



# Eagle Mountain Gold Project, Guyana

Environmental Impact Assessment  
Report: Volume 3

PREPARED FOR



Stronghold Guyana Inc.  
(subsidiary of Mako Mining Corp.)

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## CONTENTS

<b>1.</b>	<b>RISK ASSESSMENT</b>	<b>1-1</b>
1.1	RISK EVALUATION CRITERIA	1-1
1.2	RISK REGISTER AND ASSESSMENT FOR PROJECT	1-3
<b>2.</b>	<b>AIR QUALITY IMPACT ASSESSMENT</b>	<b>2-1</b>
2.1	INTRODUCTION	2-1
2.2	DEFINING AREA OF INFLUENCE	2-1
2.2.1	Screening Distances	2-1
2.2.2	Sensitive Receptors	2-1
2.2.3	Sources of emissions	2-1
2.3	IMPACT ASSESSMENT CRITERIA	2-2
2.3.1	Legal Framework	2-2
2.3.2	Significance Criteria	2-3
2.4	ASSESSMENT METHODOLOGY	2-5
2.4.1	Construction Dust	2-5
2.4.2	Construction Traffic	2-5
2.4.3	Operational Traffic	2-8
2.4.4	Operational Mining	2-8
2.5	IMPACT ASSESSMENT	2-21
2.5.1	Impacts from Pre-Construction Phase	2-24
2.5.2	Impacts from Construction Phase	2-24
2.5.3	Impacts from Operational Phase	2-26
2.5.4	Mitigation	2-40
<b>3.</b>	<b>NOISE IMPACT ASSESSMENT</b>	<b>3-1</b>
3.1	INTRODUCTION	3-1
3.1.1	Assumptions and Limitations	3-1
3.1.2	Objectives	3-1
3.1.3	Area of Influence (AoI)	3-2
3.2	IMPACT ASSESSMENT METHODOLOGY AND CRITERIA	3-4
3.2.1	Criteria	3-4
3.2.2	Noise Calculation Method for Construction and Operation	3-9
3.3	BASELINE CONDITIONS	3-10
3.4	IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASES	3-10
3.4.1	Potential Impacts	3-10
3.4.2	Assumptions	3-11
3.4.3	Existing Controls/Design Mitigation	3-12
3.4.4	Results and Significance of Impacts	3-12
3.4.5	Mitigation and Management Measures	3-13
3.4.6	Significance of Residual Impacts	3-14
3.5	IMPACTS FROM THE OPERATIONAL PHASE	3-15
3.5.1	Potential Impacts	3-15
3.5.2	Assumptions	3-15
3.5.3	Existing Controls/Design Mitigation	3-19
3.5.4	Results and Significance of Impacts	3-19
3.6	IMPACTS FROM CLOSURE PHASE	3-26
<b>4.</b>	<b>PHYSIOGRAPHY, GEOLOGY AND SOILS</b>	<b>4-1</b>

4.1	INTRODUCTION	4-1
4.2	DEFINING AREA OF INFLUENCE	4-1
4.3	IMPACT ASSESSMENT METHODOLOGY AND CRITERIA	4-1
4.3.1	Impact Assessment Methodology	4-1
4.3.2	Potential Impacts	4-1
4.3.3	Impact Assessment Criteria	4-2
4.4	IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASES	4-5
4.4.1	Potential Impacts	4-5
4.4.2	Existing Controls / Design Mitigation	4-5
4.4.3	Significance of Impacts	4-6
4.4.4	Additional Mitigation, Management, and Monitoring Measures	4-8
4.4.5	Residual Impact Significance	4-9
4.5	IMPACTS FROM OPERATION PHASE	4-12
4.5.1	Potential Impacts	4-12
4.5.2	Existing Controls / Design Mitigation	4-13
4.5.3	Significance of Impacts	4-14
4.5.4	Additional Mitigation, Management, and Monitoring Measures	4-14
4.5.5	Residual Impact Significance	4-15
4.6	IMPACTS FROM CLOSURE PHASE	4-17
<b>5.</b>	<b>LANDSCAPE AND VISUAL IMPACT ASSESSMENT</b>	<b>5-1</b>
5.1	INTRODUCTION	5-1
5.2	IMPACT ASSESSMENT METHODOLOGY AND CRITERIA	5-1
5.2.1	Landscape	5-1
5.2.2	Visual Effects	5-3
5.3	IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASE	5-4
5.3.1	Potential Impacts	5-4
5.3.2	Existing Controls and Design Mitigation	5-5
5.3.3	Significance of Impacts	5-6
5.3.4	Additional Mitigation, Management, and Monitoring Measures	5-6
5.3.5	Residual Impact Significance	5-6
5.4	IMPACTS FROM OPERATION PHASE	5-7
5.4.1	Potential Impacts	5-7
5.4.2	Existing Controls / Design Mitigation	5-8
5.4.3	Significance of Impacts	5-8
5.4.4	Additional Mitigation, Management, and Monitoring Measures	5-8
5.4.5	Residual Impact Significance	5-8
5.5	IMPACTS FROM CLOSURE PHASE	5-9
5.5.1	Landscape and Visual	5-9
<b>6.</b>	<b>SURFACE WATER</b>	<b>6-1</b>
6.1	INTRODUCTION	6-1
6.2	DEFINING AREA OF INFLUENCE	6-1
6.3	IMPACT ASSESSMENT METHODOLOGY	6-2
6.4	SURFACE WATER MODELLING	6-3
6.5	MODEL RESULTS	6-3
6.5.1	Surface Water Flow Model	6-3
6.5.2	Site-Wide Water Balance	6-6
6.5.3	Surface Water Quantity Assessment	6-9
6.5.4	Surface Water Quality Assessment	6-13
6.6	IMPACTS FROM PRE-CONSTRUCTION/CONSTRUCTION PHASE	6-21



6.6.1	Potential Impacts	6-21
6.6.2	Existing Controls/Design Mitigation	6-21
6.6.3	Significance of Impacts	6-22
6.7	IMPACTS FROM OPERATIONS PHASE	6-26
6.7.1	Potential Impacts	6-26
6.7.2	Existing Controls/Design Mitigation	6-26
6.7.3	Significance of Impacts	6-27
6.8	IMPACTS FROM CLOSURE PHASE	6-36
<b>7.</b>	<b>GROUNDWATER</b>	<b>7-1</b>
7.1	DEFINING THE AREA OF INFLUENCE	7-1
7.2	IMPACTS FROM PRE-CONSTRUCTION/CONSTRUCTION PHASE	7-4
7.2.1	Potential Impacts	7-4
7.2.2	Existing Controls / Design Mitigation	7-4
7.2.3	Significance of Impacts	7-5
7.2.4	Additional Mitigation, Management, and Monitoring Measures	7-6
7.2.5	Residual Impact Significance	7-7
7.3	IMPACTS FROM OPERATION PHASE	7-10
7.3.1	Potential Impacts	7-10
7.3.2	Existing Controls / Design Mitigation	7-23
7.3.3	Significance of Impacts	7-25
7.3.4	Additional Mitigation, Management, and Monitoring Measures	7-26
7.3.5	Residual Impact Significance	7-27
7.4	IMPACTS FROM CLOSURE / POST-CLOSURE PHASE	7-30
7.4.1	Potential Impacts	7-30
7.4.2	Existing Controls / Design Mitigation	7-31
7.4.3	Significance of Impacts	7-31
7.4.4	Additional Mitigation, Management, and Monitoring Measures	7-32
7.4.5	Residual Impact Significance	7-32
7.5	RECOMMENDATIONS FOR FURTHER WORK	7-35
<b>8.</b>	<b>BIOLOGICAL RESOURCES IMPACT ASSESSMENT</b>	<b>8-1</b>
8.1	INTRODUCTION	8-1
8.2	DEFINING AREA OF INFLUENCE	8-1
8.3	IMPACT ASSESSMENT METHODOLOGY AND CRITERIA	8-1
8.4	IMPACTS FROM PRE-CONSTRUCTION PHASE	8-3
8.4.1	Terrestrial Resources	8-3
8.4.2	Aquatic Resources	8-11
8.5	IMPACTS FROM CONSTRUCTION PHASE	8-17
8.5.1	Terrestrial Resources	8-17
8.5.2	Aquatic Resources	8-23
8.6	IMPACTS FROM OPERATION PHASE	8-27
8.6.1	Terrestrial Resources	8-27
8.6.2	Aquatic Resources	8-32
8.7	IMPACTS FROM CLOSURE PHASE	8-36
8.7.1	Terrestrial Resources	8-36
8.7.2	Aquatic Resources	8-40
<b>9.</b>	<b>SOCIOECONOMICS AND COMMUNITY HEALTH IMPACT ASSESSMENT</b>	<b>9-1</b>
9.1	INTRODUCTION	9-1
9.1.1	Defining the Area of Influence	9-1

9.1.2	Impact Assessment Methodology and Criteria	9-3
9.2	IMPACTS FROM PRE-CONSTRUCTION / CONSTRUCTION PHASE	9-5
9.2.1	Potential Impacts	9-5
9.2.2	Existing Controls/Design Mitigation	9-11
9.2.3	Significance of Impacts	9-12
9.2.4	Additional Mitigation, Management, and Monitoring Measures	9-17
9.2.5	Residual Impact Significance	9-19
9.3	IMPACTS FROM OPERATIONS PHASE	9-19
9.3.1	Potential Impacts	9-20
9.3.2	Existing Controls/Design Mitigation	9-22
9.3.3	Significance of Impacts	9-23
9.3.4	Residual Impact Significance	9-27
9.4	IMPACTS FROM CLOSURE PHASE	9-27
<b>10.</b>	<b>CULTURAL HERITAGE IMPACT ASSESSMENT</b>	<b>10-1</b>
10.1	INTRODUCTION	10-1
10.1.1	Defining Area of Influence	10-1
10.1.2	Impact Assessment Methodology and Criteria	10-1
10.2	IMPACTS FROM PRE-CONSTRUCTION AND CONSTRUCTION PHASES	10-2
10.2.1	Potential Impacts	10-3
10.2.2	Existing Controls / Design Mitigation	10-3
10.2.3	Significance of Impacts	10-4
10.2.4	Additional Mitigation, Management, and Monitoring Measures	10-8
10.2.5	Residual Impact Significance	10-8
10.3	IMPACTS FROM OPERATION PHASE	10-9
10.3.1	Potential Impacts	10-9
10.3.2	Existing Controls / Design Mitigation	10-9
10.4	IMPACTS FROM CLOSURE PHASE	10-9
<b>11.</b>	<b>IMPACT ASSESSMENT OF UNPLANNED EVENTS</b>	<b>11-1</b>
11.1	INTRODUCTION	11-1
11.2	DEFINING AREA OF INFLUENCE	11-1
11.3	IMPACT ASSESSMENT METHODOLOGY AND CRITERIA	11-1
11.3.1	Receptor Sensitivity and Impact Magnitude	11-2
11.3.2	Potential Impacts	11-2
11.4	IMPACT ASSESSMENT FROM TIDAL FLOODING AND EXTREME RAINFALL	11-3
11.4.1	Potential Impacts	11-3
11.4.2	Existing Controls and Design Mitigation	11-3
11.4.3	Significance of Impacts	11-4
11.4.4	Additional Mitigation, Management, and Monitoring Measures	11-4
11.4.5	Residual Impact Significance	11-4
11.5	IMPACT ASSESSMENT FOR SLOPE INSTABILITY AND LANDSLIDES	11-5
11.5.1	Potential Impacts	11-5
11.5.2	Existing Controls / Design Mitigation	11-5
11.5.3	Significance of Impacts	11-5
11.5.4	Additional Mitigation, Management, and Monitoring Measures	11-6
11.5.5	Residual Impact Significance	11-6
11.6	IMPACT ASSESSMENT FOR EARTHQUAKES	11-7
11.6.1	Potential Impacts	11-7
11.6.2	Existing Controls / Design Mitigation	11-7
11.6.3	Significance of Impacts	11-7

	11.6.4	Additional Mitigation, Management, and Monitoring Measures	11-7
	11.6.5	Residual Impact Significance	11-7
11.7		IMPACT ASSESSMENT FOR ACCIDENTAL POLLUTION (LEAKS AND SPILLS)	11-8
	11.7.1	Potential Impacts	11-8
	11.7.2	Existing Controls / Design Mitigation	11-8
	11.7.3	Significance of Impacts	11-8
	11.7.4	Additional Mitigation, Management, and Monitoring Measures	11-8
	11.7.5	Residual Impact Significance	11-9
11.8		IMPACT ASSESSMENT FOR TRAFFIC ACCIDENTS	11-10
	11.8.1	Potential Impacts	11-10
	11.8.2	Existing Controls / Design Mitigation	11-10
	11.8.3	Significance of Impacts	11-10
	11.8.4	Additional Mitigation, Management, and Monitoring Measures	11-10
	11.8.5	Residual Impact Significance	11-11
11.9		IMPACT ASSESSMENT FOR FIRE AND EXPLOSIONS	11-12
	11.9.1	Potential Impacts	11-12
	11.9.2	Existing Controls / Design Mitigation	11-12
	11.9.3	Significance of Impacts	11-12
	11.9.4	Additional Mitigation, Management, and Monitoring Measures	11-12
	11.9.5	Residual Impact Significance	11-13
<b>12. CUMULATIVE IMPACT ASSESSMENT</b>			<b>12-1</b>
12.1		INTRODUCTION	12-1
12.2		OBJECTIVE AND SCOPE	12-1
12.3		METHODOLOGY	12-2
	12.3.1	Definitions of Key Terminology for the CIA	12-2
	12.3.2	Limitations	12-2
12.4		DETERMINATION OF SPATIAL AND TEMPORAL BOUNDARIES	12-3
12.5		IDENTIFICATION OF OTHER PROJECTS AND EXTERNAL DRIVERS	12-3
	12.5.1	Other Projects	12-3
	12.5.2	External Drivers	12-4
12.6		VEC IDENTIFICATION AND SELECTION	12-4
	12.6.1	Overview	12-4
	12.6.2	Selection of VECs	12-5
	12.6.3	Description of VEC Conditions	12-6
	12.6.4	Assessment of Cumulative Impacts on VECs	12-6
12.7		AIR QUALITY	12-7
	12.7.1	Baseline	12-7
	12.7.2	Potential Impacts and Mitigation Measures	12-7
	12.7.3	Mitigation Measures	12-7
	12.7.4	Potential Cumulative Impacts	12-8
12.8		NOISE AND VIBRATION	12-8
	12.8.1	Baseline	12-8
	12.8.2	Potential Impacts and Mitigation Measures	12-8
	12.8.3	Potential Cumulative Impacts	12-9
12.9		WATER QUALITY	12-9
	12.9.1	Baseline	12-9
	12.9.2	Potential Impacts and Mitigation Measures	12-10
	12.9.3	Potential Cumulative Impacts	12-11
12.10		SOILS AND GEOLOGY	12-12
	12.10.1	Baseline	12-12

12.10.2	Potential Impacts and Mitigation Measures	12-12
12.10.3	Potential Cumulative Impacts	12-13
12.11	BIODIVERSITY AND ECOSYSTEM SERVICES	12-13
12.11.1	Baseline	12-13
12.11.2	Potential Impacts and Mitigation Measures	12-14
12.11.3	Potential Cumulative Impacts	12-15
12.12	SOCIAL (INCLUDING LIVELIHOODS, DEMOGRAPHICS, AND COMMUNITY HEALTH AND SAFETY, AND HUMAN RIGHTS)	12-16
12.12.1	Baseline	12-16
12.12.2	Potential Impacts	12-17
12.12.3	Potential Cumulative Impacts	12-18
12.13	CULTURAL HERITAGE	12-18
12.13.2	Potential Impacts and Mitigation Measures	12-18
12.14	TRAFFIC AND TRANSPORT	12-19
12.14.1	Baseline	12-19
12.14.2	Potential Impacts and Mitigation Measures	12-19
12.14.3	Potential Cumulative Impacts	12-20
12.15	CUMULATIVE IMPACT ASSESSMENT SUMMARY	12-20
12.16	CUMULATIVE IMPACT MANAGEMENT	12-25
<b>13.</b>	<b>ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN</b>	<b>13-1</b>
13.1	PROJECTS ENVIRONMENTAL & SOCIAL MANAGEMENT PLANS	13-1
13.1.1	Air Quality and Dust Management Plan	13-1
13.1.2	Noise and Vibration Management Plan	13-7
13.1.3	Sustainable Water Resources Management	13-11
13.1.4	Soil and Erosion Control Management	13-19
13.1.5	Landscape and Visual Management Plan	13-26
13.1.6	Biodiversity Management Plan	13-30
13.1.7	Cultural Heritage Management Plan	13-38
13.1.8	Socio-Economic Management Plan	13-41
13.1.9	Occupational Health and Safety Management Plan (OHSMP)	13-48
13.1.10	Unplanned Events Management Plan	13-54
13.2	ENVIRONMENTAL AND SOCIAL MONITORING PLAN	13-57
13.3	ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM	13-63
13.3.1	Introduction	13-63
13.3.2	Project Organisation	13-67
13.3.3	E&S Policies	13-70
13.3.4	Identification of Key E&S Risks and Impacts	13-70
13.3.5	Training Plans for the E&S Team	13-72
13.3.6	Audit and Reporting	13-74
13.3.7	Project Commitment	13-75
<b>14.</b>	<b>CONCLUSIONS AND RECOMMENDATIONS</b>	<b>14-1</b>
14.1	CONCLUSIONS	14-1
14.2	RECOMMENDATIONS	14-1
14.2.1	Additional Studies Required	14-1
14.2.2	Management Plans to be prepared	14-2
<b>15.</b>	<b>REFERENCES</b>	<b>15-1</b>

## LIST OF TABLES

TABLE 1.1	RISK REGISTER	1-4
TABLE 2.1	AIR QUALITY CRITERIA	2-2
TABLE 2.2	MINE PARAMETERS USED IN OPERATIONAL PHASE	2-9
TABLE 2.3	ROAD PARAMETERS USED IN OPERATIONAL PHASE ASSESSMENT	2-10
TABLE 2.4	EQUIPMENT PARAMETERS USED IN OPERATIONAL PHASE ASSESSMENT	2-11
TABLE 2.5	EMBEDDED MITIGATION MEASURES	2-13
TABLE 2.6	OPERATIONAL PHASE EMISSION SOURCES – AREA SOURCES	2-13
TABLE 2.7	OPERATIONAL PHASE EMISSION RATES – ROAD SOURCES	2-14
TABLE 2.8	OPERATIONAL PHASE EMISSION RATES – POINT SOURCES	2-15
TABLE 2.9	MODELLED DISCRETE RECEPTORS	2-17
TABLE 2.10	SUMMARY OF EXISTING AIRSHED	2-23
TABLE 2.11	AIR QUALITY IMPACTS CONSTRUCTION PHASE	2-24
TABLE 2.12	AIR QUALITY IMPACTS CONSTRUCTION TRAFFIC	2-25
TABLE 2.13	AIR QUALITY IMPACTS OPERATIONAL TRAFFIC	2-26
TABLE 2.14	MAXIMUM AIR QUALITY IMPACTS AT MODELLED GRID RECEPTORS	2-29
TABLE 2.15	AIR QUALITY IMPACTS FROM OPERATION OF THE MINE	2-39
TABLE 3.1	AREA OF INFLUENCE - RECEPTORS	3-2
TABLE 3.2	IFC AND IRMA NOISE LEVEL GUIDELINES	3-5
TABLE 3.3	AIRBLAST OVERPRESSURE	3-6
TABLE 3.4	GROUND-BORNE VIBRATION	3-6
TABLE 3.5	MAGNITUDE AND SIGNIFICANCE OF CONSTRUCTION NOISE EFFECTS	3-7
TABLE 3.6	MAGNITUDE AND SIGNIFICANCE OF OPERATIONAL NOISE EFFECTS	3-8
TABLE 3.7	CRITERIA FOR EVALUATION OF IMPACTS FROM AIRBLAST OVERPRESSURE	3-8
TABLE 3.8	CRITERIA FOR EVALUATION OF IMPACTS FROM GROUND-BORNE VIBRATION	3-9
TABLE 3.9	SITE CLEARANCE AND EARTHWORKS PLANT AND EQUIPMENT	3-11
TABLE 3.10	INFRASTRUCTURE ASSEMBLY PLANT	3-12
TABLE 3.11	PREDICTED CONSTRUCTION NOISE LEVELS	3-13
TABLE 3.12	NOISE IMPACTS (PRE-CONSTRUCTION AND CONSTRUCTION)	3-14
TABLE 3.13	MINING EQUIPMENT	3-16
TABLE 3.14	ESTIMATED MATERIAL MOVEMENTS (YEAR 11)	3-17
TABLE 3.15	ESTIMATED MATERIAL MOVEMENTS (YEAR 14)	3-17
TABLE 3.16	PROCESSING PLANT EQUIPMENT (PHASE 2)	3-17
TABLE 3.17	PREDICTED NOISE LEVELS - MINING OPERATION	3-19
TABLE 3.18	NOISE IMPACTS (OPERATION)	3-23
TABLE 3.19	OPEN PIT AIRBLAST OVERPRESSURE RESULTS	3-24
TABLE 3.20	OPEN PIT GROUND-BORNE VIBRATION RESULTS	3-24
TABLE 3.21	BLASTING NOISE IMPACTS	3-25
TABLE 4.1	SENSITIVITY ASSESSMENT CRITERIA FOR SOIL QUALITY	4-3
TABLE 4.2	CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO SOILS	4-3
TABLE 4.3	SUMMARY OF TOTAL HECTARES POTENTIALLY IMPACTED BY THE PROPOSED PLANNED MINE FACILITIES	4-7
TABLE 4.4	IMPACTS ON SOILS DURING CONSTRUCTION — SOIL EROSION AND SEDIMENTATION AND TOPSOIL LOSS	4-10
TABLE 4.5	IMPACTS ON SOILS DURING CONSTRUCTION — SOIL RUTTING AND COMPACTION	4-11
TABLE 4.6	IMPACTS ON SOILS DURING CONSTRUCTION — SOIL CONTAMINATION	4-12
TABLE 4.7	IMPACTS ON SOILS DURING THE OPERATIONAL PHASE – SOIL EROSION AND SEDIMENTATION AND TOPSOIL LOSS	4-16



TABLE 4.8	IMPACTS TO SOILS DURING THE OPERATIONAL PHASE – SOIL CONTAMINATION	4-16
TABLE 5.1	LANDSCAPE SENSITIVITY CRITERIA	5-2
TABLE 5.2	LANDSCAPE MAGNITUDE OF CHANGE CRITERIA	5-2
TABLE 5.3	SENSITIVITY CRITERIA OF VISUAL RECEPTORS	5-3
TABLE 5.4	VISUAL MAGNITUDE OF CHANGE CRITERIA	5-4
TABLE 5.5	LANDSCAPE AND VISUAL IMPACTS DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASE	5-7
TABLE 5.6	VISUAL IMPACTS DURING THE OPERATION PHASE	5-9
TABLE 6.1	PRE-MINING DRIEST MONTH FLOW RATES DISCHARGE	6-11
TABLE 6.2	WITH-PROJECT STREAMFLOW DISCHARGE INCREASE IN DRIEST SEPTEMBER, MAHDIA RIVER	6-12
TABLE 6.3	WITH-PROJECT STREAMFLOW DISCHARGE INCREASE IN DRIEST SEPTEMBER, MINNEHAHA CREEK	6-13
TABLE 6.4	SUPERNATANT CHEMISTRY AND STANDARDS	6-14
TABLE 6.5	MAHDIA RIVER MEASURED FLOW RATES	6-16
TABLE 6.6	IMPACTS ON SURFACE WATERS DURING PRE-CONSTRUCTION / CONSTRUCTION - SHORT-TERM ELEVATION IN TSS AT CONSTRUCTION OUTFALLS	6-24
TABLE 6.7	IMPACTS ON SURFACE WATERS DURING PRE-CONSTRUCTION / CONSTRUCTION POTENTIAL CONTAMINATION OF SITE DRAINS FROM FUELS, OILS AND CONSTRUCTION CHEMICALS	6-25
TABLE 6.8	IMPACTS ON SURFACE WATERS DURING OPERATION - BASEFLOW REDUCTION AS A RESULT OF PIT DEWATERING	6-31
TABLE 6.9	IMPACTS ON SURFACE WATERS DURING OPERATION - EROSION AND SEDIMENTATION	6-32
TABLE 6.10	IMPACTS ON SURFACE WATERS DURING OPERATION - UNCONTROLLED DISCHARGE OF MINING EFFLUENTS	6-33
TABLE 6.11	IMPACTS ON SURFACE WATERS DURING OPERATION - POTENTIAL SEEPAGES FROM TSF AND WSF	6-34
TABLE 6.12	IMPACTS ON SURFACE WATERS DURING OPERATION - POTENTIAL SPILLS FROM FUELS, OILS AND CHEMICALS	6-35
TABLE 7.1	IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION – DISTURBANCE OF SHALLOW GROUNDWATER	7-7
TABLE 7.2	IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION – LOCALISED CHANGES TO RECHARGE PATTERN	7-8
TABLE 7.3	IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION – CONTAMINATION DURING THE HANDLING OF FUEL, OIL, AND CHEMICALS	7-9
TABLE 7.4	IMPACTS ON GROUNDWATER DURING OPERATION – IMPACTS ON GROUNDWATER VOLUME (FLOW PATTERN) AND SURROUNDING GROUNDWATER USERS	7-27
TABLE 7.6	IMPACTS ON GROUNDWATER DURING OPERATION – IMPACTS ON GROUNDWATER QUALITY DUE TO POTENTIAL SEEPAGES FROM WRD AND TSF	7-29
TABLE 7.7	IMPACTS ON GROUNDWATER DURING CLOSURE / POST-CLOSURE – RECOVERY OF GROUNDWATER LEVELS AND PIT LAKE FORMATION	7-32
TABLE 7.8	IMPACTS ON GROUNDWATER DURING CLOSURE / POST-CLOSURE – POTENTIAL SEEPAGES FROM WRD AND TSF	7-34
TABLE 8.1	IMPACT CHARACTERISTIC TERMINOLOGY FOR BIOLOGICAL RESOURCES	8-1
TABLE 8.2	IMPACT SIGNIFICANCE CRITERIA FOR BIOLOGICAL RESOURCES	8-2
TABLE 8.3	ESTIMATED HABITAT LOSS	8-3
TABLE 8.4	SUMMARY OF TERRESTRIAL IMPACTS DURING THE PRE-CONSTRUCTION PHASE OF THE PROJECT	8-7
TABLE 8.5	SUMMARY OF IMPACTS ON AQUATIC BIODIVERSITY DURING THE PRE-CONSTRUCTION PHASE OF THE PROJECT	8-14
TABLE 8.6	SUMMARY OF TERRESTRIAL IMPACTS DURING THE CONSTRUCTION PHASE OF THE PROJECT	8-19
TABLE 8.7	SUMMARY OF AQUATIC IMPACTS DURING THE CONSTRUCTION PHASE OF THE PROJECT	8-25

