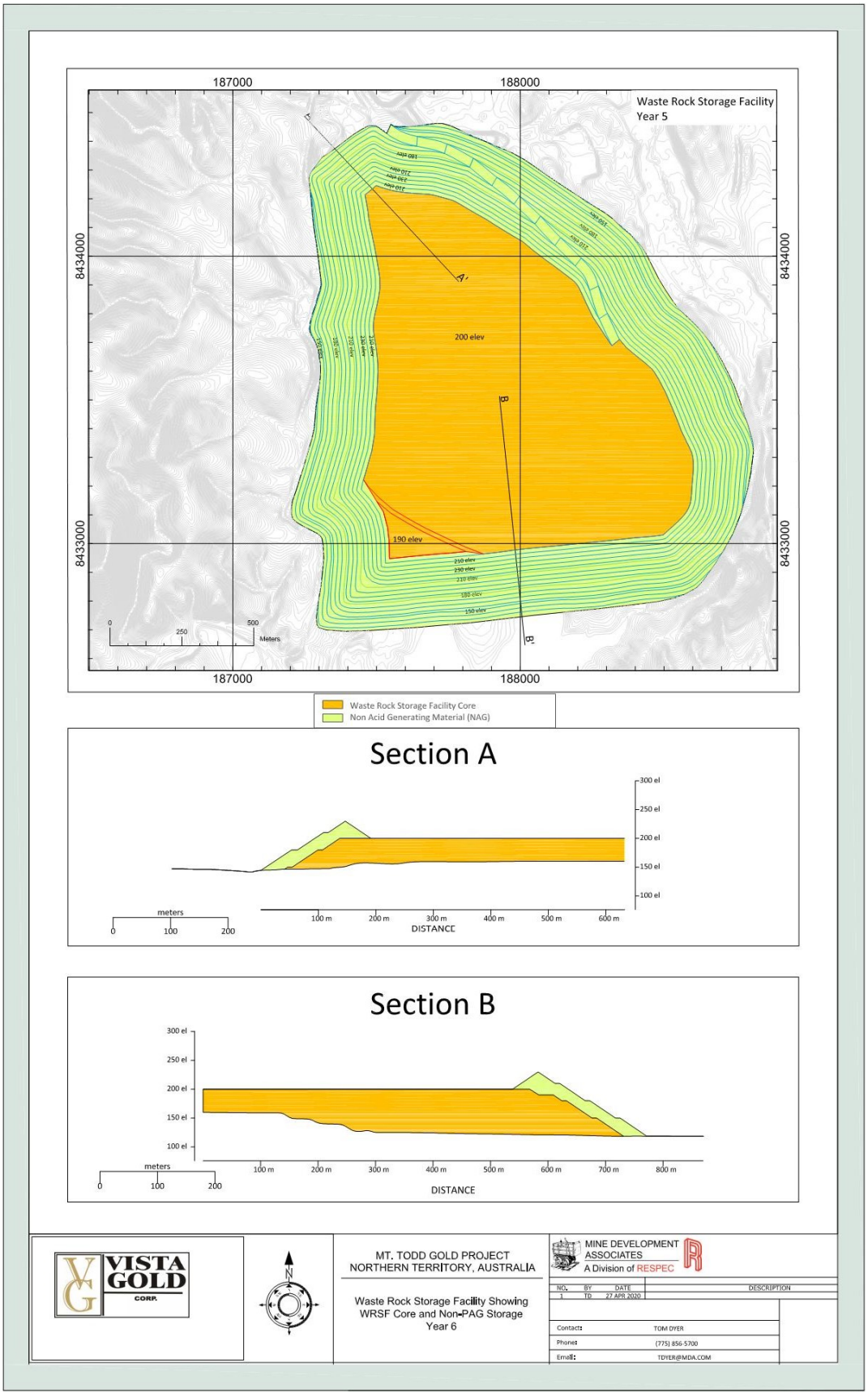

Figure 4-8 Waste Rock Dump Year 7

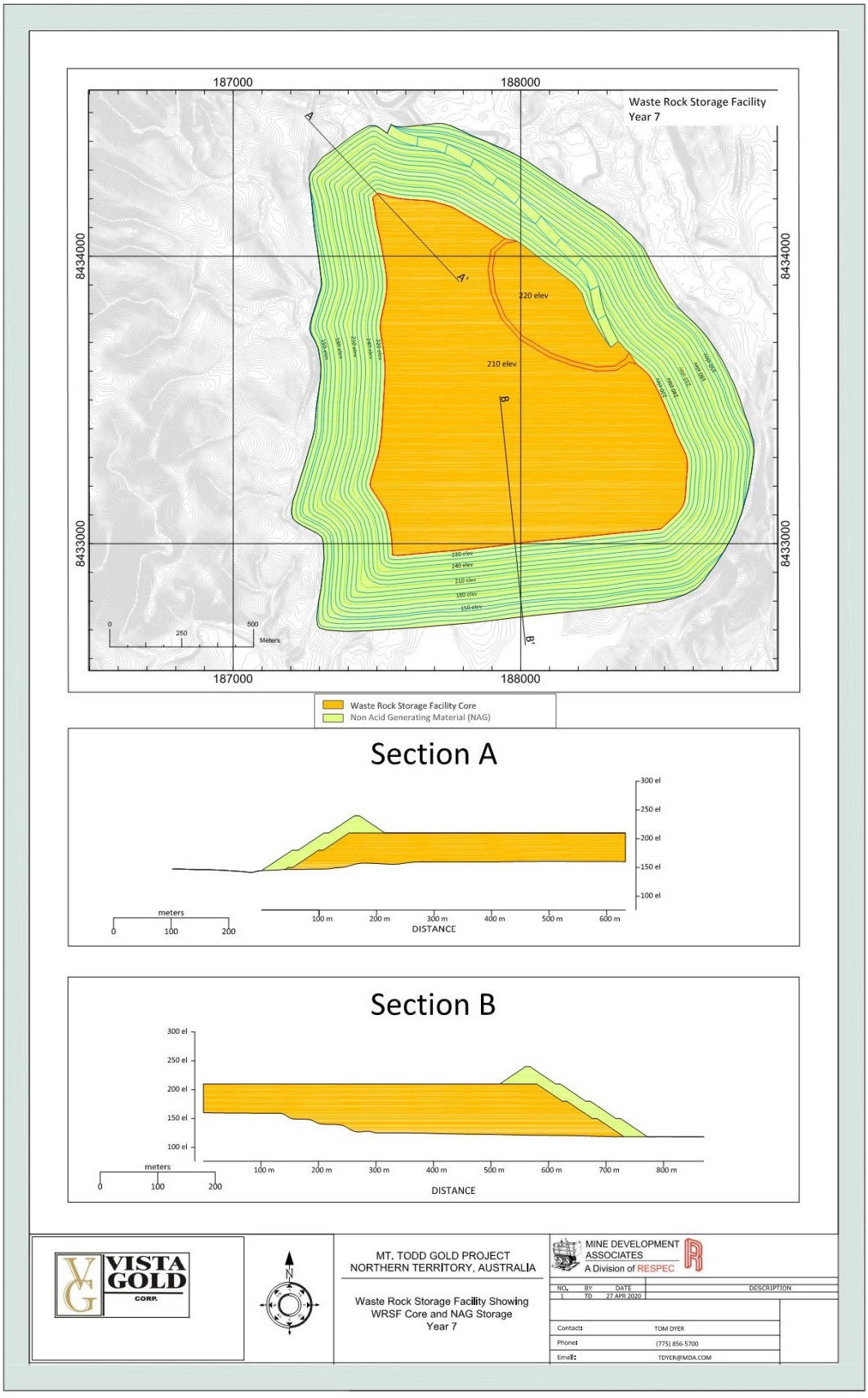

Figure 4-9 Waste Rock Dump Year 8

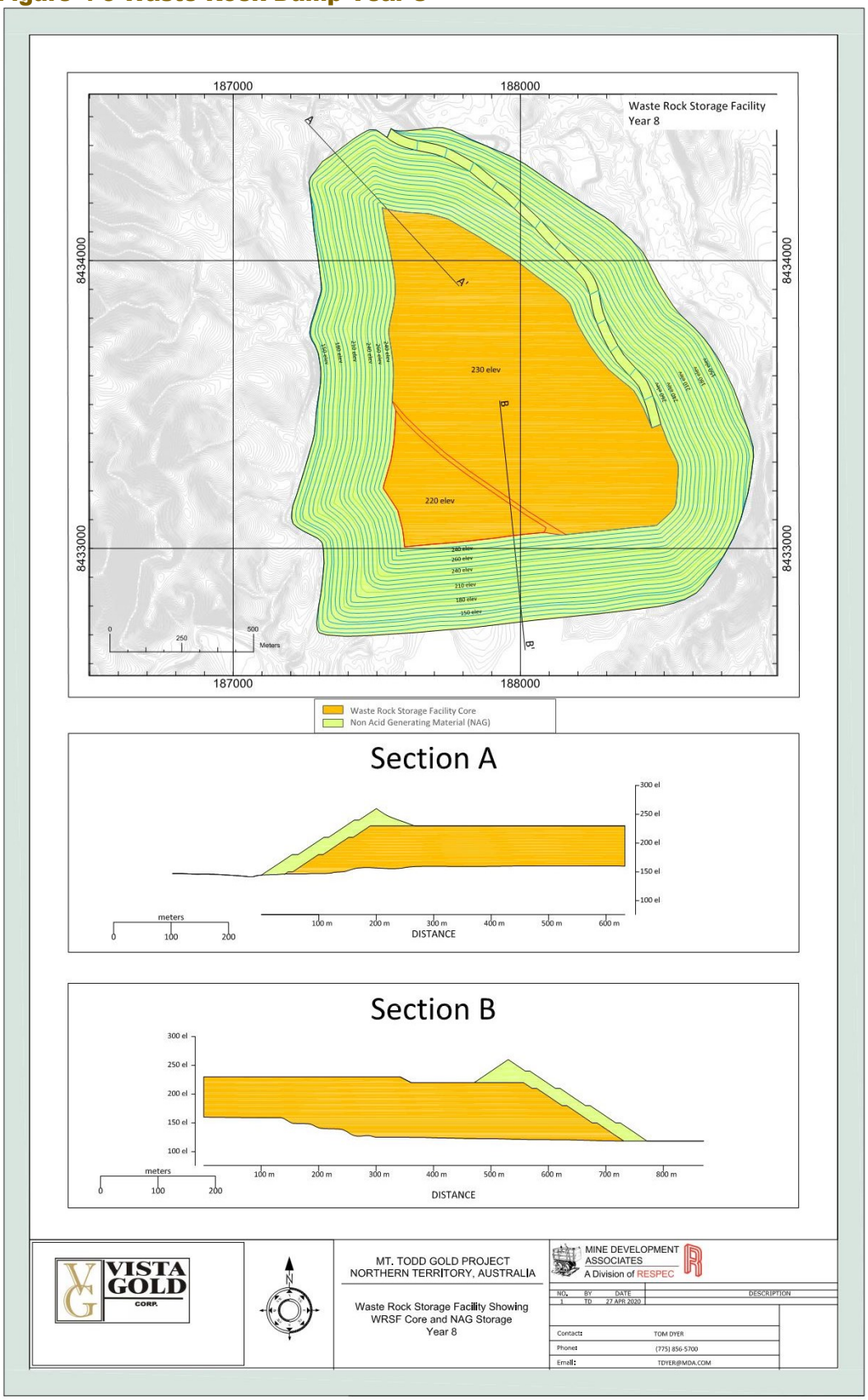

Figure 4-10 Waste Rock Dump Year 9

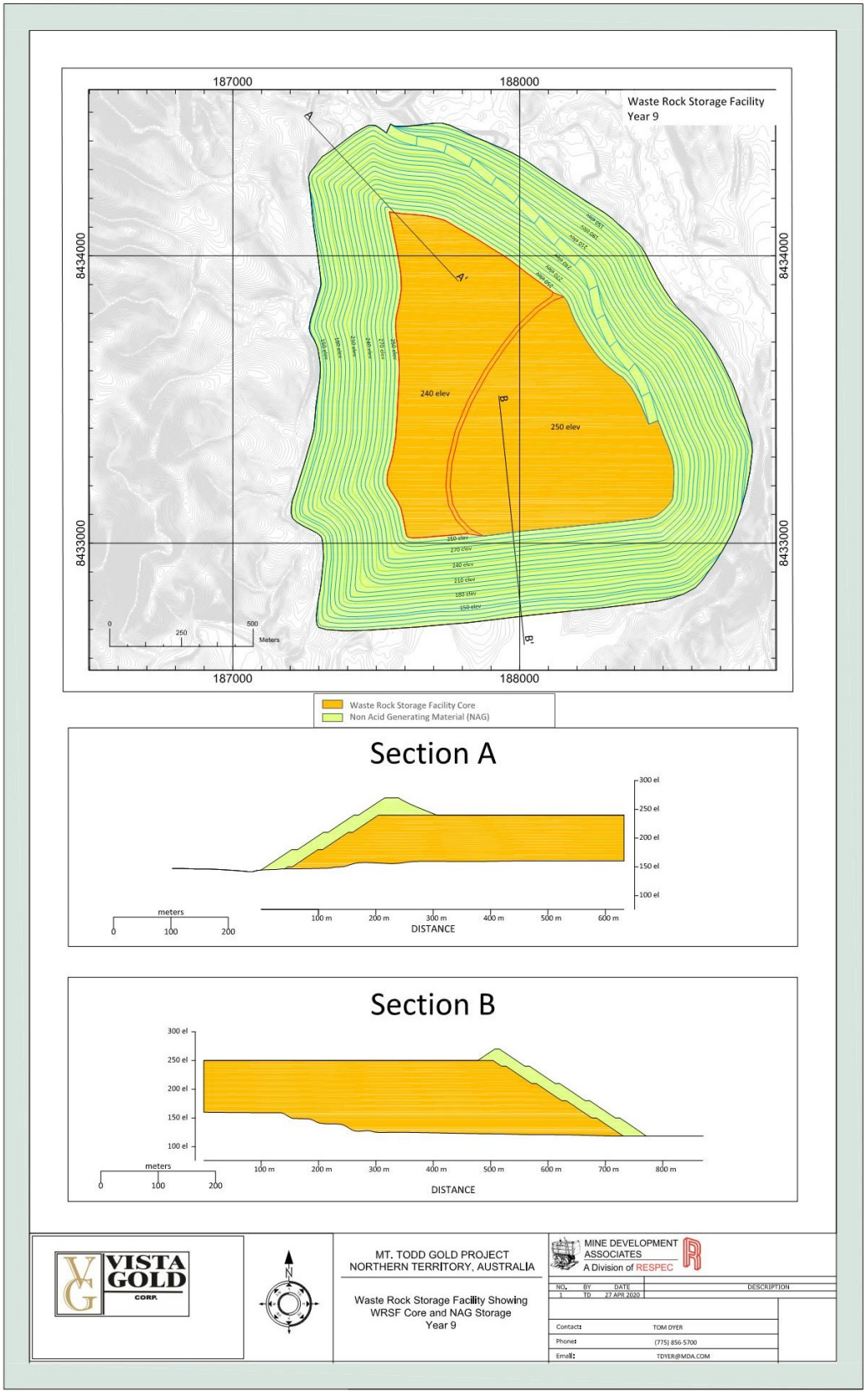

Figure 4-11 Waste Rock Dump Year 10

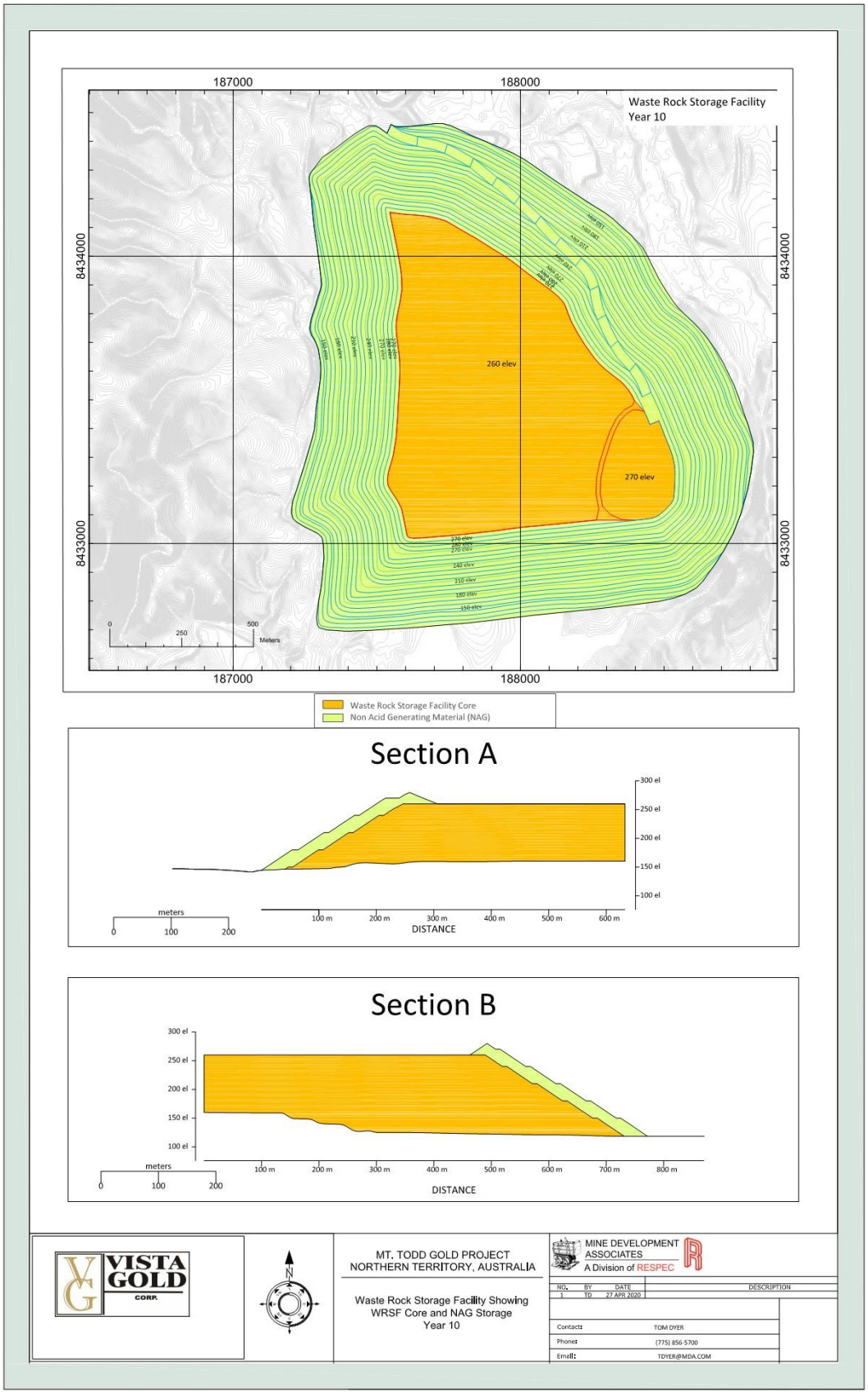

Figure 4-12 Waste Rock Dump Year 11

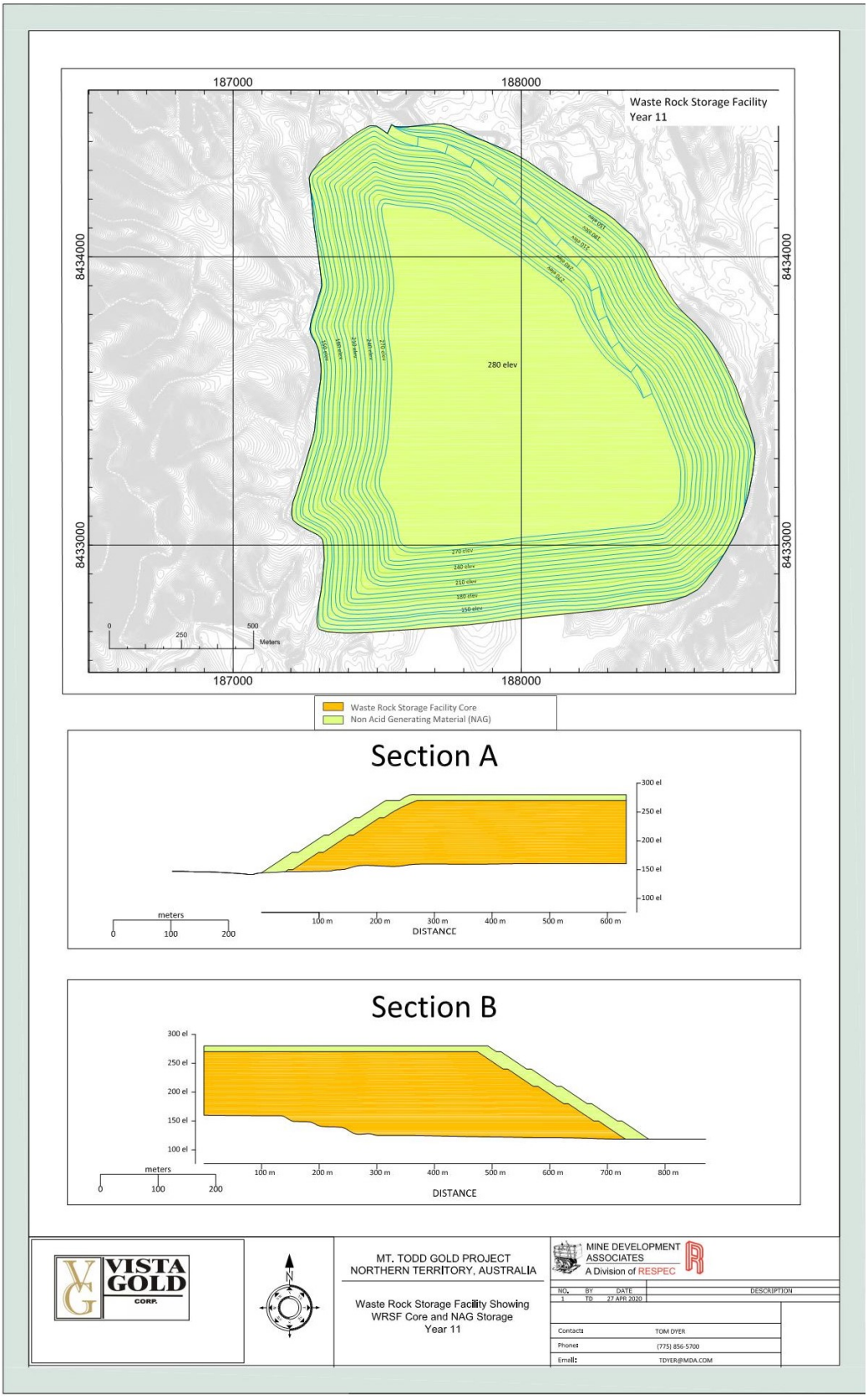