TABLE 8.8	SUMMARY OF TERRESTRIAL IMPACTS DURING THE OPERATIONAL PHASE OF THE PROJECT	8-29
TABLE 8.9	SUMMARY OF AQUATIC IMPACTS DURING THE OPERATION PHASE	8-34
TABLE 8.10	SUMMARY OF TERRESTRIAL IMPACTS DURING THE OPERATIONS PHASE OF THE PROJECT	8-38
TABLE 8.11	SUMMARY OF AQUATIC IMPACTS DURING THE DECOMMISSIONING PHASE	8-42
TABLE 9.1	DESIGNATION DEFINITION FOR SOCIOECONOMICS AND COMMUNITY HEALTH	9-3
TABLE 9.2	LEVELS OF MAGNITUDE FOR SOCIOECONOMICS	9-4
TABLE 9.3	LEVELS OF MAGNITUDE FOR COMMUNITY HEALTH, SAFETY, AND WELLBEING	9-4
TABLE 9.4	LEVELS OF SENSITIVITY FOR SOCIOECONOMICS	9-4
TABLE 9.5	LEVELS OF SENSITIVITY FOR COMMUNITY HEALTH, SAFETY, AND WELLBEING	9-5
TABLE 9.6	HEALTHCARE AND MEDICAL SERVICES IN THE SOCIAL AOI	9-8
TABLE 9.7	POTENTIAL PROJECT IMPACTS TO SOCIOECONOMIC CONDITIONS (PRE-CONSTRUCTION / CONSTRUCTION)	9-12
TABLE 9.8	POTENTIAL PROJECT IMPACTS TO LAND USE (PRE-CONSTRUCTION / CONSTRUCTION)	9-13
TABLE 9.9	POTENTIAL PROJECT IMPACTS TO COMMUNITY (PRE-CONSTRUCTION / CONSTRUCTION)	9-14
TABLE 9.10	POTENTIAL PROJECT IMPACTS TO SOCIAL INFRASTRUCTURE (PRE-CONSTRUCTION / CONSTRUCTION)	9-16
TABLE 9.11	POTENTIAL PROJECT IMPACTS TO SOCIOECONOMIC CONDITIONS (OPERATIONS)	9-23
TABLE 9.12	POTENTIAL PROJECT IMPACTS TO COMMUNITY (OPERATIONS)	9-24
TABLE 9.13	POTENTIAL PROJECT IMPACTS TO SOCIAL INFRASTRUCTURE (OPERATIONS)	9-25
TABLE 10.1	CRITERIA FOR CULTURAL HERITAGE SENSITIVITY OF RECEPTOR	10-1
TABLE 10.2	CRITERIA FOR CULTURAL HERITAGE IMPACT MAGNITUDE	10-2
TABLE 10.3	RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE	10-5
TABLE 10.4	CULTURAL HERITAGE IMPACTS PRE-CONSTRUCTION AND CONSTRUCTION PHASE	10-6
TABLE 11.1	DEFINITIONS FOR LIKELIHOOD DESIGNATIONS	11-2
TABLE 11.2	IMPACTS FROM FLOODING AND EXTREME RAINFALL	11-4
TABLE 11.3	IMPACTS FROM SLOPE INSTABILITY AND LANDSLIDES	11-6
TABLE 11.4	IMPACTS FROM EARTHQUAKES	11-7
TABLE 11.5	IMPACTS FROM ACCIDENTAL POLLUTION	11-9
TABLE 11.6	IMPACTS FROM TRAFFIC ACCIDENTS	11-11
TABLE 11.7	IMPACTS FROM FIRE AND EXPLOSIONS	11-13
TABLE 12.1	SELECTED VECS FOR INCLUSION IN CIA	12-5
TABLE 12.2	SUMMARY OF THE CUMULATIVE IMPACT ASSESSMENT	12-21
TABLE 13.1	IFC/WHO AIR QUALITY STANDARDS (AQS)	13-2
TABLE 13.2	MITIGATION AND MANAGEMENT CONTROLS FOR AIR QUALITY (CONSTRUCTION)	13-4
TABLE 13.3	MITIGATION AND MANAGEMENT CONTROLS FOR AIR QUALITY (OPERATION)	13-6
TABLE 13.4	NOISE STANDARDS (DBA)	13-8
TABLE 13.5	MITIGATION AND MANAGEMENT CONTROLS FOR NOISE (CONSTRUCTION)	13-9
TABLE 13.6	MITIGATION AND MANAGEMENT CONTROLS FOR NOISE (OPERATION)	13-10
TABLE 13.7	MINING EFFLUENT DISCHARGES – MINING	13-12
TABLE 13.8	DOMESTIC WASTEWATER (WBG)	13-13
TABLE 13.9	MITIGATION AND MANAGEMENT CONTROLS FOR WATER RESOURCES (CONSTRUCTION)	13-14
TABLE 13.10	MITIGATION AND MANAGEMENT CONTROLS FOR WATER RESOURCES (OPERATION)	13-16
TABLE 13.11	MITIGATION AND MANAGEMENT CONTROLS FOR SOIL (CONSTRUCTION)	13-21
TABLE 13.12	MITIGATION AND MANAGEMENT CONTROLS FOR SOIL (OPERATION)	13-23

TABLE 13.13	MITIGATION AND MANAGEMENT CONTROLS FOR LANDSCAPE AND VISUAL (CONSTRUCTION)	13-28
TABLE 13.14	MITIGATION AND MANAGEMENT CONTROLS FOR LANDSCAPE AND VISUAL (OPERATION)	13-29
TABLE 13.15	MITIGATION AND MANAGEMENT CONTROLS FOR ECOLOGY (PRE-CONSTRUCTION AND CONSTRUCTION)	13-34
TABLE 13.16	MITIGATION AND MANAGEMENT CONTROLS FOR ECOLOGY (OPERATION)	13-36
TABLE 13.17	MITIGATION AND MANAGEMENT CONTROLS FOR CULTURAL HERITAGE (CONSTRUCTION)	13-40
TABLE 13.18	MITIGATION AND MANAGEMENT CONTROLS FOR CULTURAL HERITAGE (OPERATION)	13-40
TABLE 13.19	MITIGATION AND MANAGEMENT CONTROLS FOR SOCIAL (CONSTRUCTION)	13-43
TABLE 13.20	MITIGATION AND MANAGEMENT CONTROLS FOR SOCIAL (OPERATION)	13-46
TABLE 13.21	MITIGATION AND MANAGEMENT CONTROLS FOR OCCUPATIONAL HEALTH AND SAFETY (CONSTRUCTION)	13-50
TABLE 13.22	MITIGATION AND MANAGEMENT CONTROLS FOR OCCUPATIONAL HEALTH AND SAFETY (OPERATION)	13-52
TABLE 13.23	MITIGATION AND MANAGEMENT CONTROLS FOR UNPLANNED EVENTS (CONSTRUCTION AND OPERATION)	13-55
TABLE 13.24	ENVIRONMENTAL AND SOCIAL MONITORING PLAN	13-58
TABLE 13.25	PROJECT E&S TEAM ROLES AND RESPONSIBILITIES	13-68
TABLE 13.26	FREQUENCY OF ESMS REVIEW MEETING OF THE PROJECT	13-78
TABLE 14.1	SUMMARY OF RESIDUAL IMPACT ASSESSMENT SIGNIFICANCE	14-4

## LIST OF FIGURES

FIGURE 1.1	RISK MATRIX	1-2
FIGURE 2	FIGURE TITLE	4
FIGURE 2.1	IFC SIGNIFICANCE CRITERIA	2-4
FIGURE 2.2	DUST INFOGRAPHIC	2-6
FIGURE 2.3	TRAFFIC INFOGRAPHIC	2-7
FIGURE 2.4	LOCATION OF EMISSION SOURCES	2-16
FIGURE 2.5	AIR QUALITY RECEPTORS	2-18
FIGURE 2.6	1-HOUR NO <sub>2</sub> MAXIMUM PC CONTOUR PLOT	2-30
FIGURE 2.7	1-HOUR NO <sub>2</sub> 99 <sup>TH</sup> PERCENTILE PC CONTOUR PLOT	2-31
FIGURE 2.8	ANNUAL NO <sub>2</sub> MAXIMUM PC CONTOUR PLOT	2-32
FIGURE 2.9	10-MINUTE SO <sub>2</sub> MAXIMUM PC CONTOUR PLOT	2-33
FIGURE 2.10	24-HOUR SO <sub>2</sub> MAXIMUM PC CONTOUR PLOT	2-34
FIGURE 2.11	24-HOUR PM <sub>10</sub> MAXIMUM PC CONTOUR PLOT	2-35
FIGURE 2.12	24-HOUR PM <sub>10</sub> 99 <sup>TH</sup> PERCENTILE PC CONTOUR PLOT	2-36
FIGURE 2.13	ANNUAL PM <sub>10</sub> MAXIMUM PC CONTOUR PLOT	2-37
FIGURE 2.14	DAILY DUST DEPOSITION MAXIMUM PC CONTOUR PLOT	2-38
FIGURE 3.1	AREA OF INFLUENCE	3-3
FIGURE 3.2	PREDICTED NOISE LEVELS – MINING OPERATION (NORTHERNMOST PITS)	3-21
FIGURE 3.3	PREDICTED NOISE LEVELS – MINING OPERATION (SOUTHERNMOST PITS)	3-22
FIGURE 6.1	HEC-HMS SUBBASINS AND RECEIVING NODES FOR THE EXISTING-CONDITIONS MODEL	6-4
FIGURE 6.2	HEC-HMS MODEL HYDROGRAPH SHOWING SIMULATED VS OBSERVED FLOW AT MINNEHAHA CREEK	6-5
FIGURE 6.3	EAGLE MOUNTAIN CONCEPTUAL WATER BALANCE MODEL	6-6
FIGURE 6.4	EAGLE MOUNTAIN CONCEPTUAL PROCESS FLOW DIAGRAM	6-7
FIGURE 6.5	WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY WET SEASON	6-7

FIGURE 6.6	WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY AVERAGE SEASON	6-8
FIGURE 6.7	WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY DRY SEASON	6-8
FIGURE 6.8	SURFACE WATER QUANTITY CONCEPTUAL MODEL	6-9
FIGURE 6.9	SURFACE WATER QUANTITY CONCEPTUAL MATHEMATICAL MODEL FOR MAHDIA RIVER	6-10
FIGURE 6.12	DISCHARGE TO MAHDIA RIVER DURING WET, MEDIAN, AND DRY CONDITIONS	6-16
FIGURE 6.13	AVERAGE MONTHLY MAHDIA RIVER FLOW UNDER VARYING PRECIPITATION CONDITIONS	6-17
FIGURE 6.14	TSF OVERFLOW WATER QUALITY UNDER VARYING PRECIPITATION CONDITIONS	6-18
FIGURE 6.15	TSF MIXING MODEL CONTAMINANT CONCENTRATIONS	6-19
FIGURE 6.16	TSF MIXING MODEL, INACTIVE STATE CONTAMINANT CONCENTRATIONS	6-20
FIGURE 7.1	GROUNDWATER AREA OF INFLUENCE	7-2
FIGURE 7.2	LOCATION OF CROSS-SECTION FOR TRANSIENT GROUNDWATER MODEL PITS WATER TABLE (PURPLE LINE)	7-13
FIGURE 7.3	TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 1 WATER TABLE	7-13
FIGURE 7.4	TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 3 WATER TABLE	7-14
FIGURE 7.5	TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 7 WATER TABLE	7-14
FIGURE 7.6	TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 15 WATER TABLE	7-15
FIGURE 7.7	TRANSIENT MINING GROUNDWATER MODEL SALBORA PIT DEWATERING	7-16
FIGURE 7.8	TRANSIENT MINING GROUNDWATER MODEL TOUCAN PIT DEWATERING	7-16
FIGURE 7.9	TRANSIENT MINING GROUNDWATER MODEL POWIS PIT DEWATERING	7-17
FIGURE 7.10	TRANSIENT MINING GROUNDWATER MODEL EAGLE PIT DEWATERING	7-17
FIGURE 9.1	SOCIAL AOI	9-2
FIGURE 12.1	HISTORIC MINING ACTIVITY IN THE SOCIAL AOI	12-4
FIGURE 13.1	BIODIVERSITY RESERVE AREA	13-33
FIGURE 13.2	MONITORING LOCATIONS	13-62
FIGURE 13.3	HIERARCHY OF THE PROJECT ESMS	13-64
FIGURE 13.4	ESMS STRUCTURE	13-66
FIGURE 13.5	RISK MANAGEMENT PROCESS	13-71
FIGURE 13.6	BASIC PROCESS FLOW OF THE MANAGEMENT PROGRAM	13-76

## 1. RISK ASSESSMENT

The Guyana EPA Environmental Impact Assessment Guidelines indicates that ESIAs for mining projects include a “description of any hazards or dangers which may arise from the project and an assessment of the risk to the environment”.

The major risks arising from mining operations as defined by UNEP’s (2001) Awareness and Preparedness for Emergencies at Local Level (APELL) for mining include:

- Tailings dam failures – can release liquified tailings in the environment that can travel great distances causing destruction of environmental, biodiversity and human / social receptors.
- Waste dumps failures – slides of waste rock can have similar effects to tailing dam failures.
- Transport to and from site and loading – transportation of hazardous materials can result in accidental spills and releases in the environment that can affect both environmental and social receptors.
- Pipeline failures – tailings, concentrate, fuel or chemicals can be transported via pipeline across large distances, ruptures can lead to leaching of hazardous substances into the environment.
- Subsidence and land collapse – generally associated with underground mining activities, subsidence can result in collapse of the ground or deteriorated ground stability across relatively large areas.
- Fires and explosions – explosives and flammable substances are commonly used in mining operations, improper use or storage can lead to fires and explosion.
- Chemical spills – several chemicals are routinely used in mining operations and improper use; transport or storage can lead to uncontrolled releases into the environment.

Other risks include, but are not limited to, soil and water contamination, poor air quality affecting community health and crops, loss of biodiversity and important habitats, increased traffic, and pressure on existing local services such as healthcare.

All risks arising from mining activities, including the ones described above, can be managed through risks and hazard identification and emergency preparedness.

### 1.1 RISK EVALUATION CRITERIA

Risk evaluation is undertaken to identify the potential risks for the Project, the likelihood of their occurrence to identify the significance of the impacts that could result from these interactions.

The potential interactions between the likelihood and the estimated impact significance are analysed through a matrix approach. The matrix of interactions between likelihood and the estimated impact magnitude are shown in Figure 1.1.



FIGURE 1.1 RISK MATRIX

Risk significance matrix						
Estimated impact	Critical	5 - Medium	10 - High	15 - Critical	20 - Critical	25 - Critical
	Major	4 - Medium	8 - Medium	12 - High	16 - Critical	20 - Critical
	Moderate	3 - Low	6 - Medium	9 - Medium	12 - High	15 - Critical
	Minor	2 - Low	4 - Medium	6 - Medium	8 - Medium	10 - High
	Negligible	1 - Low	2 - Low	3 - Low	4 - Medium	5 - Medium
		Rare	Unlikely	Possible	Likely	Very likely
		1	2	3	4	5

Key:

Low significance (1-3)

Medium significance (4-9)

High significance (10-12)

Critical significance (15-25)

Risk significance has been calculated as an interaction between the likelihood of the risk occurring and its impact. The likelihood of the risk occurring has been classified as:

- **Very likely** – event which is almost certain to arise in the next 2 years and/or will occur several times.
- **Likely** – event which is likely to arise in the next 2 years.
- **Possible** – event which can be expected at least once in the next 2 years.
- **Unlikely** – event which is unlikely to occur during the next 2 years.
- **Rare** – event which is very unlikely to occur during the next 2 years.

Impacts are classified as:

- **Critical** – leading to critical / catastrophic adverse environmental and social impacts with no recovery;
- **Major** – leading to significant adverse environmental and social impacts with large recovery time (5+ years);
- **Moderate** – leading to environmental and social impacts with medium term recovery (1-2 years)
- **Minor** – leading to environmental and social impacts with limited remediation action required;
- **Negligible** – leading to negligible environmental and social impacts.

## 1.2 RISK REGISTER AND ASSESSMENT FOR PROJECT

A risk register has been prepared for the Project and included in Table 1.1.

The register includes a subdivision of impacts according to category, a description of the risk, the nature of the impact (direct, indirect or cumulative), a description of the causes and exacerbating factors, the anticipated residual significance of the risk and a brief description of management controls in place.

TABLE 1.1 RISK REGISTER

Category	Risk	Impact type	Causes	Exacerbating factors	Anticipated Significance	Management comment
Hydrology	Altered drainage patterns and changes in flow characteristics.	Direct	Changes to topography associated with opencast mining.	-	Medium	Unavoidable changes to topography.
		Direct	Location of tailings and waste rock storage sites.	Tailings pond and dam design.	High	Unavoidable changes to topography and vegetation cover.
		Indirect	Slope failure due to reduced resilience to natural disaster because of altered topography.	High rainfall regions are prone to erosion.	Low	Reduced risk through standard slope stabilisation methods.
	Reduced flow rates.	Indirect	Reduced baseflow from decreased water table due to mine dewatering.	-	Low	High rainfall regionally and potential discharge of mine water. Limited groundwater and low permeability.
		Direct	Reduced water availability due to abstraction of ground- and surface water.	Watercourses have been disturbed by historical and ongoing mining activities	Medium	Streamflow in main rivers is relatively consistent. Reduced risk through monitoring stream baseflow.
Hydrogeology	Lowering of groundwater levels.	Direct	Decreased water table due to dewatering of mine works.	-	Low	High rainfall regionally and potential discharge of mine water. Reduced risk through continuous monitoring of groundwater levels and contingency measures.
		Direct	Reduced water availability due to abstraction of ground- and surface water.	Watercourses have been disturbed by historical and ongoing mining activities	Medium	Salbora pit within potential influence of altered groundwater regime. Reduced risk through continuous monitoring of groundwater levels.
Water quality	Increased suspended solids in surface water.	Indirect	Physical disturbance of soils during land clearance, at borrow pits and internal road and airstrip construction.	High rainfall regions are prone to erosion.	Low	Reduced risk through standard erosion control methods.
		Indirect	Construction and operation of project facilities.	High rainfall regions are prone to erosion.	Low	Reduced risk through standard riverbank stabilisation methods.
		Indirect	Increased erosion potential due to altered topography and drainage patterns caused by opencast mining and mineralised waste storage facilities, including potential slope failure incidents and tailings pond embankment failures.	High rainfall regions are prone to erosion.	Medium	Reduced risk through standard erosion control and slope stabilisation methods, including silt fences, check dams, sediment basins, and stabilised drainage channels.
		Direct	Direct runoff from exposed soils, waste rock stockpiles and tailings storage facility.	High rainfall regions are prone to erosion.	Medium	Reduced risk through standard erosion control and slope stabilisation methods.
	Regional surface water quality deterioration.	Cumulative	Increased suspended solids due to soil disturbance and increased erosion potential.	Historical mining and current artisanal mining activities in the region.	Medium	See various erosion prevention measures in ESMMP (Volume 3). Improved water quality discharges from Eagle Mountain Prospecting License (EMPL) are likely due to implementation of erosion control measures.
		Cumulative	Further deterioration of water quality due to AMD and contamination from processing reagents. Limited risk of AMD and other contaminants		Low	See various pollution prevention measures in ESMMP (Volume 3).
	Contamination of surface and groundwater resources.	Direct	Spillage of heavy fuel oil at project plant, or other bulk chemical reagents being transported, handled and used.	Transport via complex logistics and challenging terrain.	Medium	Reduced by good practice management measures for transport, handling and storage of hazardous substances.
		Direct	Contamination of groundwater and surface water from blasting residues and hydrocarbons during mining operations.	-	Low	Reduced risk through good practice blasting and hydrocarbon management measures.

Category	Risk	Impact type	Causes	Exacerbating factors	Anticipated Significance	Management comment
		Direct	Contamination of groundwater and surface water from potential AMD from mine working, mineralised waste and mine water management.	Historical mining and current artisanal mining activities in the region. Legacy contamination of water bodies within the Project area.	Low	Potential for AMD considered to be low for the Project.
		Direct	Contamination from chemical processing of ore and product.	Legacy contamination of water bodies within the Project area.	Medium	Reduced risk through good practice water treatment and reuse.
		Direct	Contamination due to spillage of hazardous substances during maintenance and repair activities.	-	Low	Reduced risk through good practice pollution and spill prevention methods.
		Direct	Contamination from waste management activities including hazardous wastes and sewage.	High rainfall region is prone to transport of contaminants.	Low	Risk reduced through good practices in waste management, treatment of sewage, and licensed disposal.
		Direct	Seepage from on-site landfill disposal of non-hazardous waste.	High rainfall region is prone to transport of contaminants.	Low	Good practice in landfill design, operation and closure and monitoring. Landfill disposal in low permeability soil storage.
		Direct	Increased mobilisation of pollutants due to a potential slope failure incident and tailings pond embankment failures.	-	Medium	Built in design mitigation measures into project design.
		Direct	Contamination from spillage during fuel and hazardous materials transport	-	Low	Reduced risk through good practice pollution and spill prevention methods and driver training.
Soils	Erosion of topsoil.	Direct	Physical disturbance of soils during land clearance, at borrow pits and internal road and airstrip construction.	High rainfall regions are prone to erosion.	Low	Good practices of soil conservation and erosion prevention measures, including revegetation of disturbed areas
	Increase in regional erosion.	Cumulative	Soil disturbance resulting increased erosion potential.	Historical mining and current artisanal mining activities in the region.	Medium	Good practices soil conservation and erosion prevention measures, and engagement with communities on soil management.
	Increased erosion potential	Indirect	Altered topography and drainage patterns caused by opencast mining and mineralised waste storage facilities, including potential slope failure and surface subsidence incidents.	High rainfall regions are prone to erosion.	Low	Reduced risk of subsidence through standard mine stabilisation and backfill methods. Reduced risk of slope failure through standard erosion control and slope stabilisation methods. To be confirmed by hydrological flow modelling and resulting recommendations.
	Contamination of soils resources.	Direct	Spillage of heavy fuel oil at project plant, or other bulk chemical reagents being transported, handled and used.	Transport via complex logistics and challenging terrain.	Medium	Reduced risk through good practice blasting? and hydrocarbon management measures.
		Direct	Contamination from chemical processing of ore and product.	Historical mining and current artisanal mining activities in the region.	Medium	Reduced risk through good practice water treatment and reuse, and management of cyanide destruction and natural degradation.
		Direct	Contamination due to spillage of hazardous substances during maintenance and repair activities.	-	Low	Reduced risk through good practice pollution and spill prevention methods.
		Direct	Contamination from waste management activities including hazardous waste and sewage.	-	Low	Risk reduced through good practices in waste management, treatment of sewage, and licensed disposal.
		Direct	Seepage and runoff from on-site landfill disposal of non-hazardous waste.	High rainfall region is prone to transport of contaminants.	Low	Good practice in landfill design, operation and closure and monitoring.

Category	Risk	Impact type	Causes	Exacerbating factors	Anticipated Significance	Management comment
Biological Environment	Non-project related exploitation of biological resources.	Indirect	Improved access to the wider area afforded by project improvements to shipping and road access.	Existing reliance on and markets for plant and animal resources.	Medium	Collaboration with government authorities, non-governmental organisations (NGOs) and community engagement on sustainable resource management.
	Increased use and harvesting of natural resources e.g. wood for fuel and construction, bushmeat, edible and medicinal plants, etc.	Direct	Worker and job seeker influx placing additional pressure on biological resources.	Existing reliance on and markets for plant and animal resources.	Medium	Can be managed through proactive stakeholder engagement and corporate social responsibility (CSR) programs, and establishing sustainable consumables supply chain. Ensuring controlled access to site and no hunting or fishing policies. Implementation of an Influx Management Plan
	Loss of habitat and deforestation.	Direct	Land clearance for access and infrastructure development.	-	Medium	Unavoidable. Design considerations incorporated to reduce extent of land clearances for infrastructure
		Indirect	Loss of habitat and deforestation of food gardens to service additional population.	-	Low	Can be managed through proactive stakeholder engagement and CSR programs, and establishing sustainable consumables supply chain.
		Indirect	Slope failure due to reduced resilience to natural disasters as a result of altered topography.	High rainfall regions are prone to erosion.	Low	Reduced risk through standard slope stabilisation methods.
	General disturbance to biodiversity.	Cumulative	Project impacts on water and soil resources, habitat, noise, vibrations, reduced air quality, night lighting, etc. and indirect impacts such as further land use change and improved accessibility.	Presence of important aquatic species.	Low	Anticipated reduction through good practice environmental impact management especially regarding habitat protection, pollution prevention, erosion control and water management, dust and noise management, visual impact reduction, and rehabilitation.
	Regional habitat degradation and loss of biodiversity.	Cumulative	Improved access, land clearance, increased population pressure and general disturbance to biodiversity.	Historical mining and current artisanal mining activities in the region. Existing reliance on and markets for plant and animal resources.	Medium	Implementation of overall habitat preservation and restoration programs. Ensuring controlled access to site and no hunting and fishing policies.
	Changes to riverine and aquatic habitats.	Indirect	Reduced flows due to water abstraction and mine dewatering.	-	Low	Reduced risk of subsidence through standard mine stabilisation and backfill methods. Reduced risk of slope failure through standard erosion control and slope stabilisation methods. To be confirmed by hydrological flow modelling and resulting recommendations.
	Contamination of riverine and aquatic habitat.	Direct	Spillage of heavy fuel oil at project plant, or other bulk chemical reagents being transported, handled and used.	Transport via water within challenging terrain.	Medium	Reduced by good practice management measures for transport, handling and storage of hazardous substances.
		Direct	Contamination of groundwater and surface water from blasting residues and hydrocarbons during mining operations.	-	Low	Reduced risk through good practice blasting and hydrocarbon management measures.
		Direct	Contamination from chemical processing of ore and product.	Legacy contamination of water bodies within the Project area, a poorly understood situation.	Low	Reduced risk through good practice water treatment and cyanide destruction.
		Direct	Contamination due to spillage of hazardous substances during maintenance and repair activities.	-	Low	Reduced risk through good practice pollution and spill prevention methods.
		Direct	Contamination from waste management activities including hazardous wastes and sewage.	High rainfall area with high runoff potential.	Low	Risk reduced through good practices in waste management, treatment of sewage, and licensed disposal.



Category	Risk	Impact type	Causes	Exacerbating factors	Anticipated Significance	Management comment
		Direct	Seepage from on-site landfill disposal of non-hazardous waste.	High rainfall area.	Medium	Good practice in landfill design, operation and closure and monitoring.
		Direct	Contamination of riverine habitat due to a potential slope failure incident and tailings pond embankment failures.	-	Medium	Built in design mitigation measures into project design.
	Entrapment, injury/death of wildlife.	Direct	Hazardous excavations, blasting and equipment during construction and mining activities.	-	Low	Training of staff and infill of trenches.
	Disruption circadian rhythms in both nocturnal and diurnal biodiversity.	Direct	Visual disturbance caused by night lighting.	-	Low	Directional lighting.
	Attraction of insectivorous wildlife and associated predators.	Indirect	Visual disturbance caused by night lighting.	-	Low	Directional lighting.

## 2. AIR QUALITY IMPACT ASSESSMENT

### 2.1 INTRODUCTION

This Chapter presents the Air Quality impact assessment (AQIA) chapter for the Eagle Mountain gold mine Project.

The Project's operation will lead to air emissions that could negatively impact the health and well-being of sensitive human receptors. The mining activities are primarily associated with:

- emissions of dust and particulate matter (as PM<sub>10</sub>) from the mining and material handling; and
- emissions of oxides of nitrogen (NO<sub>x</sub>) and by association nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>) and emissions of sulphur dioxide (SO<sub>2</sub>) from the power plant, mobile plant and non-mobile plant.
- emissions of hydrogen cyanide (HCN) from the processing plant are expected to be minimal for this assessment.

An emissions inventory has been used to prepare dispersion modelling to assess potential impacts on the general population.

### 2.2 DEFINING AREA OF INFLUENCE

#### 2.2.1 SCREENING DISTANCES

The area of influence is:

- Construction dust: 250 m from dust raising activities
- Construction traffic: 200 m from roads used by construction traffic
- Operational emissions mine: 10 km from operational emissions
- Operational Traffic: 200 m from roads used by operational traffic

Pre-construction and early works typically result in negligible impacts to air quality due to small scale and short duration and are not considered in the assessment.

#### 2.2.2 SENSITIVE RECEPTORS

The sensitive receptors that are considered in the assessment include:

- Human receptors:
  - Community areas around the Eagle Mountain Prospecting License (EMPL) boundary (such as Minnehaha to the South)
- Ecological receptors are evaluated in Biological Impact Assessment Chapter (Volume 3: Chapter 8).

#### 2.2.3 SOURCES OF EMISSIONS

The sources of emissions that are considered in terms of impacts to air quality include:

- Construction:
  - Construction dust (nuisance dust, PM<sub>10</sub> and suspended particulates):
    - Land clearing and preparation

- Construction of roads, plant, and infrastructure
- Dust generation from unpaved roads
- Construction traffic (PM<sub>10</sub>, NO<sub>2</sub> and NO<sub>x</sub>):
  - Traffic bringing materials and suppliers to the site
  - Traffic bringing workers to the site
- Operational:
  - Diesel generators (PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub>)
  - Blasting (dust, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and NO<sub>x</sub>)
  - Loading, unloading and haulage of ore and waste (dust, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and NO<sub>x</sub>)
  - Waste dumping (dust, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and NO<sub>x</sub>)
  - Crushing (dust, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and NO<sub>x</sub>)
  - Stockpiling (dust and PM<sub>10</sub>)
  - Loading and unloading of Stockpiles (dust and PM<sub>10</sub>)
  - Processing of ore using leaching agents (HCN)

## 2.3 IMPACT ASSESSMENT CRITERIA

### 2.3.1 LEGAL FRAMEWORK

In the absence of applicable Guyana regulatory guidance, ERM used International Finance Corporation (IFC) standard methods for selecting air pollutants to monitor, selecting the monitoring site, and establishing other program parameters. Resulting measurements have been compared to the World Health Organisation's (WHO) Interim Target 1 Guidelines (WHO 2000)<sup>1</sup>. Whilst the WHO issued updated air quality guidelines in 2021, the WHO also stated that the 2000 guidelines remain applicable in emerging economies.

As there is no local regulatory standard for dustfall, guidelines are derived from Germany TA-Luft standards<sup>2</sup> (these are generally comparable to other international guidelines and are considered protective of human amenity).

The air quality criteria are presented in Table 2.1.

**TABLE 2.1 AIR QUALITY CRITERIA**

Governing Organisation	Criteria Pollutant	Averaging Period	Air Quality Standard (2001)	Air Quality Standards (2021) – Interim target				Units
				1	2	3	4	
WHO	PM <sub>2.5</sub>	Annual	35	35	25	15	10	µg/m <sup>3</sup>
		24-hour	75	75	50	37.5	25	µg/m <sup>3</sup>
	PM <sub>10</sub>	Annual	70	70	50	30	20	µg/m <sup>3</sup>
		24-hour	150	150	100	75	50	µg/m <sup>3</sup>

<sup>1</sup> WHO Global Air Quality Guidelines, 2021.

<https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf>

<sup>2</sup> Technical Instructions on Air Quality Control – TA Luft, 2002. [https://www.euromot.eu/wp-content/uploads/2017/03/GERMAN\\_TA\\_Luft\\_Technical\\_Instruction\\_on\\_Air\\_Quality\\_Control\\_2002-07-24.pdf](https://www.euromot.eu/wp-content/uploads/2017/03/GERMAN_TA_Luft_Technical_Instruction_on_Air_Quality_Control_2002-07-24.pdf)

Governing Organisation	Criteria Pollutant	Averaging Period	Air Quality Standard (2001)	Air Quality Standards (2021) – Interim target				Units
				1	2	3	4	
	NO <sub>2</sub>	Annual	40	40	30	20	-	µg/m <sup>3</sup>
		24-hour	120	120	50	-	-	µg/m <sup>3</sup>
		1-hour	200	-	-	-	-	µg/m <sup>3</sup>
	SO <sub>2</sub>	24-hour	125	125	50	-	-	µg/m <sup>3</sup>
		10-minute	500	-	-	-	-	µg/m <sup>3</sup>
Germany, TA-Luft	Dust deposition	24-hour	0.35	-	-	-	-	g/m <sup>2</sup> /day

µg/m<sup>3</sup> = micrograms per cubic meter; g/m<sup>2</sup>/day = grams per meters squared per day

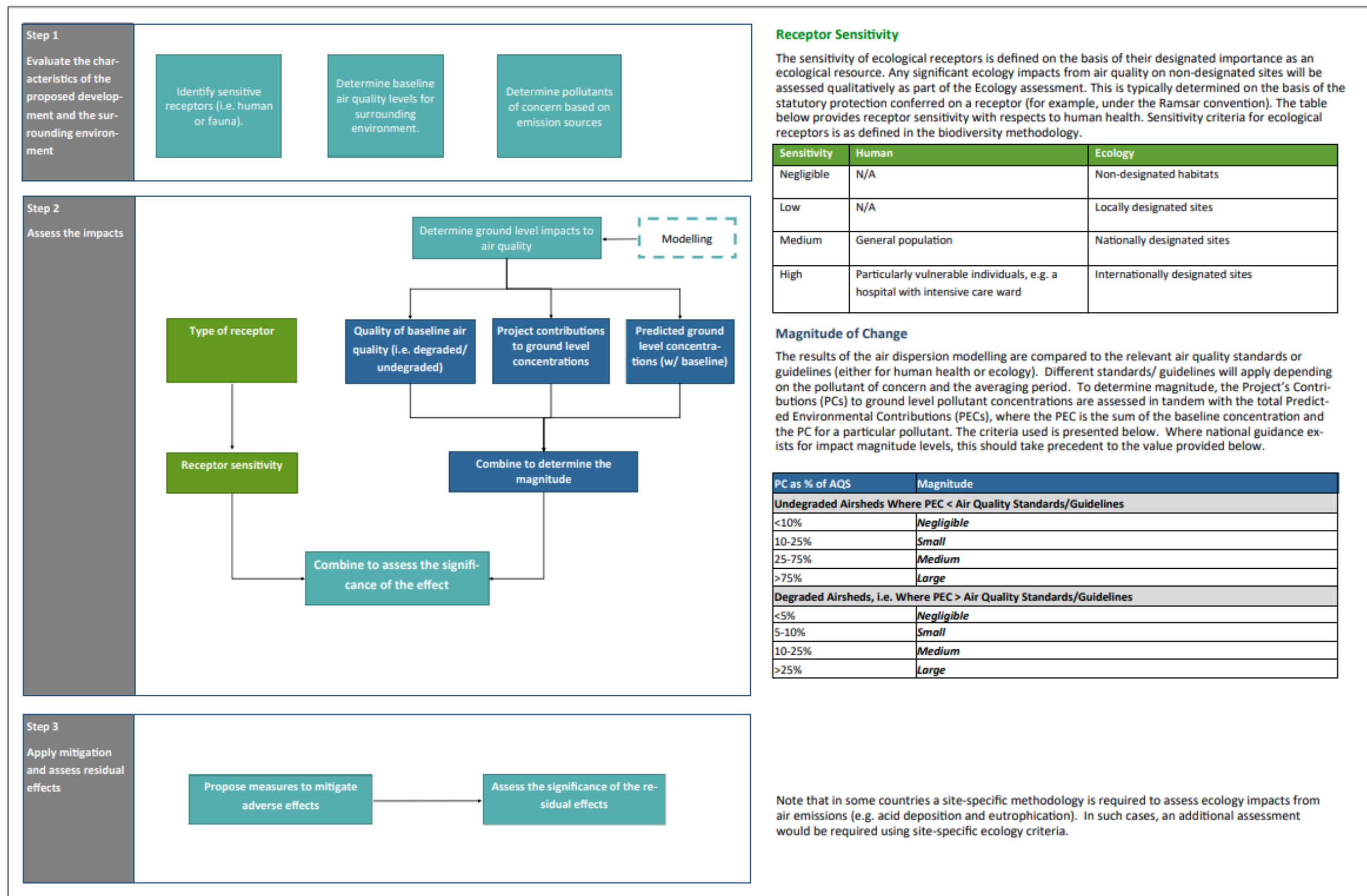
### 2.3.2 SIGNIFICANCE CRITERIA

The significance criteria adopted for the Project are derived from IFC guidance. These are based on the use of the:

- Baseline: this being the existing level of pollutants of interest
- Project contribution (PC): the impact of the project
- Predicted Environmental Concentration (PEC): Baseline + PC

The methodology and significance criteria are asset out in Figure 2.1.

FIGURE 2.1 IFC SIGNIFICANCE CRITERIA





## 2.4 ASSESSMENT METHODOLOGY

### 2.4.1 CONSTRUCTION DUST

Construction dust impacts can be rendered as negligible or, at worst, minor with the implementation of the correct mitigation. Construction activities that can result in significant emissions and impacts are:

- Earthworks
- Construction of infrastructure
- Track-out (dirt and debris mobilised onto roads which subsequently dries out and remobilises)

The screening methodology set out in Figure 2.2, is used to identify the risk of significant impacts arising and therefore the degree of mitigation required to control emissions to render residual impacts to at worst minor.

### 2.4.2 CONSTRUCTION TRAFFIC

The Project will generate traffic on the road network to bring materials and personnel to site. The screening thresholds are set out in Figure 2.3.

FIGURE 2.2 DUST INFOGRAPHIC

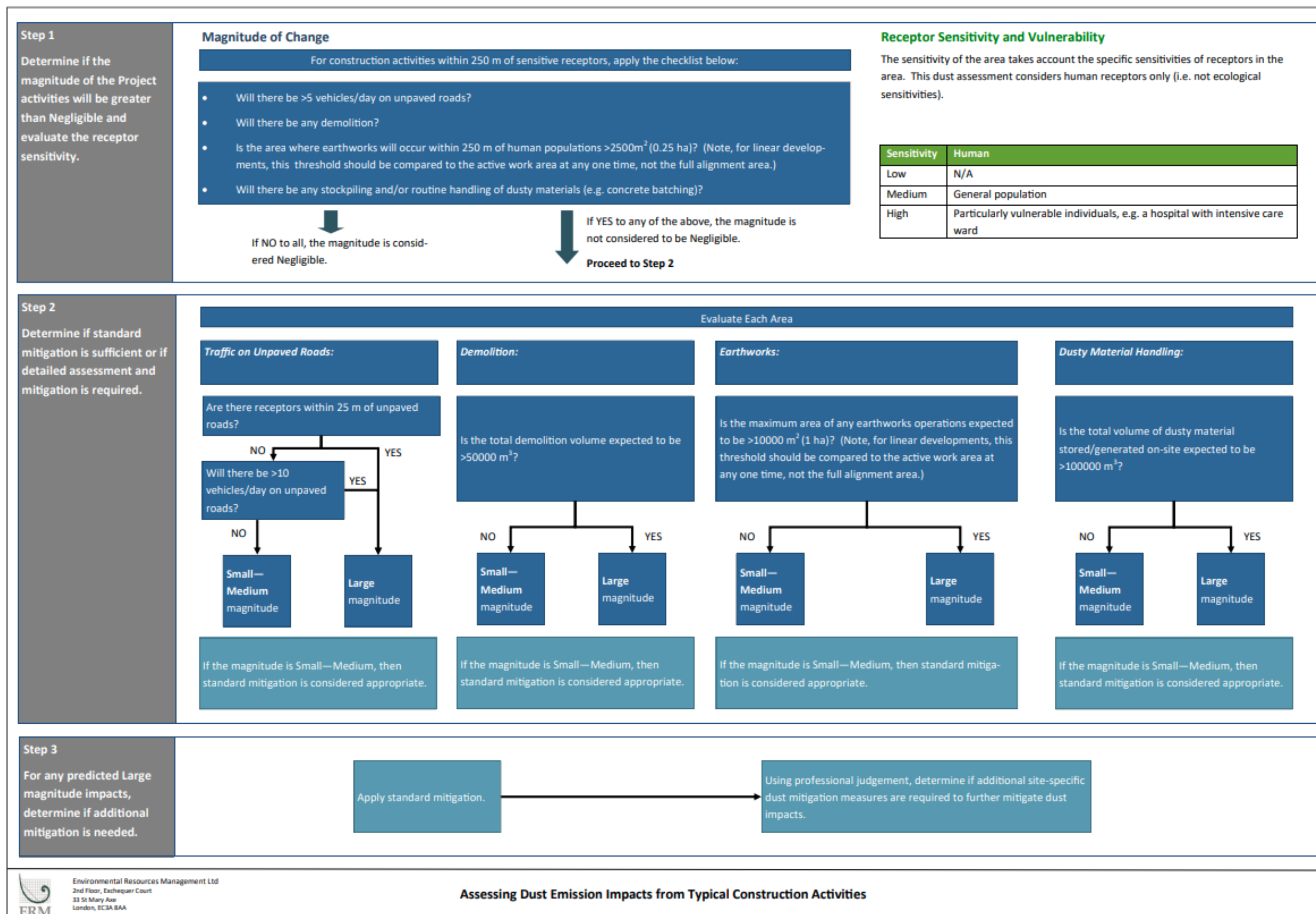
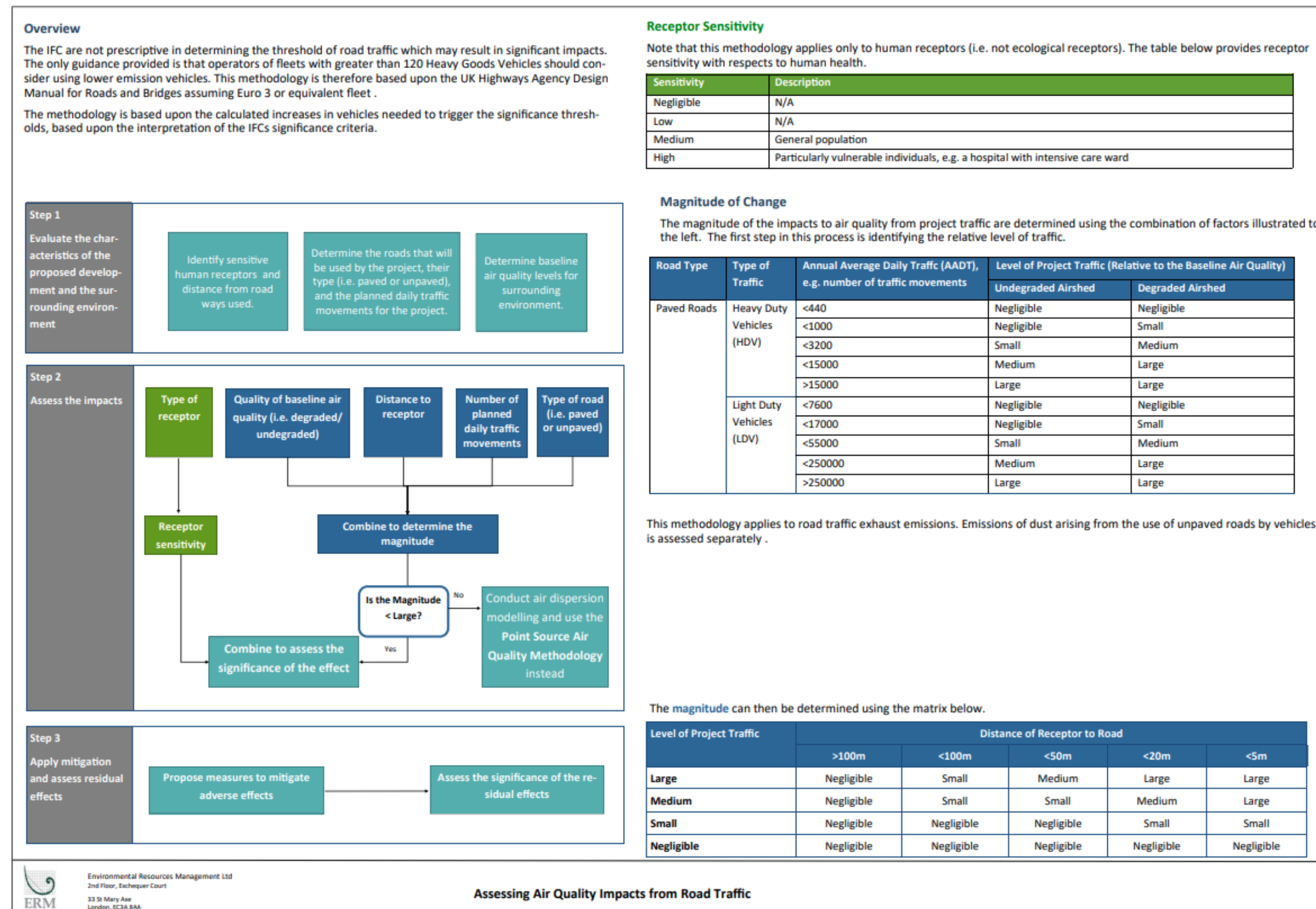


FIGURE 2.3 TRAFFIC INFOGRAPHIC



### 2.4.3 OPERATIONAL TRAFFIC

The Project will generate traffic on the local road network to bring materials and personnel to site, noting that the final product (gold doré) will be moved by air. The screening thresholds are set out in Figure 2.3.

At this stage the numbers of operational vehicle movements are unknown, and therefore the impacts cannot be predicted. However, given that final product will be flown out of site in small volumes and with consideration of the screening thresholds set out in Figure 2.3, it is anticipated that operational traffic will not result in significant impacts.

Emissions associated with heavy mobile machinery transporting mined material from the mine pit to the processing plant and waste dumps have been considered in the assessment and are covered in Section 2.4.4.

### 2.4.4 OPERATIONAL MINING

#### 2.4.4.1 INTRODUCTION

A comprehensive AQIA was undertaken utilising dispersion modelling for the Operational phase of this Project. The methodology used for undertaking this AQIA is set out in this section.

#### 2.4.4.2 EMISSIONS INVENTORY

Potential air quality impacts from the operational phase of the Project will primarily be associated with different dust raising activities. These include the initial preparation of the mine site, drilling and blasting operations, and the extraction and transfer of the mined material from the mine pit to the processing plant and the waste dumps/ TSF. Fugitive releases of dust are also anticipated at the processing plant and waste dump sites.

There is also the potential for impacts from combustion gases (oxides of nitrogen ( $\text{NO}_x$  and  $\text{NO}_2$ ), sulphur dioxide ( $\text{SO}_2$ ) and particulate matter ( $\text{PM}_{10}$ ) associated with heavy mobile machinery in the mine pit, processing plant, the operational haul fleet and the power plant that will be installed at the processing plant.

Additionally, there is the potential of impacts associated with the use of hydrogen cyanide (HCN) in the leaching process at the processing plant. The Site is expected to comply with the Cyanide Code<sup>3</sup> which will keep emissions of HCN to negligible concentrations. On that basis, impacts associated with fugitive emissions HCN have not been assessed in this study.

An emissions inventory was prepared for emission sources based on proposed activities and production rates using emission factors derived from the Australian Government National Pollutant Inventory (NPI) Mining<sup>4</sup> and United States Environmental Protection Agency (USEPA) AP-42 documents<sup>5</sup>. Table 2.2 to Table 2.4 describe the parameters associated with the mining operations, including mined volumes, vehicle movements and equipment parameters applied for each activity for input into the dispersion model.

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<sup>3</sup> Cyanide Code, <https://cyanidecode.org/about-the-cyanide-code/the-cyanide-code/#1584656516274-a4947e5f-daab>

<sup>4</sup> NPI Emission Estimation Technique Manual for Mining v3.1, 2012, <https://www.dccew.gov.au/sites/default/files/documents/mining.pdf>

<sup>5</sup> US EPA AP 42 Chapter 11: Mineral Products Industry, 2025, <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-11-mineral-products-0>

TABLE 2.2 MINE PARAMETERS USED IN OPERATIONAL PHASE

Parameter	Value	Notes
Mined Material Quantities		
Total Rock Extracted	8,517,000 tpa	The operational phase has adopted a worst-case scenario based on the scheduled year with the highest mine throughput – Year 14.
Total Ore for Stockpiling	2,264,000 tpa	
Total Waste Rock Production	6,253,000 tpa	
Crusher Feed	2,264,000 tpa	The mined quantities used in the emissions estimation have been taken from the Project Preliminary Economic Assessment (PEA) – Table 16.10.
Total Ore Export Rates	2.23 tpa	
Blasting Data		
Blasting Holes	682 per blast	Based on tonnage per blast and extracted rock for yr 14
Number of Blasts	52 per year	Assumed there would be 1 blast per week
Typical Area Blasted	10,854 m <sup>2</sup>	Calculation based on the anticipated quantity of ore that is expected to be mined in Year 14.
Tonnes/hole	240	Average fresh/transition/saprolite
Areas of Exposure		
Mine Pit 1	30,000 m <sup>2</sup>	The operational phase has adopted a worst-case scenario based on the scheduled year with the highest volume of extracted material – Year 14.
Mine Pit 2	43,000 m <sup>2</sup>	
Mine Pit 3	35,000 m <sup>2</sup>	During Year 14, ore is extracted from six different pits within the mine envelope. The area of the individual pits has been assumed from maps presented in the Project Description.
Mine Pit 4	85,000 m <sup>2</sup>	
Mine Pit 5	10,000 m <sup>2</sup>	
Mine Pit 6	16,000 m <sup>2</sup>	Emission rates have been calculated based on the total area that is mined during Year 14. Each mine pit has an individual emission rate based on its size in relation to the total mined area.
Total Mine Area	219,000 m <sup>2</sup>	
Run of Mine	64,000 m <sup>2</sup>	The area of the RoM has been assumed using maps provided by the client.
Stockpile Area in Processing Plant (Hard Rock)	3,025 m <sup>2</sup>	The two stockpiles are located within the larger RoM processing area
Stockpile Area in Processing Plant (Soft Rock)	3,150 m <sup>2</sup>	
Waste Dumps/ Tailings Storage Facility (TSF)	10,000 m <sup>2</sup>	The active waste dump is assumed to never be more than a hectare at a time.