Figure 4-13 Waste Rock Dump Year 12– At Completion

4.8 Closure of WRD

The main closure issues associated with the MTPA WRD is AMD and the potential release of poor-quality water to the environment. Full details are available in the Mine Closure Plan (Appendix R in the MMP). A summary is provided below.

Vista Gold will rehabilitate the WRD constructed by its operation. The location of PAF material within the WRD will be determined by drilling and characterisation, which will confirm the placement of PAF materials.

Observations of water discharge will be used to confirm that the construction method reduces AMD generation. In order to allow for decommissioning and rehabilitation of RP1, this discharge should be minimised.

Poor-quality seepage (AMD) from oxidation of PAF materials will be assessed as a major closure risk for the WRD. AMD is expected to occur until the pathways for oxidation are limited or removed, i.e. infiltration of water and oxygen into the dump. Options for closure are being investigated to limit these pathways for oxidation, including:

- The design of the WRD to ensure 'water shedding' with excess surface water runoff directed from the upper surfaces via rock drains
- Constructing a low permeability oxide capping to limit both oxygen and rainfall infiltration.

Further studies (where necessary) and cost benefit analysis of options for closure will be undertaken for the WRD to determine the most appropriate closure strategy.

5. Future AMD Trials

Past practice at MTPA could be considered site-specific AMD management trials with MTPA material and represent the do-nothing scenario for AMD management at the MTPA. Key results of the 'do-nothing' trials were:

- An acid pit lake
- AMD generation and seeps from the TSFs and
- AMD generation from the waste rock dumps.

Given these outcomes, additional trials were recommended by the EPA to ensure the design of the cover systems proposed are successful at mitigating AMD generation.

The aforementioned designs document seek to provide solutions for AMD mitigation but it is trials that will confirm or indicate their effectiveness in the local conditions with the local material.