Parameter	Value	Notes
		The TSF will be submerged and is assumed to never have an exposed surface than can generate fugitive emissions.
<b>Other Parameters</b>		
Moisture of Material	4%	The Project PEA has assumed that the moisture content for the fresh mill feed in the processing plant will be around 4%. This has been adopted in the AQIA to maintain consistency.
Silt Content	-	No silt content value was found in the available data.  Default emission factors for TSP and PM <sub>10</sub> were taken from the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining <sup>6</sup>
Mean Wind Speed	2.36 m/s	Taken from 5 years of WRF meteorological data used for AQIA
Percentage of hours in year with windspeed greater than 5.4 m/s	0.13%	Taken from 5 years of WRF meteorological data used for AQIA
Number of days in year with precipitation greater than 0.25 mm	196 days	Taken from 5 years of WRF meteorological data used for AQIA

TABLE 2.3 ROAD PARAMETERS USED IN OPERATIONAL PHASE ASSESSMENT

Parameter	Value	Notes
<b>Mine Pit to Processing Plant</b>		
Vehicle Mass – Haul Trucks	51.065 tonnes	For the worst-case year, there are expected to be 25 haul trucks in the fleet. The haul truck fleet are assumed to be Caterpillar 740 articulated trucks. These trucks have a 36 tonne capacity and a gross weight of 69.215 tonnes.
Mine Road Length	5,200 m	To capture worst-case emissions, the longest measured distance from one of the six mine pits in the Year 14 schedule (Site PEA) to the processing plant was chosen.
Number of Haul Trucks per Day	236 journeys/day	Calculated based on the daily throughput rate of the mine and the number of return journeys required for 25 haul trucks with a 36 tonne capacity.
Average Speed	20 km/hour	It is assumed that in-mine traffic will be slow due to mine terrain

<sup>6</sup> NPI Emission Estimation Technique Manual for Mining v3.1, 2012,  
<https://www.dcccew.gov.au/sites/default/files/documents/mining.pdf>



Parameter	Value	Notes
<b>Processing Plant to Waste Dumps</b>		
Vehicle Mass – Haul Trucks	51.065 tonnes	For the worst-case year, there are expected to be 25 haul trucks in the fleet. The haul truck fleet are assumed to be Caterpillar 740 articulated trucks. These trucks have a 36 tonne capacity and a gross weight of 69.215 tonnes.
Mine Road Length	2,600 m	To capture worst-case emissions, the longest measured distance from the processing plant to the northern-most edge of the waste dump was chosen.
Number of Haul Trucks per Day	177 journeys/day	Calculated based on the daily throughput rate of the mine and the number of return journeys required for 25 haul trucks with a 36 tonne capacity.
Average Speed	20 km/hour	It is assumed that in-mine traffic will be slow due to mine terrain

TABLE 2.4 EQUIPMENT PARAMETERS USED IN OPERATIONAL PHASE ASSESSMENT

Equipment Name	Power (kW)	Quantity	Notes
<b>Trucks</b>			
CAT 740	337	25	Located throughout mine site
Boom Truck	129	1	Located throughout mine site Assumed specifications based on Liebherr LTF 1060-4.1 truck mounted telescopic crane
Water/ Sand Truck	337	2	Located throughout mine site Assumed specifications based on CAT 740 articulated truck
<b>Front Loaders</b>			
Front End Loader	256	1	Located in processing plant Assumed specifications based on CAT 972-wheel loader
<b>Bulldozers</b>			
Cat D10	597	1	Located in mine pits
Wheel Dozer	370	1	Located in mine pits Assumed specifications based on CAT 834-wheel dozer
<b>Other Equipment</b>			
Telehandler	115	1	Located throughout mine site Assumed specifications based on Liebherr telescopic handler



Equipment Name	Power (kW)	Quantity	Notes
Rotary Drills	410	1	Located in mine pits Assumed specifications based on Epiroc DM30 II SP drill
Mobile Rock Breaker	132	1	Located in mine pits Assumed specifications based on Astec mobile rock breaker
Excavator	361	3	Located in mine pits Assumed specifications based on CAT 374 excavator
Grader	227	1	Located in mine pits Assumed specifications based on CAT 18 motor grader
<b>Power Generation</b>			
Diesel Generators	4,082	7	Located in processing plant Only four generators are assumed to be operational at any one time.

Emission calculations have been made based on current US-EPA emission factors<sup>7</sup>.

It is assumed that:

- All combustion equipment used in the Project are at least EPA Tier-2 compliant;
- All combustion equipment uses fuel with a sulphur content of 1%;
- With the exception of blasting equipment (i.e., rotary drills), which is assumed to occur only during the daytime between the hours of 0800 and 1700, equipment located in the mine pits and haul roads are assumed to be operational during both daytime and nighttime hours;
- Equipment located in the processing plant area are assumed to be operational 24/7;
- The diesel generators have a combined capacity of approximately 8 MW and are responsible for power at the processing plant. Only 4 generators are assumed to be operational at any one time;
- The diesel generators are assumed to be responsible for all power requirements at the processing plant area. No combustion emissions are assumed to be released by the processing equipment itself.

Emission mitigation will be embedded within the design of the mine. International best practise mitigation measures have been applied to the emission factors before they were implemented into the model. The mitigation measures are described in Table 2.5.

<sup>7</sup> United States Environmental Protection Agency (USEPA), 2025, *EPA Emission Standards for Nonroad Engines and Vehicles*, <https://www.epa.gov/emission-standards-reference-guide/epa-emission-standards-nonroad-engines-and-vehicles>

TABLE 2.5 EMBEDDED MITIGATION MEASURES

Activity	Abatement Measure	Effectiveness of Abatement
Scrapers on topsoil	No abatement applied	0%
Drilling	Water sprays	50%
Blasting	No abatement applied	0%
Bulldozer activities	No abatement applied	0%
Hauling materials	Water sprays	50%
Loading Trucks	No abatement applied	0%
Unloading Trucks	Water sprays	50%
Loading and Unloading Stockpiles	Water sprays	50%
Miscellaneous transfer and conveying	Water sprays	50%
Wind Erosion	No abatement applied	0%

### Emission Rates

The emission rates for each activity for the operational phase are set out in Table 2.6 to Table 2.8. The mine layout, showing approximate locations of the modelled emission sources are detailed in Figure 2.4.

TABLE 2.6 OPERATIONAL PHASE EMISSION SOURCES – AREA SOURCES

Source Name	Active Area (m <sup>2</sup> )	Emission Rate (g/s/m <sup>2</sup> )			
		Constant Operations <sup>a</sup>		Daytime Operations <sup>b</sup>	
		TSP	PM <sub>10</sub>	TSP	PM <sub>10</sub>
Mine Pits (Total)	219,000	$7.07 \times 10^{-6}$	$3.57 \times 10^{-6}$	$3.92 \times 10^{-5}$	$1.07 \times 10^{-5}$
Mine Pit 1	30,000	$9.69 \times 10^{-7}$	$4.90 \times 10^{-7}$	$5.36 \times 10^{-6}$	$1.46 \times 10^{-6}$
Mine Pit 2	43,000	$1.39 \times 10^{-6}$	$7.02 \times 10^{-7}$	$7.69 \times 10^{-6}$	$2.10 \times 10^{-6}$
Mine Pit 3	35,000	$1.13 \times 10^{-6}$	$5.71 \times 10^{-7}$	$6.26 \times 10^{-6}$	$1.71 \times 10^{-6}$
Mine Pit 4	85,000	$2.74 \times 10^{-6}$	$1.39 \times 10^{-6}$	$1.52 \times 10^{-5}$	$4.15 \times 10^{-6}$
Mine Pit 5	10,000	$3.23 \times 10^{-7}$	$1.63 \times 10^{-7}$	$1.79 \times 10^{-6}$	$4.88 \times 10^{-7}$
Mine Pit 6	16,000	$5.17 \times 10^{-7}$	$2.61 \times 10^{-7}$	$2.86 \times 10^{-6}$	$7.81 \times 10^{-7}$
Processing Area	64,000	$5.04 \times 10^{-5}$	$2.14 \times 10^{-5}$	$2.76 \times 10^{-7}$	$1.31 \times 10^{-7}$
Waste Dumps	10,000	$5.56 \times 10^{-6}$	$2.78 \times 10^{-6}$	$4.88 \times 10^{-6}$	$2.31 \times 10^{-6}$

<sup>a</sup> The AQIA has assumed that drilling and blasting activities in the mines, all activities at the processing plant and wind erosion sources are constant and emit fugitive dust on a 24/7 basis.

<sup>b</sup> During the worst-case year (Year 14), ore will be extracted from six locations within the mine envelope. Six area sources have been set up within the model representing these six mine pits. The fugitive dust emission rate for the total mine pit area has been divided among the six area sources based on their active area in comparison to the total mine active area.

**TABLE 2.7 OPERATIONAL PHASE EMISSION RATES – ROAD SOURCES**

Source Name	Length of Road Segment	Number of Modelled Points	Emission Rate (g/s)	
			TSP	PM <sub>10</sub>
Mine Pit to Processing Area	500 m	12	2.89	0.85
Processing Area to Waste Dumps	500 m	5	2.17	0.64

The AQIA has assumed that all haul road operations only take place during the hours of 0800 to 1700. The haul road fleet will generate fugitive dust emissions through movement along haul roads and emissions to air via an exhaust. Emissions associated with the vehicle movement have been modelled as individual point sources along the length of the haul road.

The emissions are not associated with internal combustion from the vehicle engines, so the point source temperature was set to ambient. As the fugitive emissions are anticipated to come from the vehicle wheels, not the exhaust, the stack height was set to 0.5 m and the stack diameter was set to 3.5 (representative of the road width).

The locations of the sources along the haul road were co-located with the sources for the combustion emissions from the haul road traffic.

TABLE 2.8 OPERATIONAL PHASE EMISSION RATES – POINT SOURCES

Source Area	Number of Modelled Points	Stack Height (m)	Stack Diameter (m)	Emission Velocity (m/s)	Emission Temp. (°C)	Actual Volumetric Flow Rate (m <sup>3</sup> /s)	Emission Rate (g/s)		
							NO <sub>x</sub>	PM <sub>10</sub>	SO <sub>2</sub>
Mine Pits	6	4	0.104	40	400	0.340	0.675	0.0140	0.100
Processing Plant	1	4	0.104	40	400	0.340	0.284	0.00142	0.0533
Processing Plant – Diesel Generators	1	25	0.400	40	400	5.03	29.0	0.907	3.63
Haul Road Traffic (Mine to Processing)	12	4	0.104	40	400	0.340	0.675	0.00488	0.127
Haul Road Traffic (Processing to Waste Dumps)	5	4	0.104	40	400	0.340	1.62	0.012	0.305

The AQIA has assumed that all mobile mining equipment will be present and operational in each of the six mining pits at the same time. This is a conservative assumption as in reality the pits will not be operational at the same time but will be excavated over the course of the same year.

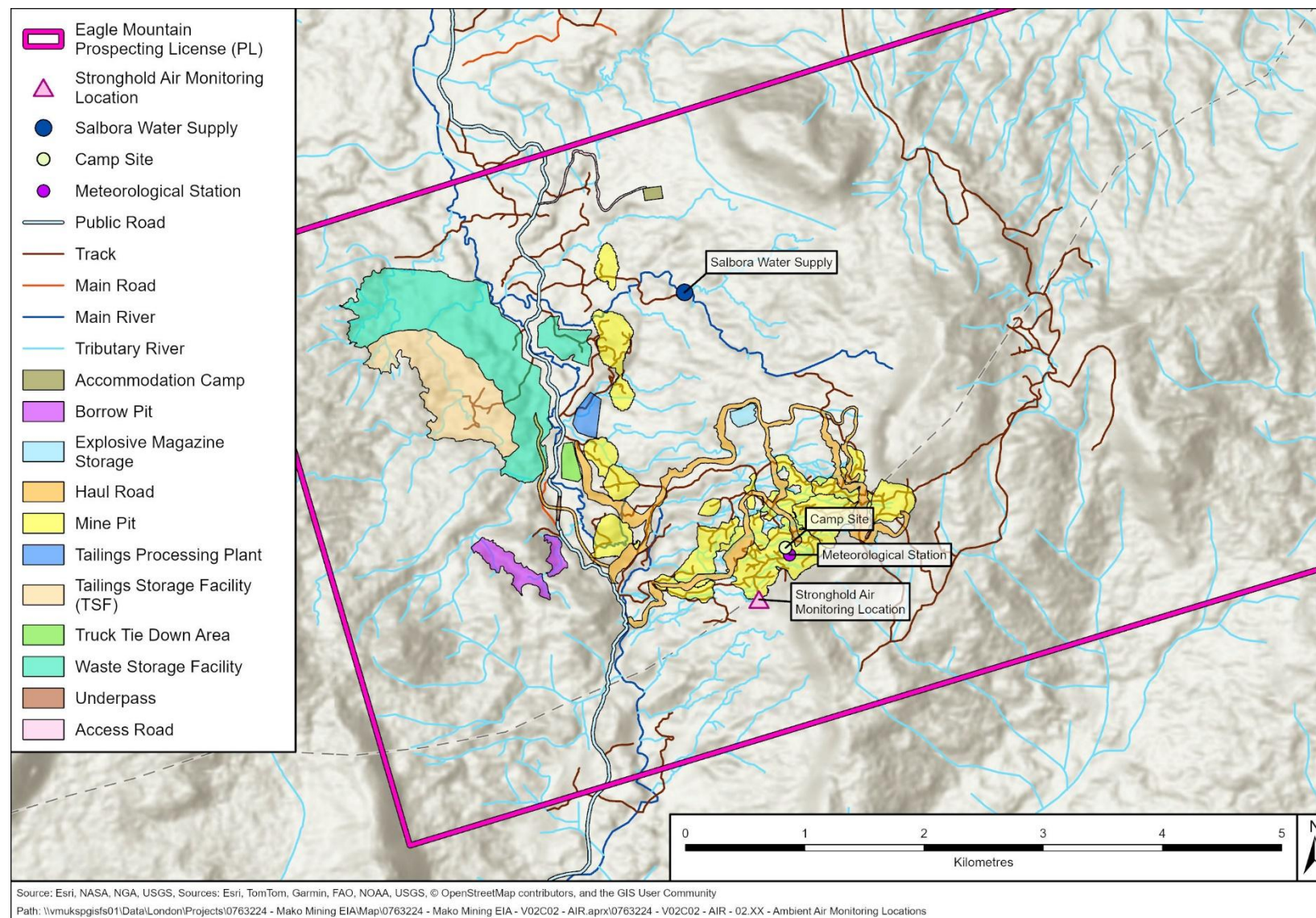
The mobile mining equipment will generate fugitive dust emissions through movement and track out and emissions to air via an exhaust. Emissions associated with combustion in the mining equipment have been modelled as point sources. Assumptions about the stack parameters (stack height/ diameter and emission temperature) have been made based on typical exhaust locations for heavy mobile machinery.

The AQIA has assumed that the diesel generators are operational on a 24/7 basis. The emission rate for the diesel generators is representative of four of the seven installed generators being operational at 100% load with three other generators being available on standby.

The AQIA has assumed that all combustion sources for the mine pits and haul roads along with mobile equipment in the processing plant are operational during both daytime and nighttime hours.

The locations of the sources along the haul road were co-located with the sources for the fugitive emissions from the haul road traffic.

FIGURE 2.4 LOCATION OF EMISSION SOURCES





### 2.4.4.3 DISPERSION MODELLING

The emissions inventory was developed for use in the dispersion model and then input to the model to calculate the PC. The model incorporates meteorological data, terrain data and includes the relevant averaging periods for the pollutants of interest.

Air dispersion modelling was conducted using the latest version of AERMOD (version 13.0.0). AERMOD<sup>8</sup> is the USEPA's recommended air dispersion model for nearfield (within 50 kilometres) applications, and is recognised globally, including by the IFC and international lenders, as applicable for this type of assessment.

### 2.4.4.4 RECEPTORS

A multi-tier nested grid of potential receptor points was established within 15 km of the Project outside of the EMPL boundary. Receptors were spaced 100 m apart up to 5 km from the centre of the EMPL and were spaced 200 m apart from 5 km to 15 km from the centre of the EMPL. For each pollutant, dispersion modelling was used to predict the maximum ground-level concentration at any time at any one of the receptor points; these maximum predicted concentrations were then compared to ambient air quality guidelines.

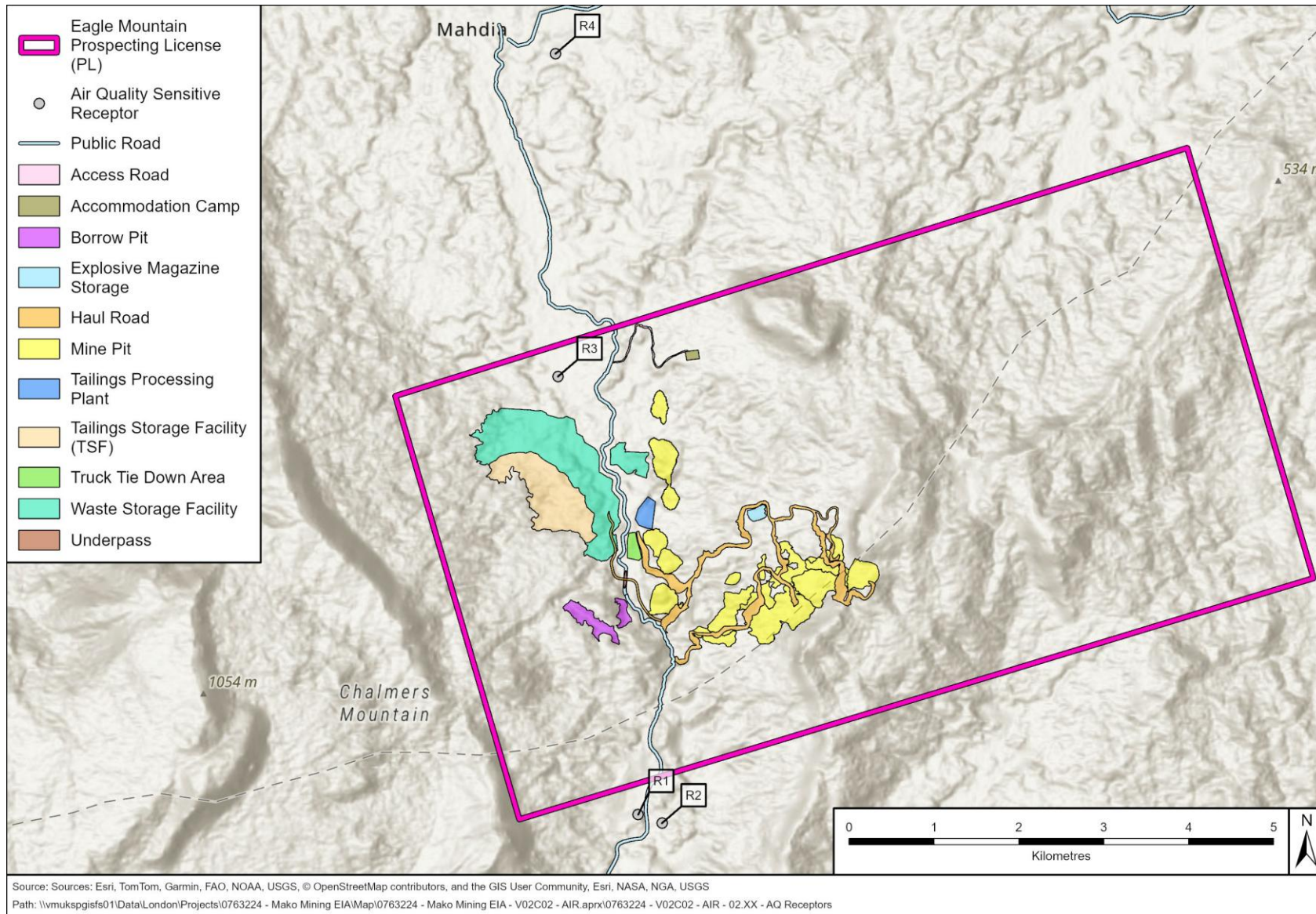
In addition to the receptor grid defined above, the impact assessment also considered potential sensitive receptor locations at which the public could be expected to be present. The selected receptors are presented in Table 2.9 and Figure 2.5. For the purpose of the assessment the receptor sensitivity assigned is **Medium**, assuming that the sensitivity to air pollutants - related to health impacts will occur within the general population.

**TABLE 2.9 MODELLED DISCRETE RECEPTORS**

Receptor Number	Easting (x)	Northing (y)
R1 (Minnehaha)	263819	573654
R2 (Minnehaha)	264098	573554
R3 (North of EMPL)	262873	578818
R4 (Mahdia Town)	262845	582623

<sup>8</sup> USEPA (accessed March 2024) AERMOD Modelling System Development  
<https://www.epa.gov/scram/aermod-modeling-system-development>

FIGURE 2.5 AIR QUALITY RECEPTORS





#### 2.4.4.5 SOURCES

With regard to source characteristics, point sources were modelled with fixed parameters, including physical dimensions and exhaust characteristics. Area sources (i.e., mobile fugitive dust sources without fixed locations) were modelled in a fashion to represent their transit across the planned travel areas within the EMPL (see Table 2.2 to Table 2.4).

All modelled mobile and fugitive sources were assumed to operate during both daytime and nighttime hours. Drilling activities in the mine pits, and activities at the processing plant, including power generation, were assumed to be operational 24/7, while blasting activities were assumed to only occur during daytime hours.

#### 2.4.4.6 METEOROLOGICAL DATA

The meteorological data used in the modelling assessment included five years of hourly sequential meteorological data (2020-2024) representative of the general site conditions. This data was developed using Mesoscale Model 5 (MM5)/ Weather Research and Forecasting (WRF) prognostic data<sup>9</sup>.

#### 2.4.4.7 TERRAIN

There are sustained gradients of >1:10 in the vicinity of the Project. The NASA Shuttle Radar Topography Mission digital elevation model (SRTM1 ~30m) was extracted for the modelling domain to account for terrain influences on dispersion.

#### 2.4.4.8 NO<sub>x</sub> TO NO<sub>2</sub> CONVERSION

NO<sub>x</sub> can occur as both nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>), with combustion emissions typically containing 90-95% NO to 5 – 10% NO<sub>2</sub>. NO oxidises to NO<sub>2</sub> in the atmosphere, but this conversion is not immediate or complete before reaching ground level. To estimate ground level NO<sub>2</sub> for this assessment, the IFC General EHS guidelines for air emissions and ambient air quality cite the UK guidelines<sup>10</sup>, that uses a NO to NO<sub>2</sub> conversion of 35% for short -term periods and 70% for long-term periods.

#### 2.4.4.9 AVERAGING PERIOD CONVERSION RATES

AERMOD does not allow for modelling of averaging periods shorter than 1 hour. To estimate maximum SO<sub>2</sub> concentrations for comparison against the 10-minute AQS, the power law<sup>11</sup> was used to calculate a factor (1.431). This factor was applied to the predicted maximum 1-hour SO<sub>2</sub> concentration to determine a predicted maximum 10-minute SO<sub>2</sub> concentration.

#### 2.4.4.10 ASSUMPTIONS AND LIMITATIONS OF THE STUDY

- Baseline air quality measurements have been conducted during both the wet and dry season. Annual PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub> background concentrations were calculated using a period weighted average from the 2025 wet and dry seasons. 24-hour PM<sub>10</sub> background

<sup>9</sup> United States Geological Survey (USGS), 2025, WRF – Weather Research and Forecasting Tool, <https://data.usgs.gov/modelcatalog/model/2e157944-c0be-4ae7-90eb-50b7a18e9bbb>

<sup>10</sup> Environment Agency, 2007, Review of methods for NO to NO<sub>2</sub> conversion in plumes at short ranges, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/290985/scho0907bnhi-e-e.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290985/scho0907bnhi-e-e.pdf)

<sup>11</sup> <http://tools.envirolink.govt.nz/assets/Uploads/Good-Practice-Guide-MFE-atmospheric-dispersion-modelling-jun04.pdf>

concentrations were calculated by taking the maximum daily concentration recorded during the 2025 wet and dry seasons. Concentrations for dust deposition were calculated by using a period weighted average from the 2025 wet and dry seasons. For short-term averages, the long-term baseline concentration will be multiplied by two.

- The AQIA primarily relies on the project description provided by the Client. Some details regarding construction and operational activities were not available at the time of the assessment.
- The AQIA has modelled a worst-case scenario based on the predicted mining schedule set out in the Preliminary Economic Assessment report for the Project. The schedule indicates that the worst-case year (i.e. the year with the highest volume of extracted material) is Year 14. The AQIA has used values from the PEA as input for the emissions inventory.
- The AQIA primarily assesses impacts against local human receptors and the onsite workforce. An assessment of air quality impacts against biological receptors has not been included in this study.
- Assessment of PM<sub>2.5</sub> has not been undertaken. As the sources of particulate emissions are dominated by mechanical sources (i.e. dust created by material handling, blasting and movement of vehicles over surfaces), the particulates will be concentrated into the 2.5 – 10 µm size range. This is acknowledged by NPi and USEPA who do not set emission factors for PM<sub>2.5</sub>.
- It is expected that Stronghold Guyana will follow the framework listed in the Cyanide Code and emissions of cyanide from the site will be negligible.
- Assessment of emissions associated with light vehicles used in the construction and operational phases of the Project have not been undertaken as the contribution is anticipated to be insignificant.
- The majority of the mine operations are assumed to take place during both daytime and nighttime hours. All operations in the mine pits, with the exception of drilling and blasting, and along the haul roads have only been modelled to take place during all hours. Operations at the processing plant, including power generation and processing have been assumed to take place 24/7.
- The diesel generators installed at the processing plant will have a combined capacity of approximately 8MW and are assumed to power all non-mobile equipment at the processing plant, including the crushing plant. Only 4 generators have been assumed to be operational out of the 7 that are installed.
- All vehicles on site will use a fuel with a sulphur content of 1% or less.
- The PEA provides detailed maps of the mining schedule for the planned 15 years of operation. This includes indicative areas where mining is scheduled to take place for each year. The mining sources in the AQIA have been selected based on the indicative mining pits in Year 14 of the mining schedule in the PEA. The AQIA has assumed that all mobile mining equipment will be present and operational in each of the six mining pits at the same time. This is a conservative assumption as in reality the pits will not be operational at the same time despite being excavated within the same year.

## 2.5 IMPACT ASSESSMENT

As discussed in Volume 1: Chapter 5, Project impacts for planned activities are characterised using impact significance through a standardised approach that considers the magnitude of the potential impact (which is determined based on three factors: frequency, duration, and intensity) and the sensitivity of the receptor

For air quality, the approach taken is to predict pollutant concentrations quantitatively and compare them against standards that inherently take receptor sensitivity into account. Rather than applying a two-dimensional matrix for impact significance, the process for air quality instead considers the type of receptor and draws on the relevant guidelines to directly determine impact significance. Those guidelines, referred to in this EIA as air quality standards (AQS), are provided in Table 2.1.

The impact magnitude rating for potential air quality impacts is determined on the basis of three factors:

- Whether the existing air quality conditions, as shown by the maximum measured baseline ambient air quality concentrations, are above (degraded airshed) or below (undegraded airshed) the AQS for the pollutant;
- The increase in pollutant concentrations in air as a result of the Project (Project Contribution [PC]) expressed as a percent of AQS; and
- The total air pollutant concentration arising as a result of the PC added to the existing conditions (the Predicted Environmental Concentration [PEC]) expressed as a percent of AQS.

The PC and PEC are considered in the context of their respective ambient air quality guidelines. The approach taken to assign significance ratings is based on guidance from the International Finance Corporation for undegraded airsheds that states: "Emissions [should] not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards" (IFC 2007). As a general rule, this guidance suggests 25 percent of the applicable AQS to allow additional, future sustainable development in the same airshed (IFC 2007)<sup>12</sup>. Based on this guidance, significance criteria are established as shown in Figure 2.1.

Existing air quality in the Project area is discussed in Section 8.2, Air Quality Baseline. To support interpretation of the result of air dispersion modelling, the guidelines shown in Table 2.1 were used to characterise existing conditions in the ambient airshed. For each of the parameters subjected to modelling and each of the averaging periods for which a guideline is provided in Table 2.1. Table 2.10 shows the measured concentrations for the same averaging periods and indicates the condition of the airshed. Where a guideline is applied on a statistical basis (e.g., 99<sup>th</sup> percentile), the tabulated measured value is expressed on that basis as well.

These measured concentrations were derived by combining the data samples collected from the Mine Site monitoring location described in Section 8.2, Air Quality Baseline. The Mine Site monitor was selected for the assessment due to its close proximity to the sources evaluated. Annual PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub> background concentrations were calculated using a period weighted

<sup>12</sup> IFC (International Finance Corporation). 2007. "Air Emissions and Ambient Air Quality." In Environmental, Health, and Safety Guidelines: General EHS Guidelines: Environmental, <https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf>

average from the 2025 wet and dry seasons. 24-hour PM<sub>10</sub> background concentrations were calculated by taking the maximum daily concentration recorded during the 2025 wet and dry seasons. Concentrations for dust deposition were calculated by using a period weighted average from the 2025 wet and dry seasons.

For short-term averages, the long-term baseline concentration will be multiplied by two. This follows guidance published by the United Kingdom's Environment Agency<sup>13</sup> which is referenced by the IFC<sup>14</sup>.

Table 2.10 indicates that the airshed quality near the mine site is undegraded for all pollutants.

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<sup>13</sup> Environment Agency, Last updated 7 October 2020, Air emissions risk assessment for your environmental permit, <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

<sup>14</sup> <https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-air-emissions-and-ambient-air-quality-en.pdf>

TABLE 2.10 SUMMARY OF EXISTING AIRSHED

Pollutant	Averaging Period	Ranking	Air Quality Standard (2001)	Air Quality Standard (2021) interim targets ( $\mu\text{g}/\text{m}^3$ )				Background Concentration	Airshed Quality <sup>b</sup>
				1	2	3	4		
NO <sub>2</sub>	1-hour	Maximum	200 $\mu\text{g}/\text{m}^3$	35	25	15	10	9.8 $\mu\text{g}/\text{m}^3$	Undegraded
	24-hour	99th percentile	120 $\mu\text{g}/\text{m}^3$	75	50	37.5	25	9.8 $\mu\text{g}/\text{m}^3$	Undegraded
	Annual	Maximum	40 $\mu\text{g}/\text{m}^3$	70	50	30	20	4.9 $\mu\text{g}/\text{m}^3$	Undegraded
SO <sub>2</sub>	10-minute	Maximum	500 $\mu\text{g}/\text{m}^3$	150	100	75	50	31.2 $\mu\text{g}/\text{m}^3$	Undegraded
	24-hour	99th percentile	125 $\mu\text{g}/\text{m}^3$	40	30	20	-	31.2 $\mu\text{g}/\text{m}^3$	Undegraded
PM <sub>10</sub>	24-hour	99th percentile	150 $\mu\text{g}/\text{m}^3$	120	50	-	-	50.1 $\mu\text{g}/\text{m}^3$	Undegraded
	Annual	Maximum	70 $\mu\text{g}/\text{m}^3$	-	-	-	-	25.1 $\mu\text{g}/\text{m}^3$	Undegraded
Dust Deposition	24-hour	Maximum	0.35 g/m <sup>2</sup> /day	125	50	-	-	0.286 g/m <sup>2</sup> /day	Undegraded

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter; g/m<sup>2</sup>/day = grams per meters squared per day

<sup>a</sup> AQS based on standards defined in Table 2.1.

<sup>b</sup> Airshed degraded if AQS is exceeded.

In addition to the ambient background data collected, meteorological data for both wet and dry seasons was collected to support this assessment. In Guyana, the climate is characterised by two distinct seasons: a wet season and a dry season. These occur due to the Intertropical Convergence Zone (ITCZ), a band of low pressure near the equator where trade winds converge. The ITCZ shifts northward and southward throughout the year, bringing prolonged rainfall during the wet season and reduced precipitation during the dry season. The naturally wet conditions of this region contribute to the natural attenuation of dust, as moisture helps suppress its resuspension. Additionally, the onsite collected meteorological data indicates generally low wind speeds, which further reduce the potential for dust dispersion at the site.

### 2.5.1 IMPACTS FROM PRE-CONSTRUCTION PHASE

As previously noted, impacts from pre-construction phase on air quality are anticipated to be negligible due to the limited scale and duration and have not been considered in detail.

### 2.5.2 IMPACTS FROM CONSTRUCTION PHASE

#### 2.5.2.1 CONSTRUCTION DUST

As noted, application of appropriate mitigation will render residual impacts as negligible, or at worst, minor. To identify the appropriate level of mitigation required, the process set out in Infographic 2 has been worked through:

- There are anticipated to be >10 vehicles/day on unpaved roads and assuming that there are, at some point, receptors within 25 m of unpaved roads, therefore the impact magnitude is 'Large' and mitigation is required
- The area of earthworks is expected to be >10,000 m<sup>2</sup>, therefore the impact magnitude is 'Large' and mitigation is required
- The quantity of dusty material handled and stored is anticipated to be >100,000 m<sup>3</sup>, due to the extensive land clearing to prepare the site and mine areas, therefore the impact magnitude is 'Large' and mitigation is required

**TABLE 2.11 AIR QUALITY IMPACTS CONSTRUCTION PHASE**

Significance of Impact				
Impact	Fugitive dust emissions arising during construction activities			
Impact Nature	Negative	Positive		Neutral
	Impacts to air quality will be negative			
Impact Type	Direct	Indirect		Induced
	Impacts to air quality would be direct, impacting on sensitive human receptors close to construction activities and roads used to access the Project			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Due to the short duration of the construction, impacts are expected to be short-term			
Impact Extent	Local	Regional		International
	The impact will only be localised within the Area of Influence of the Project.			
Impact Scale	Impact scale, without mitigation, would be large albeit over a limited area			

Significance of Impact					
Frequency	Impacts to air quality will occur throughout the construction phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	• Unmitigated impacts are likely to be Large				
Receptor Sensitivity	Low		Medium		High
	In terms of air quality, the sensitivity for human health within the general population is expected to be Medium at human receptors.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Medium Resource Sensitivity and Large Impact Magnitude will result in a Major impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Correct application of mitigation will render residual impacts as negligible, or at worst minor in a small number of limited locations.				

### 2.5.2.2 CONSTRUCTION TRAFFIC

At this stage the volume of traffic to be generated by the Project is not confirmed. Given the nature of the Project, it is not expected that the traffic volume will reach the screening threshold required to quantitatively assess impacts. Therefore, the impact is anticipated to be **negligible** and no mitigation is required.

TABLE 2.12 AIR QUALITY IMPACTS CONSTRUCTION TRAFFIC

Significance of Impact				
Impact	Exhaust combustion emissions arising during construction activities			
Impact Nature	Negative	Positive		Neutral
	Impacts to air quality will be negative			
Impact Type	Direct	Indirect		Induced
	Impacts to air quality would be direct, impacting on sensitive human receptors close to construction activities and roads used to access the Project			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Due to the short duration of the construction, impacts are considered to be short-term			
Impact Extent	Local	Regional		International
	The impact will only be localised within the Area of Influence of the Project.			
Impact Scale	Impact scale, without mitigation, would be negligible			
Frequency	Impacts to air quality will occur throughout the construction phase			



Significance of Impact					
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	• Unmitigated impacts are likely to be Negligible				
Receptor Sensitivity	Low	Medium	High		
	In terms of air quality, the sensitivity for human health within the general population is considered to be Medium at all sensitive human receptors				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Negligible Impact Magnitude will result in a Negligible impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
Impacts are anticipated to be negligible.					

## 2.5.3 IMPACTS FROM OPERATIONAL PHASE

### 2.5.3.1 OPERATIONAL TRAFFIC

At this stage the volume of traffic to be generated by the Project is not confirmed. However, given the nature of the Project, it is considered unlikely that the lower threshold of traffic volumes will be met that could potentially trigger a significant impact. Therefore, the impact is anticipated to be **Negligible** and no mitigation is required.

TABLE 2.13 AIR QUALITY IMPACTS OPERATIONAL TRAFFIC

Significance of Impact					
Impact	Exhaust combustion emissions arising during operation of the mine				
Impact Nature	Negative		Positive	Neutral	
	Impacts to air quality will be negative				
Impact Type	Direct		Indirect	Induced	
	Impacts to air quality would be direct, impacting on sensitive human receptors close to roads used to access the Project				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Due to the long duration of the operations, impacts are considered to be long-term				
Impact Extent	Local		Regional	International	
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale, without mitigation, would be negligible				
Frequency	Impacts to air quality will occur throughout the operational phase				
	Positive	Negligible	Small	Medium	Large

Significance of Impact				
Impact Magnitude	<ul style="list-style-type: none"><li>Unmitigated impacts are likely to be Negligible</li></ul>			
Receptor Sensitivity	Low	Medium		High
	In terms of air quality, the sensitivity for human health within the general population is considered to be 'Medium' at all sensitive human receptors			
Impact Significance	Negligible	Minor	Moderate	Major
	The combination of a Medium Resource Sensitivity and Negligible Impact Magnitude will result in a Negligible impact significance.			
Residual Impact				
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	Impacts are anticipated to be negligible.			

### 2.5.3.2 OPERATION OF THE MINE

Using the methodology described above, modelling was conducted with AERMOD to predict maximum ground-level concentrations at the modelled receptors as a result of emissions for each pollutant from Project operations. PCs were calculated for each modelled pollutant, for each averaging period with an associated AQS. The modelling results are summarised in Table 2.14 for the PC (Project Contribution) and the PEC (Predicted Environmental Concentration, which is PC plus the ambient background).

For modelled concentrations of PM<sub>10</sub>, NO<sub>2</sub>, SO<sub>2</sub> and deposited dust, the maximum concentration outside of the EMPL boundary have been considered. For modelled concentrations of HCN, impacts within the EMPL boundary have also been considered. Figures 2.5-2.13 show concentration contour plots of PC for each of the modelled pollutants. The key findings of the modelling assessment are summarised in the bullets below:

#### NO<sub>2</sub>

- The maximum modelled PC exceeds the 1-hour AQS for NO<sub>2</sub> at a number of grid receptors outside the EMPL boundary. With the added ambient background concentration, the maximum PEC for 1-hour NO<sub>2</sub> at any potential receptor location is 330 µg/m<sup>3</sup>, representative of 165% of the AQS. Using the significance criteria in Figure 2.1, this is representative of a Major impact.
- None of the modelled grid points where exceedances of the 1-hour AQS are predicted are not representative of areas where sensitive receptors are anticipated to be present for an hour or longer.
- The maximum modelled PC does not exceed the AQS for 24-hour or annual NO<sub>2</sub> at any of the modelled grid receptors outside the EMPL boundary and the impacts can be considered Minor for 24-hour NO<sub>2</sub> and Negligible for annual NO<sub>2</sub>.

- The maximum modelled PC and PEC do not exceed the relevant AQS for NO<sub>2</sub> at any of the modelled residential receptors listed in Table 2.9. Impacts at these receptors are considered Negligible and Minor for 1-hour NO<sub>2</sub>, and Negligible for annual NO<sub>2</sub>.

## SO<sub>2</sub>

- The maximum modelled PC does not exceed the AQS for 10-minute or 24-hour SO<sub>2</sub> at any of the modelled receptors outside the EMPL boundary.
- With the added ambient background concentration, the maximum PEC for 10-minute SO<sub>2</sub> at any potential receptor location is 195 µg/m<sup>3</sup>, representative of 38.9% of the AQS. Using the significance criteria in Figure 2.1, this is representative of a Moderate impact.
- The maximum modelled PC and PEC do not exceed the relevant AQS for SO<sub>2</sub> at any of the modelled residential receptors listed in Table 2.9. Impacts at these receptors are considered Negligible for both 10 minute and 24-hour SO<sub>2</sub>.

## PM<sub>10</sub>

- The maximum modelled PC does not exceed the AQS for 24-hour or annual PM<sub>10</sub> at any of the modelled receptors outside the EMPL boundary.
- With the added ambient background concentration, the maximum PEC for 24-hour PM<sub>10</sub> at any potential receptor location is 67.0 µg/m<sup>3</sup>, representative of 44.7% of the AQS. Using the significance criteria in Figure 2.1, this is representative of a Minor impact.
- The maximum modelled PC and PEC do not exceed the relevant AQS for PM<sub>10</sub> at any of the modelled residential receptors listed in Table 2.9. Impacts at these receptors are considered Negligible for both 24-hour and annual PM<sub>10</sub>.

## Deposited Dust

- The maximum modelled deposited dust concentration does not exceed the recommended threshold at any of the modelled receptors outside the EMPL boundary.
- With the added ambient background concentration, the maximum deposited dust concentration is 0.303 g/m<sup>2</sup>/day, representative of 86.6% of the recommended threshold. Using the significance criteria in Figure 2.1, this is representative of a Negligible impact.
- The maximum modelled PC and PEC do not exceed the recommended threshold for deposited dust at any of the modelled residential receptors listed in Table 2.9. Impacts at these receptors are considered Negligible.

Based on the maximum predicted modelled impact, the overall impact of significance on air quality from the operational phase has been assessed as **Major**, as summarised in Table 2.15.

The resulting 'major' impact is primarily attributable to local valley topography, which promotes the funnelling and accumulation of emissions under certain meteorological conditions. The dispersion modelling has therefore applied a precautionary worst-case approach, assessing impacts for Year 14 of operations, which represents the period of highest predicted mining activity and is conservative relative to long-term average operating conditions.

TABLE 2.14 MAXIMUM AIR QUALITY IMPACTS AT MODELLED GRID RECEPTORS

Pollutant	Averaging Period	Ranking	AQS ( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>	Background Concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>	PC ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	PC % of AQS	PEC ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	PEC % of AQS	Receptor Sensitivity	Magnitude Rating <sup>d</sup>	Significance Rating <sup>d</sup>
NO <sub>2</sub>	1-hour	Maximum	200	9.8	320	160%	330	165%	Medium	Large	Major
		99th percentile	200	9.8	170	85.2%	180	90.0%	Medium	Large	Major
	24-hour	99th percentile	120	9.8	14.5	12.1%	24.3	20.0%	Medium	Small	Minor
	Annual	Maximum	40	5.0	3.75	9.37%	8.64	21.6%	Medium	Negligible	Negligible
SO <sub>2</sub>	10-minute	Maximum	500	31.2	164	32.7%	195	38.9%	Medium	Medium	Moderate
	24-hour	99th percentile	125	31.2	5.18	4.14%	36.3	29.1%	Medium	Negligible	Negligible
PM <sub>10</sub>	24-hour	Maximum	150	50.1	16.9	11.3%	67.0	44.7%	Medium	Small	Minor
	Annual	Maximum	70	25.1	1.16	1.66%	26.2	37.5%	Medium	Negligible	Negligible
Dust Deposition	24-hour	Maximum	0.35 g/m <sup>2</sup> /day	0.286	0.017	4.89%	0.303	86.6%	Medium	Negligible	Negligible

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter; g/m<sup>2</sup>/day = grams per meters squared per day

<sup>a</sup> AQS based on standards defined in Table 2.1. Concentrations of NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> are in  $\mu\text{g}/\text{m}^3$ . Dust deposition is in units of g/m<sup>2</sup>/day

<sup>b</sup> The ambient background concentrations used for calculating the PEC are shown in Table 2.10.

<sup>c</sup> Concentrations are the maximum predicted concentrations across the modelled meteorological conditions.

<sup>d</sup> Magnitude and significance ratings for air quality is based on guidance shown in Figure 2.1.

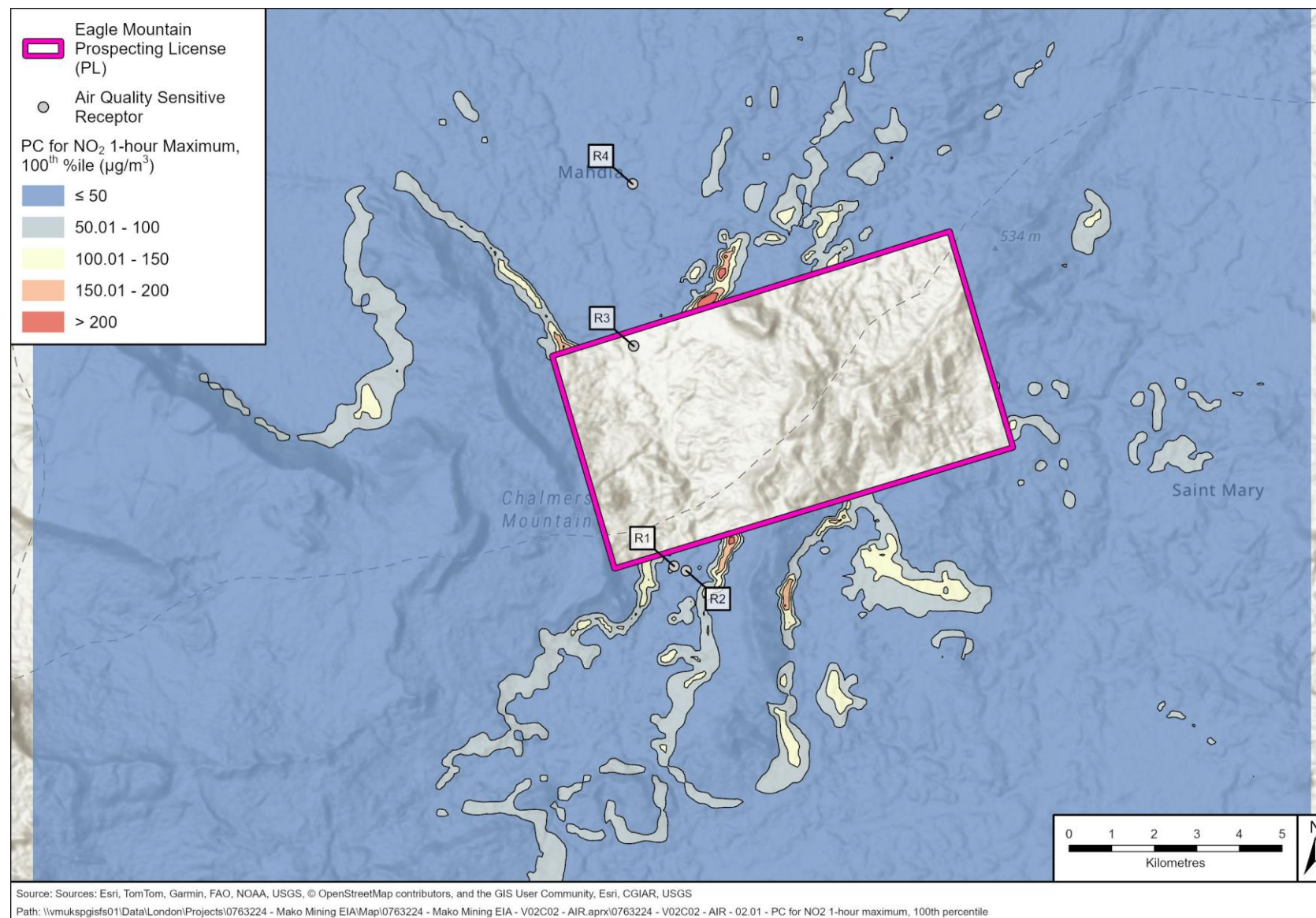
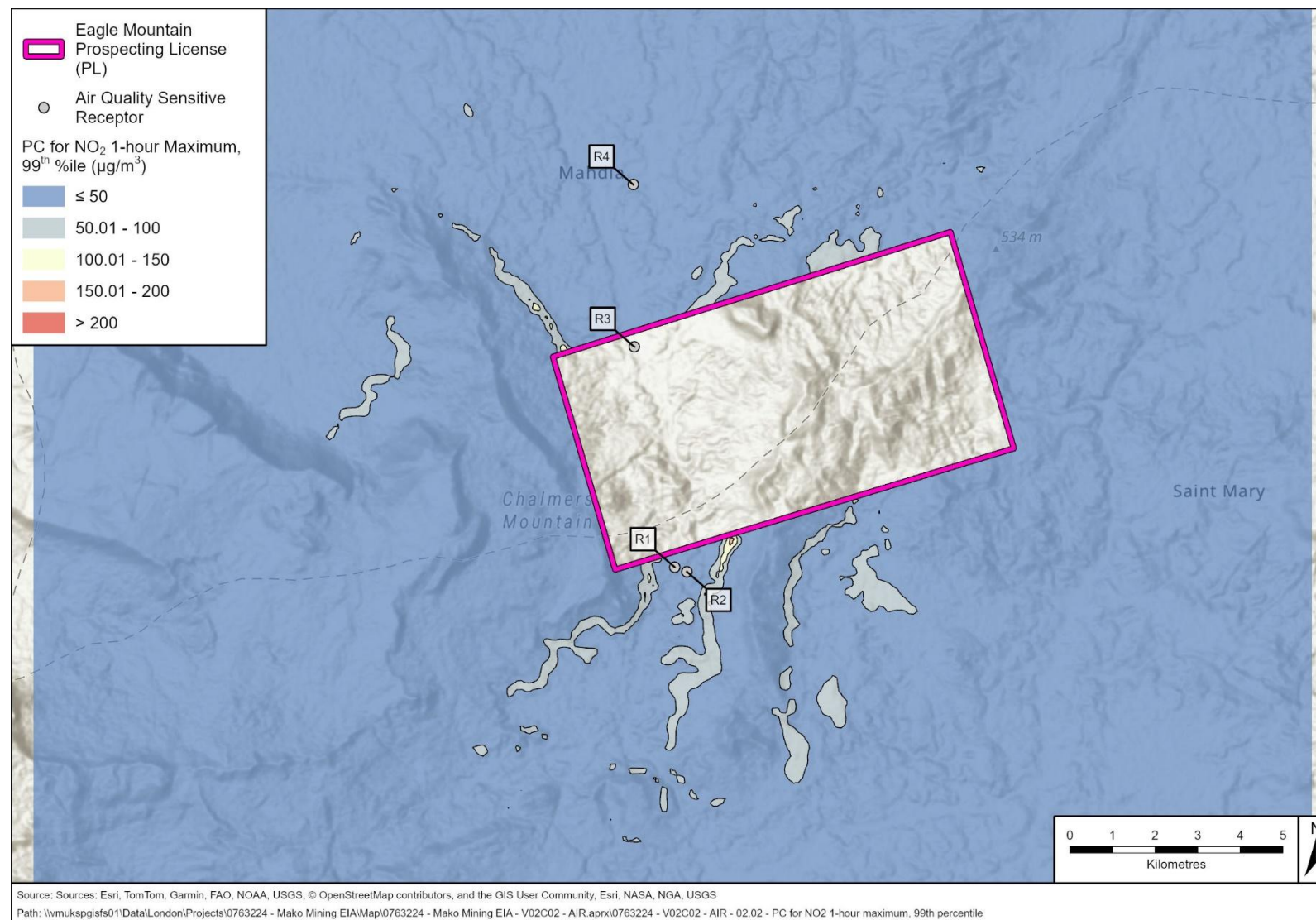
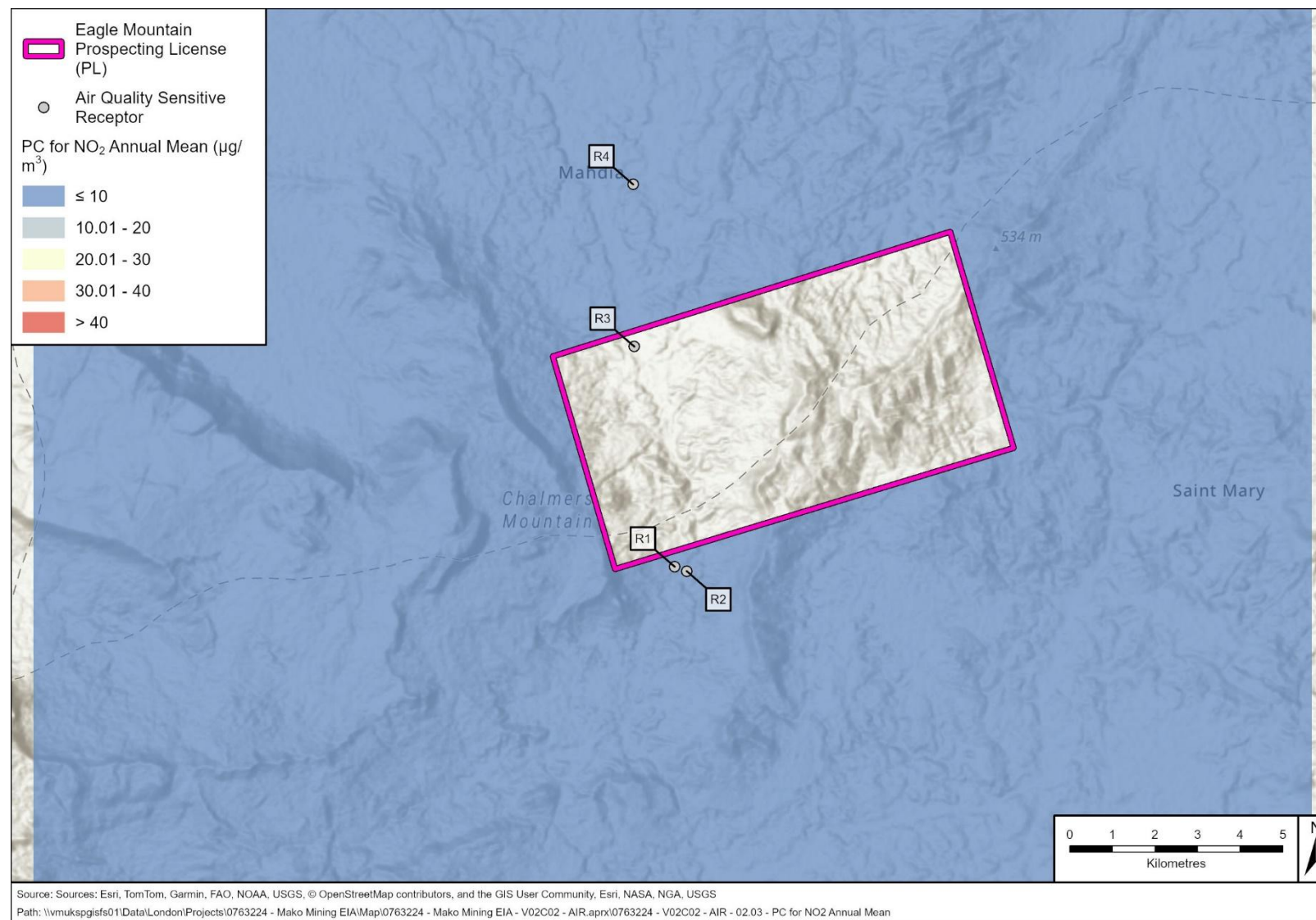
FIGURE 2.6 1-HOUR NO<sub>2</sub> MAXIMUM PC CONTOUR PLOT