5.1 Trial Dumps

The trial will consist of a section of the first lift finished and left as a standalone dump area for initial performance monitoring. The trial dump sections will be located in the two distal corners of the proposed WRD footprint. The trial dumps will be constructed and finished as a priority such that the remainder of the WRD can be constructed without influencing the trial dump sections for as long a period as possible.

5.2 Barrel Tests

In additional, a series of barrel tests of all materials will be undertaken on site to test the materials under differing controlled conditions. Specific barrel testing focussed on the performance of the NAF (non-PAG) material will provide further insight into the performance of the material.

5.3 NAF (non-PAG) Specific Testing

NAF (non-PAG) trials and additional testing will include testing to determine the likelihood of these materials resulting in neutral or saline mine drainage as well as determine the likelihood the materials will perform as adequate. These tests will include but are not limited to:

- Dispersity, sodicity and salinity testing
- Assessments of the existing AMD database (with particular focus on the NAF [non-PAG] samples) against geochemical abundance indices (GAIs);
- Additional Australian Standard Leaching Procedure (ASLP) tests; and
- Additional static testing (especially distal to the orebody where limited drilling has occurred).

5.4 Pit Lake Assessments

Additional research will be undertaken to determine the feasibility of ongoing in-situ treatment. This research (and costing) will leverage off the interrogation of the data from the in-situ treatment that has already occurred within the Batman Pit within recent years.

5.5 Pit High Wall Cover Assessments

Additional research will be undertaken to determine the feasibility of a cover system on the high wall of the pit that is primarily classified as PAF (PAG). Whilst such covers are not currently considered feasible within the mining industry, the concept of highwall covers will be considered as technologies develop.

6. Reporting and Compliance

6.1 Education and Training

Waste rock awareness training will be a component of the competency-based site induction program. All personnel will be inducted on the significance of acid and metalliferous drainage in the MTPA including the following:

- Procedures for identifying and classifying potential acid forming material.
- Procedures for temporarily storing potential acid forming material at surface.
- Awareness of monitoring requirements.
- Procedures for relocating potential acid forming material as soon as a designated void area is available.

The Environment Manager will be responsible for ensuring the appropriate waste rock training is included in the induction.

6.2 Reporting of results & non-compliances

Vista Gold will provide performance results against the EMPs and MMP commitments / requirements for the period within the MMP. Any non-compliance found in this performance report is discussed, analysed with corrective and preventative actions identified.

6.3 Incident Reporting

Where a waste rock related pollution incident, causes or threatens to cause pollution resulting in material[1] or serious[2] environmental harm, on and offsite the Northern Territory DITT will be informed as soon as practicable in accordance with the *Mining Management Act*. As a minimum, Vista Gold internal policy prescribes reporting within 12 hours and submission of a Section 29 report to DPIR within 24 hours. For all environmental incidents offsite the Department of Environment Protection Authority (EPA) will be informed as soon as practicable (and in any case within 24 hours after) as per the *Waste Management and Pollution Control Act 1998*.

Reporting of incidents and non-compliances will be reported in accordance with regulator requirements.

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[1] Where material environmental harm is defined as 'environmental harm that is not trivial or negligible in nature, consists of an environmental nuisance of a high impact or on a wide scale, results, or is likely to result, in not more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of not more than $50,000 or the prescribed amount (whichever is greater).

[2] Where serious environmental harm is defined as 'environmental harm that is more serious than material environmental harm and includes environmental harm that is irreversible or otherwise of a high impact or on a wide scale, damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance, results or is likely to result in more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of more than $50,000 or the prescribed amount (whichever is greater).

6.4 Recording

Any waste rock or AMD related complaints will be recorded in the Vista Gold stakeholder register. Complaints will be discussed within the Vista Gold Environment Department immediately and as a minimum, the aim is to have a strategy for resolution within a week.

6.5 Review

The Waste Rock and AMD EMP will be reviewed and updated annually. A review may occur sooner consequent to a material change in risk, legal requirements or an incident relevant to waste rock management.

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File Name: *Appendix H - Waste Rock and AMD Management Plan R2.0.docx*

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev A	John Ross	James Hill		Jill Woodworth		16/11/2017
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Rev 3	Brent Murdoch	John Rozelle		Brent Murdoch		23/05/2022