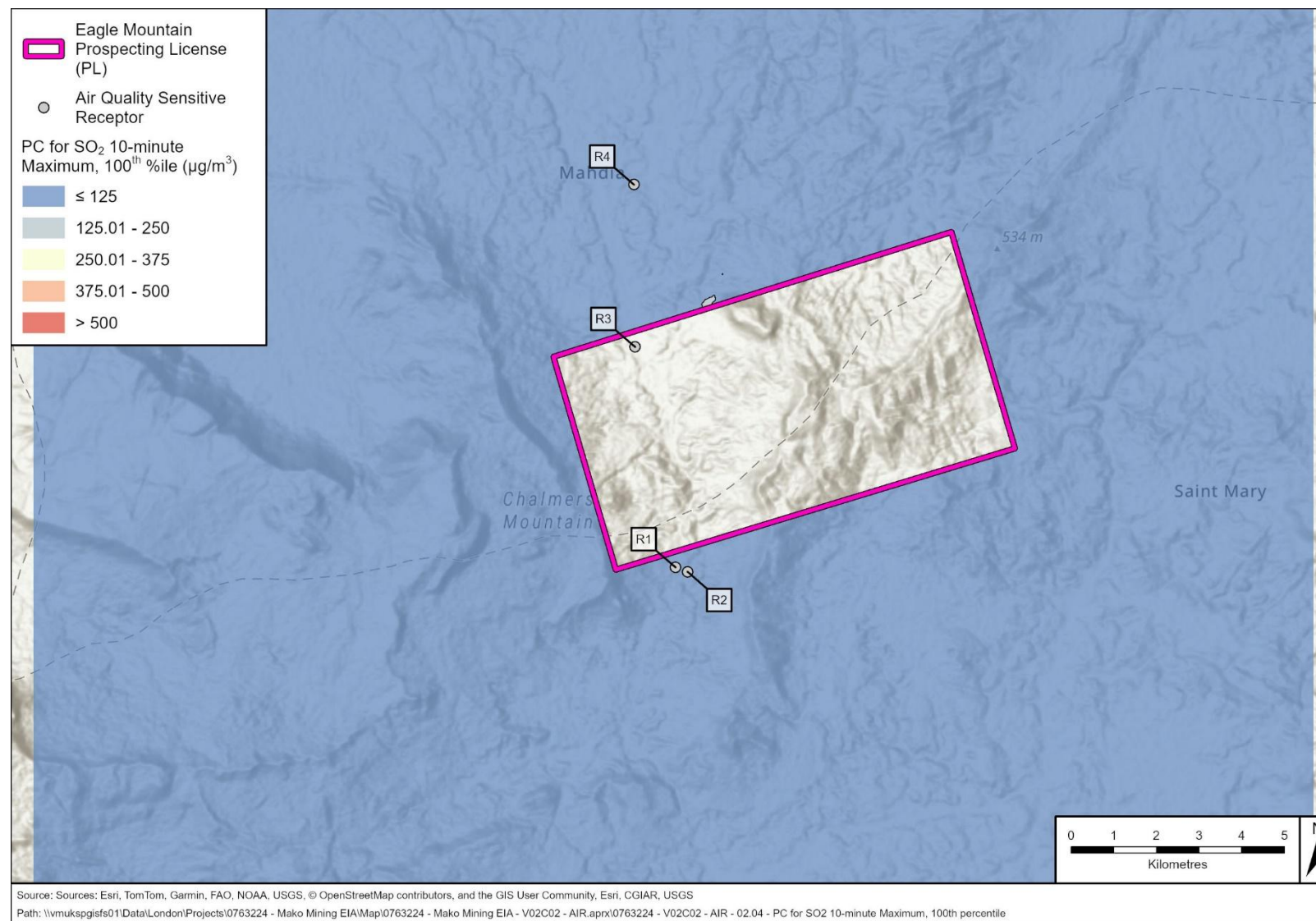
FIGURE 2.7 1-HOUR NO<sub>2</sub> 99TH PERCENTILE PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the 1-hour NO<sub>2</sub> AQS (200 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary.

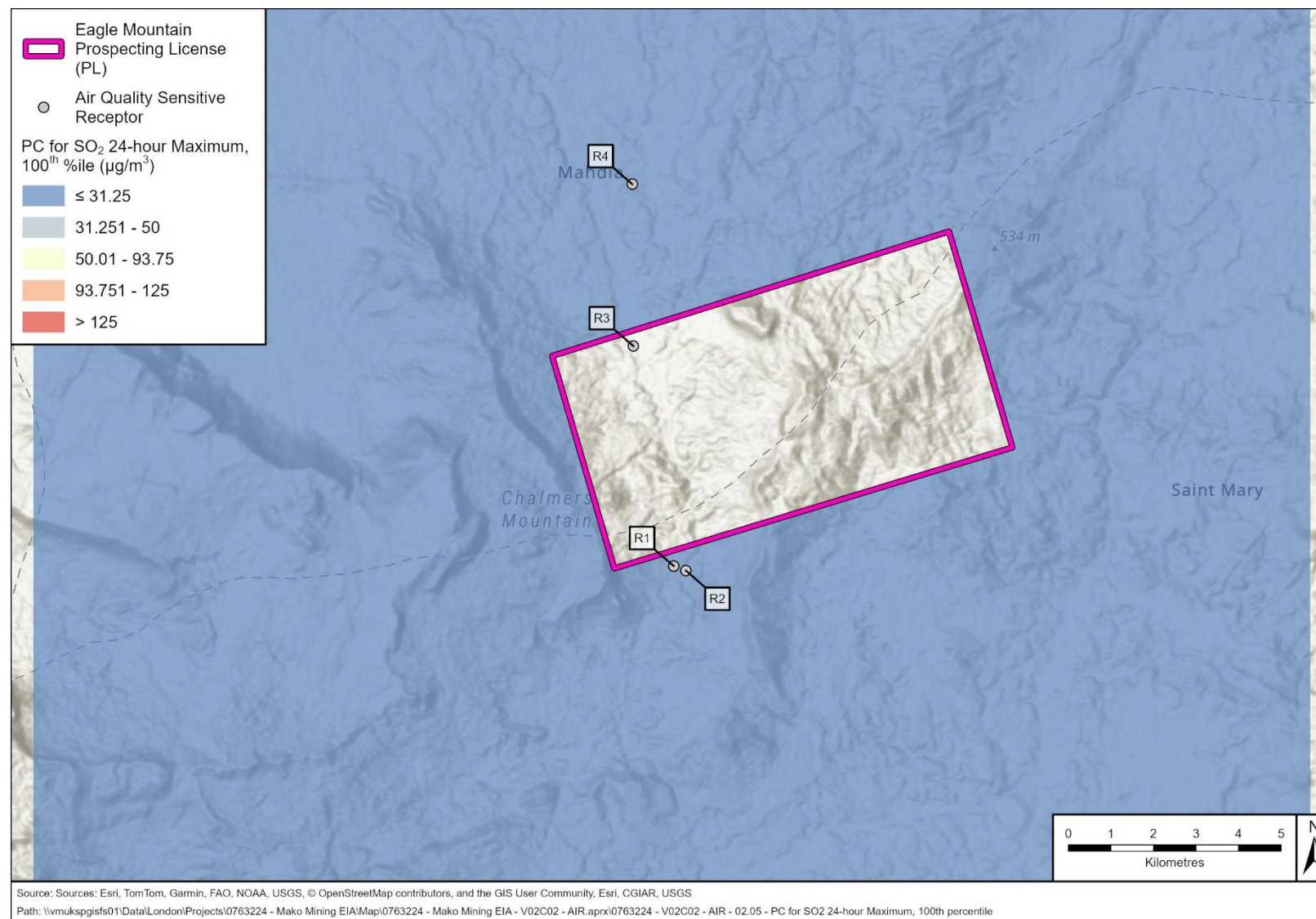
FIGURE 2.8 ANNUAL NO<sub>2</sub> MAXIMUM PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the annual NO<sub>2</sub> AQS (40 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary.

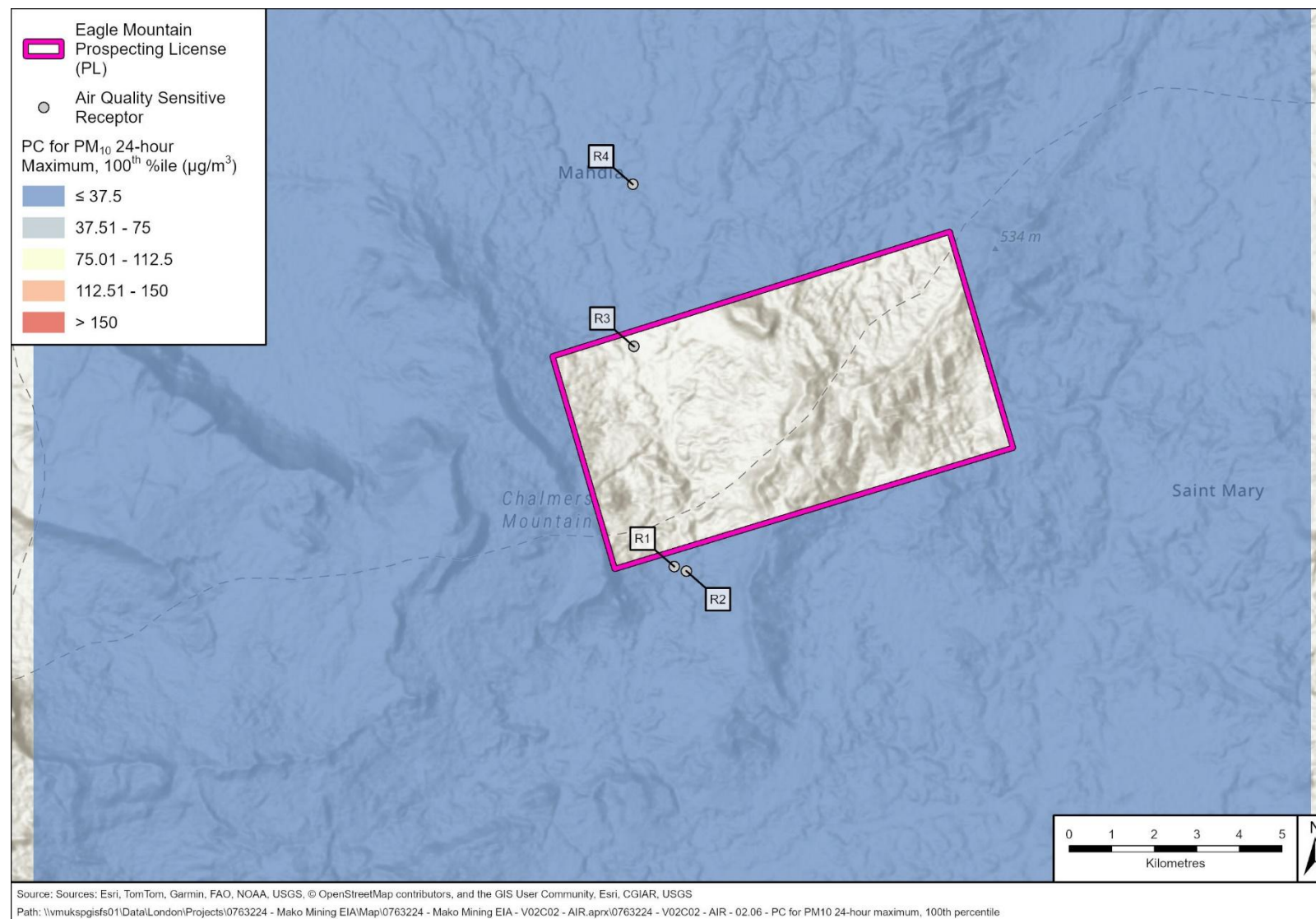


FIGURE 2.9 10-MINUTE SO<sub>2</sub> MAXIMUM PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the 10-minute SO<sub>2</sub> AQS (500 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary

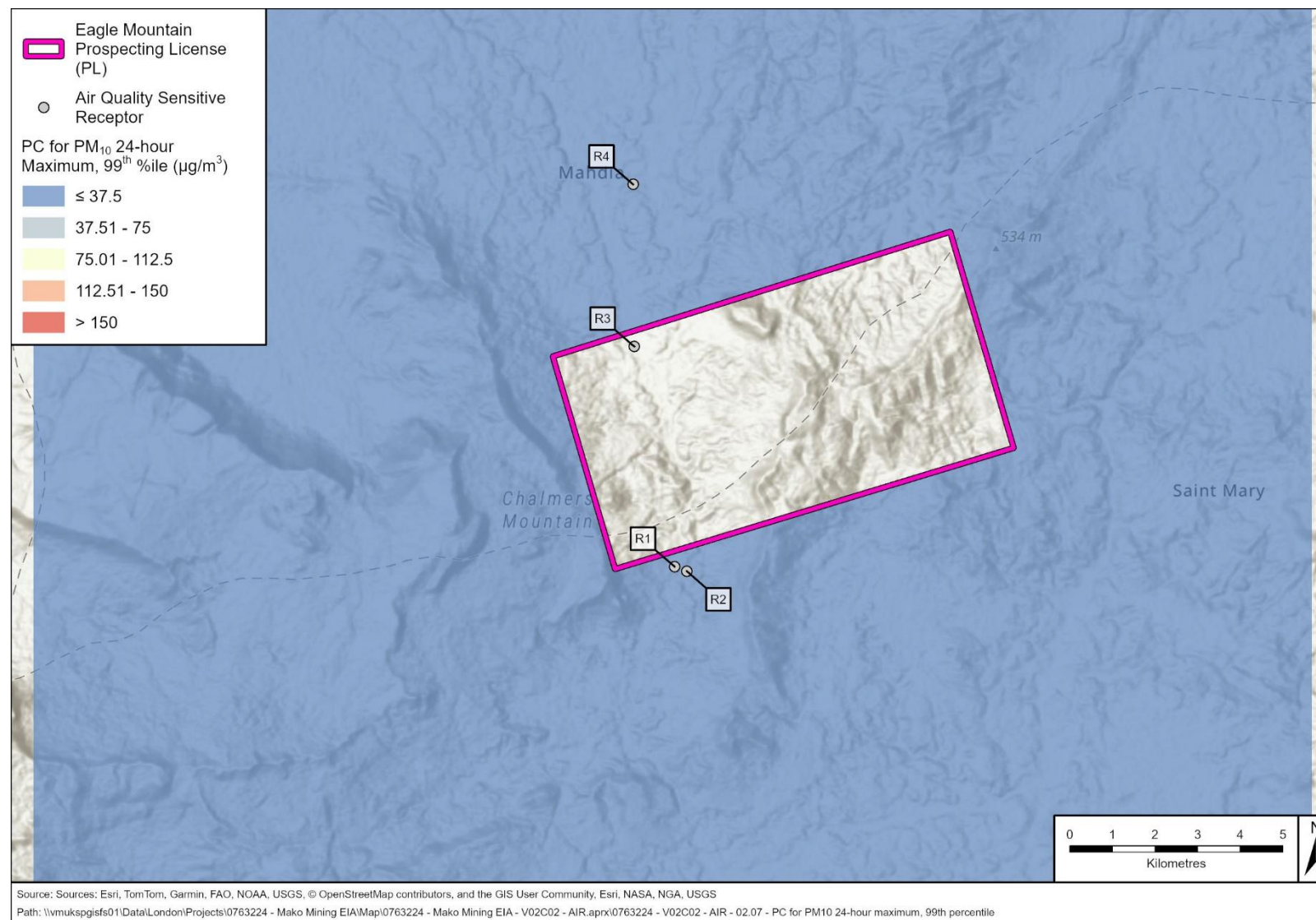
FIGURE 2.10 24-HOUR SO<sub>2</sub> MAXIMUM PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the 24-hour SO<sub>2</sub> AQS (125 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary.

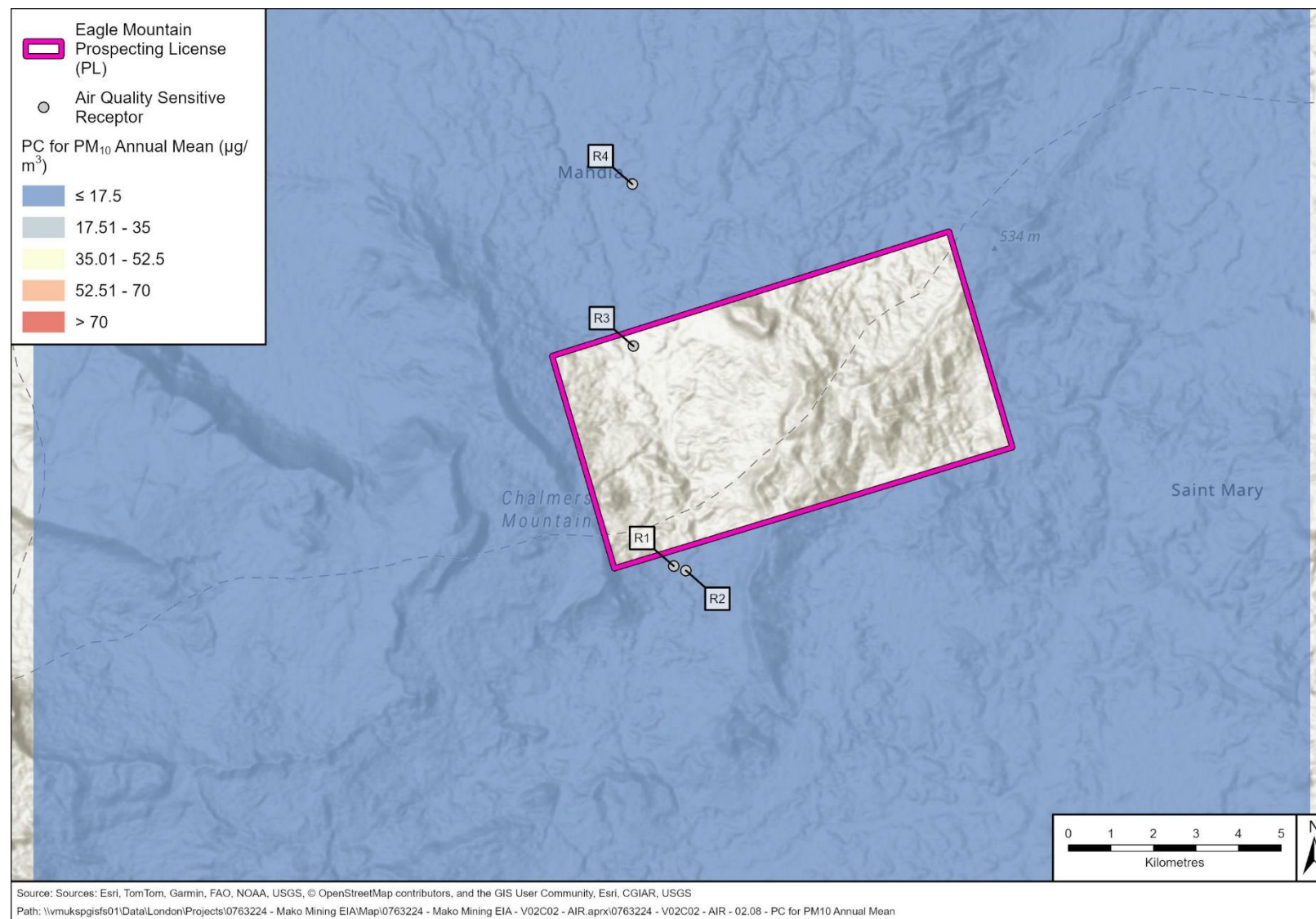
FIGURE 2.11 24-HOUR PM<sub>10</sub> MAXIMUM PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the 24-hour PM<sub>10</sub> AQS (150 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary.



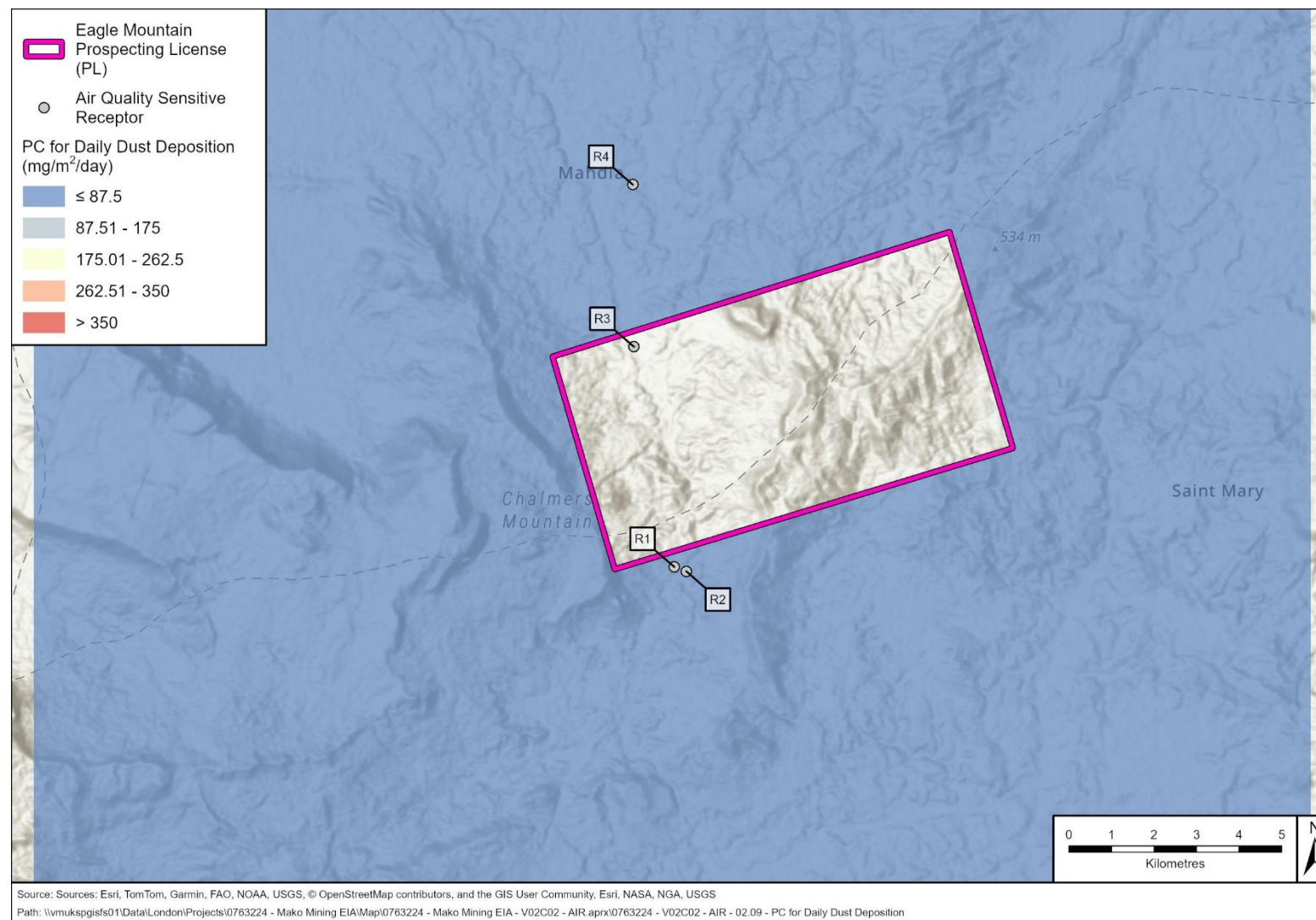
FIGURE 2.12 24-HOUR PM<sub>10</sub> 99<sup>TH</sup> PERCENTILE PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the 24-hour PM<sub>10</sub> AQS (150 µg/m<sup>3</sup>) at sensitive receptors outside the EMPL boundary.

FIGURE 2.13 ANNUAL PM<sub>10</sub> MAXIMUM PC CONTOUR PLOT

The PC shown in the contour plot does not exceed the annual PM<sub>10</sub> AQS (70 µg/m³) at sensitive receptors outside the EMPL boundary.

FIGURE 2.14 DAILY DUST DEPOSITION MAXIMUM PC CONTOUR PLOT



The PC shown in the contour plot does not exceed the dust deposition threshold (0.35 g/m<sup>2</sup>/day) at sensitive receptors outside the EMPL boundary.



TABLE 2.15 AIR QUALITY IMPACTS FROM OPERATION OF THE MINE

Significance of Impact					
Impact	Fugitive dust and combustion emissions arising during operation of the mine				
Impact Nature	Negative	Positive		Neutral	
	Impacts to air quality will be negative				
Impact Type	Direct	Indirect		Induced	
	Impacts to air quality would be direct, impacting receptors close to prospect license area of the Project				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Due to the long duration of the operations, impacts are considered to be long-term				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised and small.				
Frequency	Impacts to air quality will occur frequently throughout the operational phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	<ul style="list-style-type: none"><li>The impacts range from negligible (Annual NO<sub>2</sub> and PM<sub>10</sub>, 24-hour SO<sub>2</sub>, dust deposition) to large (1-hour NO<sub>2</sub>)</li></ul>				
Receptor Sensitivity	Low	Medium		High	
	In terms of air quality, the sensitivity for human health within the general population is considered to be 'Medium' at all receptors.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a <b>Medium</b> Resource Sensitivity and <b>Large</b> Impact Magnitude will result in a <b>Major</b> impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small		Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the embedded mitigation measures and the additional mitigation measures, the impacts at local sensitive receptors (listed in Table 2.9) are assessed generally to be <b>Negligible</b> to <b>Minor</b> , however <b>Moderate</b> to <b>Major</b> impacts may still occur outside the EMPL boundary, especially during periods with dry and dusty winds.				

## 2.5.4 MITIGATION

### 2.5.4.1 CONSTRUCTION AND OPERATIONAL TRAFFIC

No mitigation is required associated with construction or operational traffic.

### 2.5.4.2 CONSTRUCTION DUST

As noted, mitigation is required to control dust emissions during construction of the mine. These are set out below.

General mitigation measures:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
- Record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the logbook
- Carry out regular site inspections to monitor compliance with the construction environmental management plan (CEMP), record inspection results and make inspection log available to stakeholders when asked
- Increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles
- Fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period
- Keep site fencing, barriers and scaffolding clean using wet methods
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover as detailed below
- Cover, seed or fence stockpiles to prevent wind whipping
- Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate
- Use enclosed chutes and conveyors
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
- If feasible, consider installing and operating monitoring of ambient PM<sub>10</sub> and TSP

Measures specific to construction:

- Avoid scabbling (roughening of concrete surfaces) if possible

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery
- For smaller supplies of fine powder material ensure bags are sealed after use and stored appropriately to prevent dust

Measures specific to track out:

- Avoid dry sweeping of large areas
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable
- Record all inspections of haul routes and any subsequent action in a site logbook
- Install hard surfaced haul routes where practicable
- Use surface binder sprays on unpaved haul roads where practicable to minimise dust emissions
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)

#### 2.5.4.3 MINE OPERATIONS

The mine will require various mitigation measures to control emissions and residual impacts some of which were taken into consideration during the development of the emissions inventory. In addition to the mitigation measures that were embedded into the modelled emission rates and detailed in Table 2.5, the following mitigation measures are proposed during the operational phase.

General Mitigation Measures:

- The development and implementation of a dust management plan (DMP) to include the monitoring of dust deposition and continuous PM monitoring.
- Mining activities should be kept under review with regards to dust emissions to assess the need for additional water spraying at the in-pit activities and the haul roads.
- Avoiding dust-raising activities during dry and windy periods and when is blowing towards nearby sensitive receptors.
- Preventative maintenance of all equipment to ensure optimal operation.
- Road wetting will be a daily occurrence during the drier periods and as necessary in the rainy season.
- One full HD1500 (or similar) water truck with 100m<sup>3</sup> of water to operate continuously during the dry season. In addition, another tanker would be operated during the peak dry season.

- A second large water truck to be used on crushed rock materials on haul roads to reduce the release of dust. Both type of trucks will have a cycle time of two hours and are able to spray the full width of the road they are wetting.

## 3. NOISE IMPACT ASSESSMENT

### 3.1 INTRODUCTION

This chapter presents the Noise and Vibration Impact Assessment (NVIA) for the Eagle Mountain Gold Mine Project ("the Project"), conducted as part of the Environmental Impact Assessment (EIA). The NVIA evaluates potential noise and vibration impacts arising from both the construction and operational phases of the Project. The assessment is primarily based on the Guyanese national noise guidelines, with the Initiative for Responsible Mining Assurance (IRMA) and International Finance Corporation (IFC) criteria referenced as supplementary benchmarks and examples of international good practice.

#### 3.1.1 ASSUMPTIONS AND LIMITATIONS

- This NVIA primarily relies on the Project description provided by the Client. However, some details regarding construction and operation activities were not available during the assessment. Therefore, several assumptions were made based on data from similar projects, as mentioned in the chapter.
- The pit activities, processing plant, haul roads and power plant are expected to generate the highest levels of noise emissions.
- Regarding air transportation from the Mahdia airstrip or from the Project site to Georgetown, given the small fuselage of the aircraft and the anticipated small number of flights per week, noise impacts are unlikely and have therefore been scoped out.
- Traffic related to construction and operation (for mine supplies delivery) will occur mostly during daytime hours and will use primarily the main access road from Mahdia.
- Equipment located in the mine pits and haul roads are assumed to be operational 24 hours per day, seven days per week, with the exception of blasting activities which is assumed to occur only during the daytime between the hours of 0800 and 1700.
- The impact of vibrations from pile driving and roller activities is typically assessed within a range of less than 100 meters. All sensitive receptors, including nearby settlements, are located more than 1,000 meters away from the Project's associated infrastructure. As a result, significant vibration impacts from construction and operational activities (other than ground-borne vibration from blasting) are unlikely and have been scoped out.

#### 3.1.2 OBJECTIVES

The objectives of this NVIA are to:

- Review national and international standards to determine suitable criteria for assessing impacts from noise and blasting;
- Identify the closest and/or potentially most affected receptors situated within the area of influence (AoI) of the Project;
- Establish a model to predict noise levels at the nearby noise-sensitive receptors (NSRs) resulting from the construction and operation of the Project and the associated traffic;
- Develop a model to predict noise levels associated with traffic during both the construction and operational phases and estimate the distance at which these levels meet established criteria.

- Conduct a blast-assessment to estimate air-blast overpressure and ground-borne vibration levels; and
- Provide a comparison of predicted noise levels to the noise limits, air-blast overpressure and ground-borne vibration levels to acceptable limits.

### 3.1.3 AREA OF INFLUENCE (AOI)

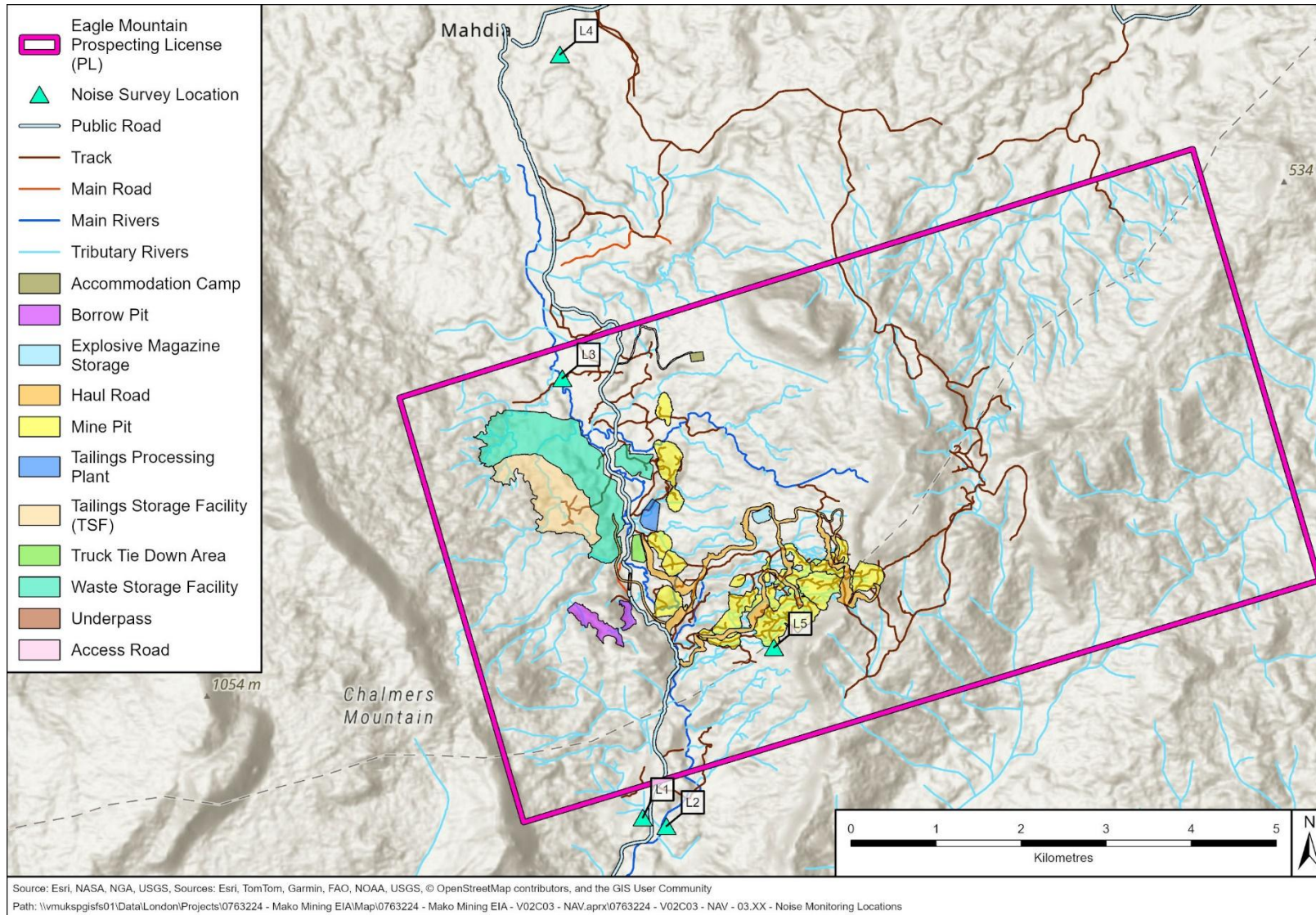
The AoI for the assessment is determined by the nature and location of the receptors located in proximity to the Project area. For this NVIA four settlements (L1 to L4) surrounding this area were identified as sensitive receptors. A description of each sensitive receptor and associated noise sources is provided in Table 3.1 and the AoI is presented in Figure 3.1

**TABLE 3.1 AREA OF INFLUENCE - RECEPTORS**

ID	Location Area	Type of Receptor	Coordinates UTM 21N	
			X (m)	Y (m)
L1	Southern Boundary of Eagle Mountain Prospecting Licence (EMPL)	Residential	263819	573654
L2	Southern Boundary of EMPL	Residential	264098	573554
L3	Northern Boundary	Industrial	262873	578818
L4	Northern Residential Area	Residential	262845	582623



FIGURE 3.1 AREA OF INFLUENCE



## 3.2 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

### 3.2.1 CRITERIA

This NVIA has been undertaken with due regard to, and in accordance with, the following acoustics standards and guidelines:

- Guyana National Bureau of Standards (GNBS)- Guidelines for Noise Emission (GYS 263:2010).
- Environmental Protection Agency - Noise Management Regulations 2013.
- International Finance Corporation (IFC). Environmental, Health, and Safety (EHS) Guidelines – Section 1.7 – Environmental Noise Management (IFC EHS-Guidelines 1.7 Noise).
- Initiative for Responsible Mining Assurance (IRMA). IRMA Standard for Responsible Mining IRMA-STD-001. Environmental Responsibility Requirements: Noise and Vibration.

#### 3.2.1.1 GYS263:2010 AND EPA NOISE MANAGEMENT REGULATIONS 2013

Under these regulations, operations that emit noise are required to apply to the Environmental Protection Agency (EPA) for environmental authorisation. The regulations include the general requirements to apply for authorisation, the permissible noise levels, factors involved in the determination of the point of noise emissions, applications for variance, requirements related to new and altered sources of noise pollution, requirements and approval of plans, and restrictions on construction activities and power to waive restrictions. The Guyana National Bureau of Standards (GNBS) is responsible for establishing standards for permissible noise levels in industry, construction, and other areas<sup>1</sup>.

The EPA has developed the following interim noise standards, established according to categories of activities, in collaboration with the GNBS<sup>2</sup>:

- Residential: 75 decibels (dB) during the day, 60 dB during the night.
- Industrial: 100 decibels (dB) during the day, 80 dB during the night.
- Commercial: 80 dB during the day, 65 dB during the night.
- Construction: 90 dB during the day, 75 dB during the night.
- Transportation: 100 dB during the day, 80 dB during the night.

#### 3.2.1.2 IFC'S GENERAL EHS GUIDELINES FOR NOISE

The IFC's EHS Guidelines 1.7 Noise include internationally recognised noise guidelines and information for the assessment and management of noise. The guidelines also present applicable noise level target values. The IFC's EHS Guidelines 1.7 Noise<sup>3</sup> and IRMA Standard for Responsible Mining<sup>4</sup> differentiate between two principal receptor categories: residential and industrial; the corresponding limits are summarised in Table 3.2.

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<sup>1</sup> Guyana Standard Provides Guidelines for Noise Emission – Guyana National Bureau of Standards 2010

<sup>2</sup> Environmental Protection (Litter Enforcement) Regulations 2013 07.16 Noise Regulations

<sup>3</sup> IFC (International Finance Corporation) 2007. Environmental, Health, and Safety (EHS) General Guidelines, April 30, 2007.

<sup>4</sup> IRMA Standard for Responsible Mining IRMA-STD-001. Environmental Responsibility Requirements: Noise and Vibration. June 2018.

The IFC's guidelines refer to noise from facilities and stationary noise sources and are commonly applied as design standards for industrial facilities. While they relate to some threshold of noise effects in a general sense, the IFC has indicated that they are not directly applicable to transport or mobile noise sources. Measurements are to be taken at noise receptors located outside a project's property boundary.

**TABLE 3.2 IFC AND IRMA NOISE LEVEL GUIDELINES**

Receptor	Maximum Allowable Ambient Noise Levels, LAeq,1hr, dB(A) Free field	
	Day time (07:00 – 22:00)	Night-time (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: IFC - EHS General Guidelines (1.7) (2007). Standard for Responsible Mining IRMA-STD-001 (2018) references the IFC standards.

The IFC's EHS Guidelines 1.7 Noise contain two assessment requirements: firstly, meeting the allowable fixed (disturbance) noise thresholds at noise receptors, and secondly, not increasing ambient noise levels by more than 3 dB at the nearest receptor location off-site. The latter requirement is relevant where existing noise levels are above the thresholds.

### 3.2.1.3 IRMA STANDARD FOR RESPONSIBLE MINING

#### Noise Criteria

For the noise assessment, the IRMA Standard refer to the IFC criteria and periods in its section 4 4.4.2-Management and Mitigation of Impacts on Human Receptors. The acceptable noise levels are the same as those presented in Table 3.2.

#### Airblast Overpressure and Ground-borne Vibration Definitions

In the context of blasting, airblast overpressure refers to the increase in air pressure caused by the sudden release of energy during a blast. This rapid release of energy creates a shockwave that propagates through the air producing sound waves that we perceive as noise. High levels of airblast overpressure can cause hearing damage, stress, anxiety, and other disturbances to people in the vicinity.

Ground-borne vibration, on the other hand, refers to the vibrations transmitted through the ground as a result of the explosive energy released during blasting activity. These vibrations transmitted through the ground can lead to the development of cracks in buildings and infrastructure or may affect the stability of foundations. The level of damage depends on factors such as the distance from the blast, the type of construction, and the intensity of the explosion.

Most standards and guidelines for blasting often rely on an empiric assessment (measurements) as their foundational basis. However, the approach endorsed by the IRMA, *Standard for Responsible Mining IRMA-STD-001*, offer insights into potential airblast

overpressure and ground-borne vibration levels at specific points of concern based on predictions.

These criteria are proposed with the intention of ensuring adequate protection of existing sensitive land uses whilst permitting the operations to be conducted in a practical manner.

### ***Airblast Overpressure Criteria***

The criteria adopted for airblast are presented as 95<sup>th</sup> percentile limits for human comfort in occupied building and should be adhered to at all times during normal operations. The proposed criteria for blast emissions establish that a maximum level for air blast overpressure of 115 dB shall be exceeded for no more than 5% of blasts over a 12-month period. Moreover, blasting shall only occur during the hours of 08:00 to 17:00. Mines may undertake blasting outside of this time restraint when the operating company can demonstrate one or more of the following:

- There are no nearby human noise receptors that will be impacted by blasting noise or vibration;
- Alternative hours are necessary and/or appropriate because of local, cultural or social norms; and/or
- Potentially affected human receptors have given voluntary approval for the expanded blasting hours.

Due to the nature of blasting emissions, compliance with these criteria would result in impacts that are unlikely to be significant, although the potential remains for local community objections and complaints to arise. Exceeding any of these recommended levels would result in significant impacts and the potential for regulatory issues.

**TABLE 3.3 AIBLAST OVERPRESSURE**

Receptor Type		Airblast (dB Linear)
Occupied Buildings (Disturbance)		Compliance Level
Residential	Day	115

### ***Ground-borne Vibration Criteria***

The criteria for ground vibration are considered both in terms of the risk of cosmetic and structural damage to buildings and structures and the effects of disturbance to building occupants. According to the criteria established by the IRMA, ground vibration (peak particle velocity) shall neither exceed 5 mm/second on 9 out of 10 consecutive blasts, nor exceed 10 mm/second at any time.

**TABLE 3.4 GROUND-BORNE VIBRATION**

Receptor Type		Peak Particle Velocity (mm/s)	
Occupied Buildings (Disturbance)		Compliance Level (9 out of 10 consecutive blasts)	Maximum Compliance Level
Residential	Day	5	10



### 3.2.1.4 DEFINITION OF SIGNIFICANCE CRITERIA

#### Noise

##### Construction

The assessment of construction activities primarily focuses on evaluating their impact on the surrounding environment based on Guyanese and the IRMA/IFC noise standards. The significance of an impact is derived from its magnitude and from other factors such as the design details of noise-sensitive properties, the sensitivity of the receptor and the duration of the construction activity. In situations where construction occurs over a short duration, the potential impacts may be considered relatively less significant. The determination of the significance of noise effects, based on national criteria, is presented in Table 3.5.

**TABLE 3.5 MAGNITUDE AND SIGNIFICANCE OF CONSTRUCTION NOISE EFFECTS**

Exceedance of criteria, dB(A)	Magnitude of predicted impact	Other relevant factors	Resulting Significance of effect
below, up to the criteria	Negligible	Factors which may influence significance of effects, e.g., duration of construction activity	Negligible
up to 5 dB above the criteria	Small		Minor
>5 dB and up to 10 dB above the criteria	Medium		Moderate
> 10 dB above the criteria	Large		Major

##### Operation

The assessment of operational noise is based on the Guyanese noise standards, although the IRMA/IFC guidelines have also been considered as reference. Where measured ambient noise levels are lower than the absolute criteria defined, the assessment uses the most stringent thresholds for the relevant assessment period. However, where measured ambient noise levels exceed the established criteria, the assessment criteria for each period are defined by the increase of 3 dB of the measured noise levels.

In applying guidance such as the IFC's EHS Guidelines 1.7 Noise, it is necessary to scale impact magnitude into ranges required for an impact assessment. When assessing the significance of an impact for the noise assessment, the process is slightly different from most other topics in this EIA.

The sensitivity of the receptor is taken account of when calculating the impact magnitude as the criteria consider the receptor's sensitivity to noise. For example, receptors sensitive to noise during the daytime only are assessed using criteria that consider the impact of noise on daytime activities, whilst those rated as sensitive during the night-time are assessed using criteria that consider the impact of noise on sleep disturbance. The magnitude of significance of noise effects is set out in Table 3.6.

TABLE 3.6 MAGNITUDE AND SIGNIFICANCE OF OPERATIONAL NOISE EFFECTS

Exceedance of criteria, dB(A)	Magnitude of predicted impact	Other relevant factors	Resulting Significance of effect
Below the criteria	Negligible	Factors which may influence significance of effects, e.g. type of receptor, duration of impact.	Negligible
Up to 3 dB above the criteria	Small		Minor
>3 dB and up to 10 dB above the criteria	Medium		Moderate
> 10 dB above the criteria	Large		Major

### Definition of Impact Significance from Construction and Operation

The meaning of the four impact significance ratings used in the context of a NVIA, is as follows:

- **Negligible** – no significant effect, no need to consider in decision making, no mitigation required;
- **Minor** – the effect may be detectable, but small enough that noise management measures would ensure impacts are reduced to be negligible;
- **Moderate** – a detectable effect, an impact that is significant, noise-management practices and/or mitigation should be considered. Mitigation is likely to affect design and cost;
- **Major** – a detectable effect, an impact that is significant, noise-management practices and mitigation must be considered. Mitigation will alter a project's design and cost. Impacts are undesirable if not addressed.

Hence, impacts rated as moderate or above will be mitigated where practicable, feasible and reasonable with proportionately more emphasis as the rating increases. These criteria will provide the basis for developing performance standards and acoustic specifications for the Project. Mitigation may not eliminate an impact but would be expected to reduce its severity.

### Airblast Overpressure & Ground-borne Vibration

International standards and guidelines for airblast overpressure and ground-borne vibration have also been reviewed to establish criteria for assessment of impacts from blasting. The resulting criteria are set out in Table 3.7 and Table 3.8 (IRMA, 2018). No distinction is made between minor and moderate impacts because of the nature of impacts from blasting and the response of receptors.

TABLE 3.7 CRITERIA FOR EVALUATION OF IMPACTS FROM AIRBLAST OVERPRESSURE

Period	Airblast dB(Z) 95% percentile		
Significance	Negligible	Minor/Moderate	Major
Daytime	<115	≥115-120	≥ 120

Source: IRMA 2018



**TABLE 3.8 CRITERIA FOR EVALUATION OF IMPACTS FROM GROUND-BORNE VIBRATION**

Period	Ground Vibration PPV mm/s		
Significance	Negligible	Moderate	Major
Daytime	<5	≥5-10	≥ 10

Source: IRMA 2018

### 3.2.2 NOISE CALCULATION METHOD FOR CONSTRUCTION AND OPERATION

#### 3.2.2.1 NOISE

The Predictor V2024 (by SoftNoise) noise-modelling software package was used to calculate predicted noise emissions from Construction and Operation activities of the Project using ISO 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation* noise-propagation algorithms (international method for general purpose, 1/1 octaves).

The Predictor software package allows topographic details to be combined with ground regions, water, foliage, significant building structures etc. and receptor locations, to create a detailed and accurate representation of the site and surrounding area. The noise model allowed for the quantification of noise levels from multiple sources, based on the sound characteristics (overall level, frequency data etc.) emitted from each source to predict the contributed noise levels from mining operations at the nearest potentially affected receptors for various operating scenarios.

The inputs and assumptions used in the predictive noise modelling are outlined below:

- Ground factor of 0.5 was applied for the study area (0 is acoustically hard or reflective, 1.0 is soft);
- Temperature 25°C;
- Relative Humidity of 70%.

All noise levels were predicted at a height of 1.5m (representing the typical height of the ear), are presented in decibels, dB(A), and rounded to the nearest whole integer or decimal place where necessary.

All sound pressure levels ( $L_p$ ) values are expressed as dB(A) re:  $2 \times 10^{-5}$  pascals (Pa) and all sound power level ( $L_w$ ) values are expressed as dB(A) re: 10-12 Watts (W).

#### 3.2.2.2 TRAFFIC NOISE

Additionally, the Calculation of Road Traffic Noise (CRTN)<sup>5</sup> method, as adapted by the Transport Research Laboratory (TRL)<sup>6</sup> in its method 2 (applicable when traffic flow per period is available) was implemented in Predictor for assessing road traffic noise levels during both Construction and Operation phases. Developed in the UK and widely recognised, this method is

<sup>5</sup> Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3 – Department of Transport – Welsh Office – London 1988

<sup>6</sup> Transport Research Laboratory – Adapt UK Traffic Noise Calculation Method for Noise Mapping - 2002

particularly applied in environmental noise assessments to predict the noise impact of road traffic on nearby communities.

### 3.2.2.3 AIRBLAST OVERPRESSURE

The airblast levels have been predicted using the methodology outlined in the *ICI Blasting Guide* (ICI 1995)<sup>7</sup> to provide an understanding of the potential of impacts from blasting.

The 95<sup>th</sup> percentile airblast site law, which may be exceeded up to 5% of the total annual blasts, is defined by the peak airblast level ( $L_p$ ) measured in dB (Z) and is defined as:

$$\text{Airblast OP (95\%)} = 165.3 - 24 \log_{10}(\text{SD})$$

Where scaled distance (SD) is:

$$SD = \frac{d}{\sqrt[3]{MIC}}$$

### 3.2.2.4 GROUND-BORNE VIBRATION

Ground vibration levels depend on the maximum charge mass (effective charge per delay) and not the total charge weight, provided the effective delay interval is appropriate.

When blasting is carried out to a free face in average field conditions, the following equation may be used to estimate the mean vector peak particle velocity.

$$\text{PVV (mm/s)} = 1140(\text{SD})^{-1.6}$$

Where scaled distance (SD) is:

$$SD = \frac{d}{\sqrt[2]{MIC}}$$

MIC is the maximum explosive charge mass (kilograms) detonated per delay at any 8-millisecond interval; and d is the distance between charge and receptor.

## 3.3 BASELINE CONDITIONS

The baseline noise measurements are presented in Chapter 8.11 [Noise Baseline].

## 3.4 IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASES

### 3.4.1 POTENTIAL IMPACTS

The potential noise impacts associated with the pre-construction and construction phases are summarised:

- The earthworks and site clearance activities of the Project's area such as pits, tailings storage facility (TSF) and waste storage facility (WSF), are likely to increase the noise levels in the vicinity of the Project.
- The construction of the processing facilities and the power plant may increase the noise levels in the vicinity of the Project.

<sup>7</sup> ICI Explosives Blasting Guide, ICI Explosives Technical Services, Australia, Nov. 1995.

- Noise from construction traffic may increase the noise levels in the vicinity of the Project.

### 3.4.2 ASSUMPTIONS

The following assumptions have been integrated into the construction noise model:

- Pre-construction activities will be limited to the development and improvements of access roads and tree harvesting. At the time of this assessment, detailed information regarding these activities was not available. However, it is anticipated that these activities will be of short duration and occur only during daytime. Therefore, any impact related to pre-construction activities are expected to be temporary.
- During construction, traffic is expected to reach approximately 30 trucks/day.
- It is expected that the construction activities will progress in stages throughout the construction period. The construction of the infrastructure will begin in areas that have already been prepared, while site clearance continues in other areas. Therefore, those activities are not expected to occur simultaneously in a specific location.
- The construction activities related to Site Clearance and Earthworks are expected to generate the highest levels of noise emissions.
- The noise impact from the construction phase will be modelled based on a typical construction scenario, assuming a construction plant operating on a flat terrain with a defined "emitting (source) area" of 200x200 meters and without considering any noise shielding effects from topography. This approach ensured a worst-case (conservative) evaluation of noise impacts and is sufficient for calculating noise levels at different distances from the project and assessing the noise impacts on receptors as the construction activity progressed along the time.

For each item of equipment, the sound power level ( $L_w$ ) value was determined for the purposes of noise modelling. Noise levels within the emitting source area are determined by the type and maximum number of active equipment for each scenario as shown in Table 3.9 and Table 3.10. The total SWL is calculated by the logarithmic addition of the SWL for each equipment involved.

**TABLE 3.9 SITE CLEARANCE AND EARTHWORKS PLANT AND EQUIPMENT**

Construction Plant	Quantity	BS5228 (Annex C) OR Manufactured reference	SWL, dB(A)	% of 12-hour day	SWL adjust to % of work, dB(A)	Sum SWL, dB(A)
Excavator	2	CAT 374	108	50	105	108
Bulldozers	2	CAT D10	116	50	113	116
Roller	1	C.5 25	103	25	97	97
Grader	1	CAT 16M	108	25	102	102
Water Truck	1	CAT 777	114	25	108	108
Loader	1	Komatsu PH L2350	117	25	111	111
Feller buncher	1	Tigercat 720G	94	25	88	88
Dump Truck	3	CAT 740 GC	118	50	115	120

Construction Plant	Quantity	BS5228 (Annex C) OR Manufactured reference	SWL, dB(A)	% of 12-hour day	SWL adjust to % of work, dB(A)	Sum SWL, dB(A)
Total						122

TABLE 3.10 INFRASTRUCTURE ASSEMBLY PLANT

Construction Plant	Quantity	BS5228 (Annex C) OR Manufactured reference	SWL, dB(A)	% of 12-hour day	SWL adjust to % of work, dB(A)	Sum SWL, dB(A)
Concrete agitator truck	1	C.4.27	107	50	104	104
Poker Vibrator	1	C.4.73	106	25	100	100
Mobile concrete pump	1	C.3.26	103	50	100	100
Mini piling rigs	1	C.3.18	103	50	100	100
Mobile Tower crane	2	C.4.50	99	50	96	99
Generator	1	C4.85	94	75	93	93
Compressor	1	C3.19	103	50	100	100
Forklifts	1	C.2.35	99	25	93	93
Manitou Telescopic	1	Library	99	25	93	93
Piler Driver	2	Library	115	50	112	115
Generators (40 kVA)	1	Library	93	75	92	92
Dump Truck	1	CAT 740 GC	118	25	112	112
Total						117

### 3.4.3 EXISTING CONTROLS/DESIGN MITIGATION

The following embedded mitigation measures are included in the Project's design:

- Construction activity will be undertaken only during daytime.
- Most borrowed material will be sourced from within the Project location (borrow pits), minimising noise from transportation-related activities that would otherwise impact nearby villages.

### 3.4.4 RESULTS AND SIGNIFICANCE OF IMPACTS

#### 3.4.4.1 CONSTRUCTION ACTIVITIES

The predicted noise levels at each sensitive receptor are in Table 3.11.

TABLE 3.11 PREDICTED CONSTRUCTION NOISE LEVELS

Receptor	Period (T)	GNBS Daytime Criteria, dBA	Distance to Nearest Mining Facility	Predicted Noise Levels, dB(A)
L1	Daytime	90	1,800 meters from the southernmost pit	39
L2			1,800 meters from the southernmost pit	39
L3			1,000 meters from WSF	45
L4			4,500 meters from the northernmost pit	31

Predicted noise levels during construction phase are anticipated to comply with Guyanese and IRMA/IFC daytime criteria for residential areas at all receptors.

#### 3.4.4.2 CONSTRUCTION TRAFFIC

Daytime noise criteria due to construction traffic are predicted to be met within the road width; therefore, **Negligible** impacts are expected.

#### 3.4.4.3 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

All receptors represent residential receptors and therefore receptors' sensitivity is considered **High**. Predicted noise levels indicate that construction activities will result in **Negligible** impact magnitude at all receptors.

#### 3.4.4.4 IMPACT SIGNIFICANCE

**Negligible** noise impacts are anticipated at all sensitive receptors during construction activities and associated traffic.

#### 3.4.5 MITIGATION AND MANAGEMENT MEASURES

To ensure compliance and effective management of noise emissions, regular monitoring through direct measurements should be conducted at any critical sensitive receptors identified. If any exceedances of criteria occur, the implementation of a noise management plan (NMP) is necessary to identify noise sources and implement corrective actions.

The following mitigation measures and good practices can be used when feasible and practical (e.g., residential receptor identified near the construction area), to keep the noise levels below the applicable standards at the closest sensitive receptors to the source:

- Where practicable, stationary noisy equipment will be sited as far away as possible from receptors and orientated away from the receptors.
- Construction contractors will use alternatives to audible reversing alarms, where possible and/or close to EMPL boundaries, such as visual and/or broadband noise emitting models, that provide a safe system of work or configure the Project's work sites to maximise forward movements of mobile plant.
- Where practicable, alternatives to noisy diesel and petrol engines and pneumatic units will be used, such as hydraulic or electric-controlled units.

- Where practicable, stationary equipment (such as compressors, generators etc.) will be fitted with an acoustically treated enclosure.
- Throttle settings will be reduced, and equipment and plant turned off, when not being used.
- Onsite chutes and bins will be lined with damping material.
- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.
- Storage of excavated material between the construction site and sensitive receptors to form noise barriers (with cover to avoid dust erosion) or installation of other (temporary) noise barriers. Where practicable, place earth mounds or rock piles between construction activity and sensitive receptors.
- Minimising drop height of materials.
- Taking advantage of the natural topography and vegetation cover for noise shielding.
- Implementation of speed limits (50 km/h) for trucks while travelling to and from construction sites (25 km/h for village roads in poor condition).
- Reducing the Project's traffic through Mahdia and other communities, when feasible, to avoid disturbing residential receptors.
- Limiting hours of operation for specific equipment or operations (e.g. trucks or machines operating in or passing through communities).

### 3.4.6 SIGNIFICANCE OF RESIDUAL IMPACTS

By implementing these noise-good practices and management measures, an overall reduction in construction noise by more than 5 dB (A) is expected. If additional mitigation measures are applied, the residual impact will remain negligible, as indicated in Table 3.12.

**TABLE 3.12 NOISE IMPACTS (PRE-CONSTRUCTION AND CONSTRUCTION)**

Significance of Impact				
Impact	Pre-construction and construction activity are likely to increase the noise levels in the vicinity of the Project.			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to environmental noise would bare considered to be negative			
Impact Type	Direct	Indirect		Induced
	Impacts to environmental noise would bare direct impacts through noise mainly from the pre-construction and construction equipment and plant and related traffic.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The pre-construction and construction phases of the Project are expected to be completed in 24 months. However, these activities are not expected to occur simultaneously in a specific location. Therefore, impacts are considered transient and short-term.			
	Local	Regional		International



Significance of Impact					
Impact Extent	The impact will only be localised within the area of influence of the Project.				
Impact Scale	Impact scale is considered localised and small				
Frequency	Impacts to noise environment could occur intermittently to regularly during the pre-construction and construction phases.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be negligible.				
Receptor Sensitivity	Low		Medium		High
	In terms of noise, all receptors represent residential receptors and therefore receptors’ sensitivity is considered high				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a high receptor sensitivity and negligible impact magnitude will result in a negligible impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The residual impact for the pre-construction and construction phases is assessed to be Negligible. Even though no impacts are anticipated, frequent noise monitoring should be undertaken at the nearest receptors to the construction activities.				

### 3.5 IMPACTS FROM THE OPERATIONAL PHASE

#### 3.5.1 POTENTIAL IMPACTS

The following operational activities are anticipated to increase the noise levels at the sensitive receptors in the proximity of the Project:

- The operation of the mining mobile equipment, such as excavators, bulldozers and haul trucks.
- The processing plant and associated infrastructure, such as crushers, conveyors and mill.
- The operation of the power plant.
- Noise from operational traffic.
- Blast events can produce both airblast overpressure and ground-borne vibrations, which can have significant noise impacts on sensitive receptors (e.g., nearby communities, infrastructure, and the environment).

#### 3.5.2 ASSUMPTIONS

##### 3.5.2.1 OPEN PIT, TAILING STORAGE FACILITY, WASTE ROCK STORAGE FACILITY AND TRAFFIC FROM THE OPERATION

The following assumptions have been incorporated into the mine operational noise model:

- Production (Life of Mine) will take place over 15 years.
- During this time, the mine is estimated to process 27.2 million tonnes of ore, creating 56.6 million tonnes of waste rock and 17.2 Mm<sup>3</sup> of tailings.
- The mine will operate 24 hours per day, seven days per week.
- Mining activity will progress in stages. Each year, mill feed and waste rock will be sourced from several pits. For modelling purposes, two conservative scenarios have been selected by representing mining activity in the northernmost and southernmost pits, those closest to residential receptors at either end of the Prospecting License area. Within these zones, production during years 11 (for northern pits) and 14 (for southern pits) have been selected, as these years represent the highest total mined production for their respective areas.
- The mining fleet such as loaders, graders, drilling rigs was modelled as point sources.
- To represent a robust case, the maximum number of each type of mining equipment has been modelled. The type, number and SWL of the equipment is presented in Table 3.13.
- Haul trucks (CAT 740) were considered as line-moving noise sources, honouring the haul roads. The routes were interpreted based on the load capacity and the amount of material movement per year as per Table 3.14 and Table 3.15.
- The average speed limit will be limited to 25 km/h on-site and along communities.
- Waste spreading and sloping will be undertaken with dozers for cleaning up and managing the waste dump.
- Tailings are pumped to the TSF as slurry.
- It is estimated that 10 to 15 trucks per day will be needed to supply the mine with fuel, reagents, perishables, and other essentials. These deliveries would be scheduled to occur during daytime hours; however, unexpected incidents - such as adverse weather or road conditions - may result in deliveries occurring outside daylight hours.

TABLE 3.13 MINING EQUIPMENT

Equipment	Quantity	SWL, dB(A)	% of 12-hour day	SWL adjusted to % of work, dB(A)
Haul truck (CAT 740)	24	118	100	118
Rotatory Drill (Epiroc - DM30 II SP)	2	114	90	114
Bulldozer (CAT D10)	1	116	90	116
Excavator (CAT 374)	5	108	90	108
Loader (CAT D8)	4	113	90	113
Loader (CAT 950)	1	107	90	107
Grader (CAT 12M)	2	108	50	105
Boom truck	1	105	25	99
Telehandler	1	98	25	92
Crane 60-100 tonne	1	99	25	93
Powder truck	1	105	25	99
Forklift	1	80	25	74

Equipment	Quantity	SWL, dB(A)	% of 12-hour day	SWL adjusted to % of work, dB(A)
Mobile Rock Breaker	1	113	25	107

TABLE 3.14 ESTIMATED MATERIAL MOVEMENTS (YEAR 11)

	Ore	Waste
Tonnes (year 11)	1,820,000	3,918,000
Total journey trips (round-trip)	100,275.48	215,867.77
Daily journey trips	275	591

TABLE 3.15 ESTIMATED MATERIAL MOVEMENTS (YEAR 14)

	Ore	Waste
Tonnes (year 14)	1,820,000	6,253,000
Total journey trips (round-trip)	100,275.48	344,517.91
Daily journey trips	275	944

### 3.5.2.2 PROCESSING PLANT AND POWER PLANT

The following assumptions have been incorporated into the processing plant and power plant operational noise model:

- The processing plant and power plant will operate 24 hours per day, seven days per week.
- While Phase 1 of the LOM will prioritise saprolite mining, Phase 2 will focus on the mining and processing of all rock types, predominantly fresh and transition material. Therefore, to represent the worst-case scenario, the processing plant during Phase 2 will be modelled, as it will require additional screening, crushing and grinding, and additional power generation equipment to treat the higher proportion of fresh rock material.
- The power plant will be located within the processing plant area. Power generation will be provided by 7 CAT C32 generators (1,250 kw ea.), with planned 5-6 units operating, and 1-2 units on standby.

The type, number and SWL of the modelled equipment is presented in Table 3.16.

TABLE 3.16 PROCESSING PLANT EQUIPMENT (PHASE 2)

Equipment	Quantity	SWL, dB(A)	% of 12-hour day	SWL adjusted to % of work, dB(A)
Primary Jaw Crusher	1	85.0	100	85
Feed Grizzly/Apron	1	85.0	100	85
Conveyor 1	1	113.0	100	113
Conveyor 2	1	113.0	100	113
SAG Mill	1	105.0	100	105

Equipment	Quantity	SWL, dB(A)	% of 12-hour day	SWL adjusted to % of work, dB(A)
Scrubber	1	110.0	100	110
Conveyor 3	1	113.0	100	113
Ball Mill	1	100.0	100	100
Gravity Contr	4	95.1	100	95
Mag Sep	1	95.0	100	95
Pebble Crusher	1	105.0	100	105
Conveyor 4	1	113.0	100	113
Pre-Leach/Grinding Thickener	1	94.1	100	94
Trash Screen	2	89.5	100	90
Leach Tank Agit	5	90.4	100	90
CIP Tank Agit	7	90.4	100	90
CIP Tank Carb Screens	14	86.0	100	86
CIP Tails Safety Screen	1	89.5	100	90
Elution Area	1	78.0	100	78
Detox Area Agit	4	90.4	100	90
Refinery Ventilation Fans/Scrub	2	85.0	100	85
Tails Discharge (potential cetrif)	2	75.0	100	75
Lime Silo Baghouse	1	90.0	100	90
Loader at Feed	1	101.0	100	101
CAT D-8 at Stockpile	1	76.0	100	76
Forklift	1	80.0	100	80
Telehandler	1	80.0	100	80
Reagent Mix Area	6	84.2	100	84
Lab Baghouse	1	83.0	100	83
Lab Scrubber	2	83.0	100	83
CAT C32 generators	6	108.7	100	109
Compressors	11	75.0	100	75
<b>Total</b>				

### 3.5.2.3 BLASTING

Stronghold Guyana anticipates that blasting operations will utilise holes measuring 152.4 mm in diameter and a burden and spacing ranging from 4.0 m to 5.5 m, depending on material type. The maximum charge of explosive per delay (MIC) will be 358.08 kg, with powder factors of 0.20 kg/t for saprolite and 0.45 kg/t for fresh rock. Additionally, it was assumed that

modern blasting techniques will be used with a delay of greater than 8 ms between detonations.

### 3.5.3 EXISTING CONTROLS/DESIGN MITIGATION

The following embedded mitigation measures are included in the Project's design:

- Since saprolite is a soft, weathered material that allows for excavation without the need for blasting, saprolite layers will be managed using free-digging techniques, avoiding unnecessary blasting.
- Blasting events will be undertaken only during daytime. Communities in the direct Social AoI will be notified in advance of blasting activities.

### 3.5.4 RESULTS AND SIGNIFICANCE OF IMPACTS

#### 3.5.4.1 NOISE

##### Operation Activities

As mentioned in Section 3.2.1, the assessment of the operational noise is based on a combination of the Guyanese and the IRMA/IFC noise standards. Where measured ambient noise levels are lower than the absolute criteria defined, the assessment uses the most stringent thresholds for the relevant assessment period. However, where measured ambient noise levels exceed the established criteria, the assessment criteria for each period are defined by the increase of 3 dB of the measured noise levels.

Predicted noise levels at nearby receptors due to the mining operation are presented in Table 3.17 and predicted noise contours are shown in Figure 3.2 and Figure 3.3.

**TABLE 3.17 PREDICTED NOISE LEVELS - MINING OPERATION**

ID	Location	Type of Receptor	Predicted Noise Level LAeq, dB(A)		Measured Baseline (LAeq) +3dB(A) Criteria		Guyanese Absolute Criteria, dB(A)	
			Day	Night	Day	Night	Day	Night
L1	Southern Boundary of EMPL	Residential	38	38	61	55	75	60
L2	Southern Boundary	Residential	38	38	45	52	75	60
L3	Northern Boundary	Industrial	45	45	47	44	100	80
L4	Northern Residential Area	Residential	25	25	49	-	75	60

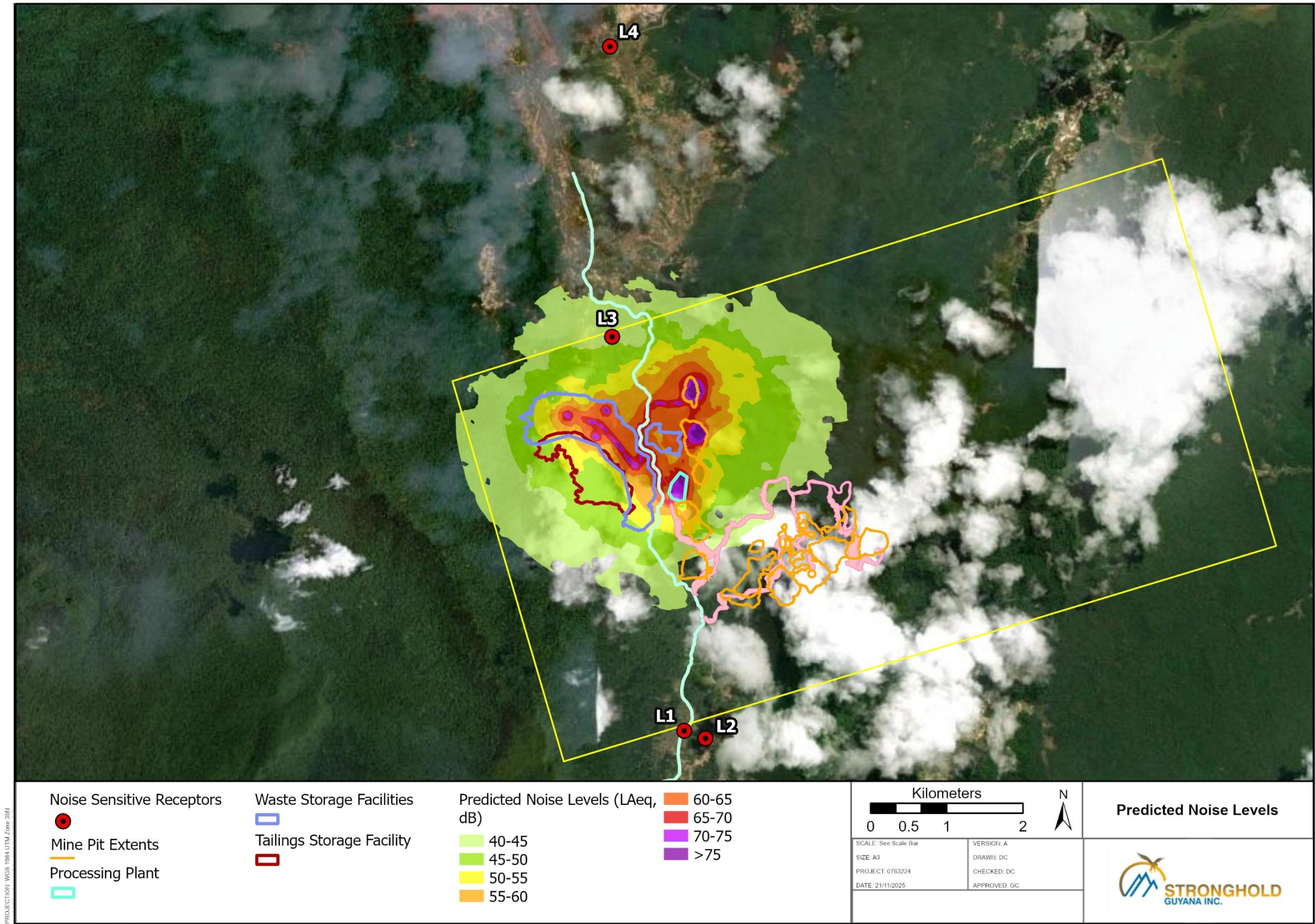
Noise levels are predicted to comply with the Guyanese and IRMA/IFC criteria at all sensitive receptors for daytime and night-time periods.

**Operational Traffic**

Daytime noise criteria due to operational traffic are predicted to be met within the road width; therefore, **Negligible** impacts are expected.



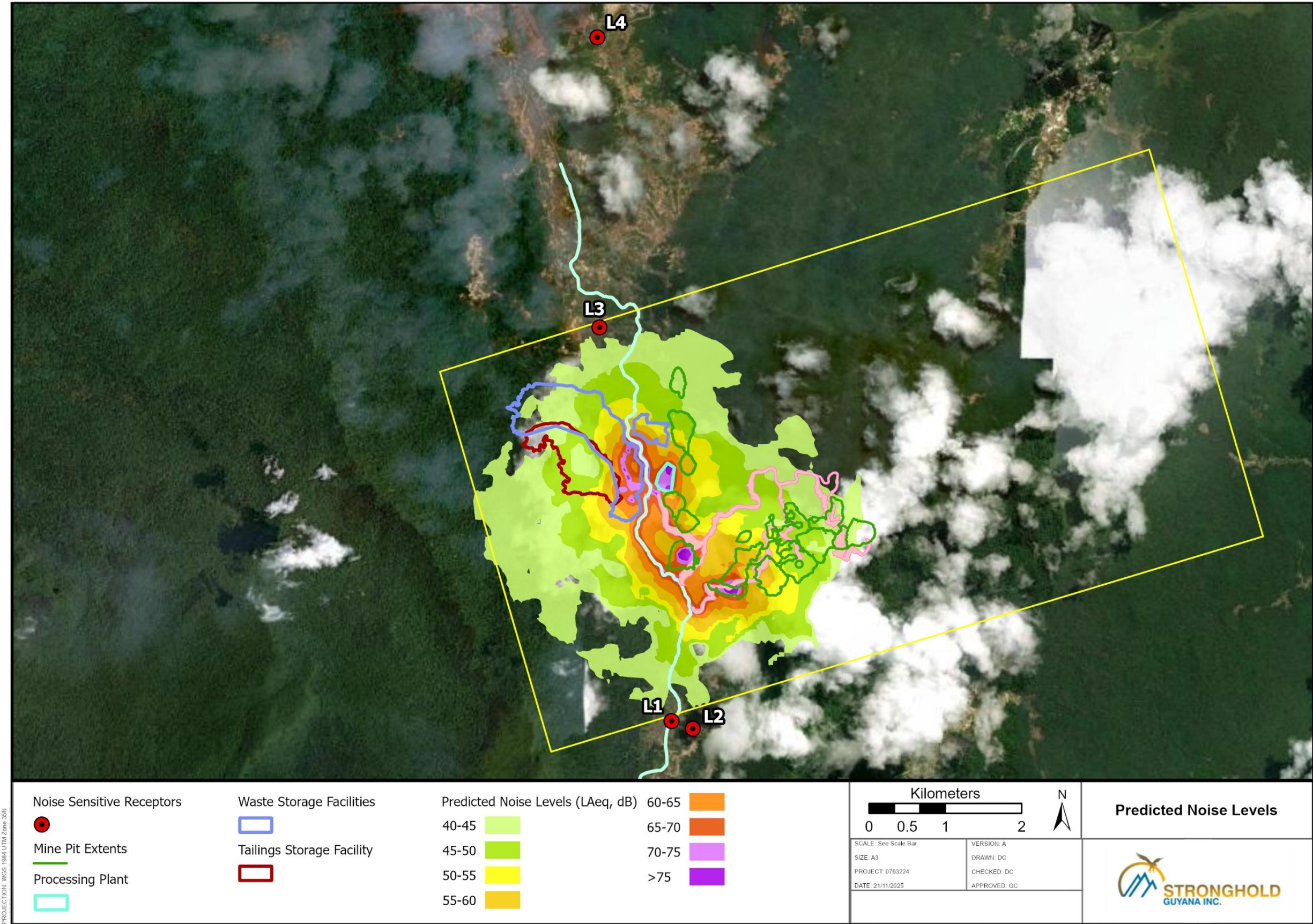
FIGURE 3.2 PREDICTED NOISE LEVELS – MINING OPERATION (NORTHERNMOST PITS)



Source: ERM, 2025.



FIGURE 3.3 PREDICTED NOISE LEVELS – MINING OPERATION (SOUTHERNMOST PITS)



Source: ERM, 2025.



## Receptor Sensitivity and Impact Magnitude

All receptors identified as residential receptors are considered as **High** sensitivity receptors. The predicted noise levels during operations will result in **Negligible** impact magnitude at all sensitive receptors.

## Impact Significance

According to presented results, noise impacts of **Negligible** significance are anticipated during the operation of the Project.

## Additional Mitigation, Management, and Monitoring Measures

No significant impacts are anticipated during operation of the Project and therefore no additional mitigation measures are required. To ensure compliance and effective management of noise emissions, regular monitoring through direct measurements should be conducted at any critical sensitive receptors identified. In the event that an exceedance of the criteria is identified, a noise management plan will be implemented to investigate the cause of the noise source and implement corrective actions to minimise the impact.

## Residual Impact Significance

Predicted noise levels due to the operation of the Project are expected to comply with the IFC's guidelines, and no additional mitigation measures are required (refer to Table 3.18).

**TABLE 3.18 NOISE IMPACTS (OPERATION)**

Significance of Impact					
Impact	Operation of the Project is likely to increase the noise levels in the vicinity of the Project.				
Impact Nature	Negative	Positive	Neutral		
	Potential impacts to environmental noise would bare considered to be negative				
Impact Type	Direct	Indirect	Induced		
	Impacts to environmental noise would bare direct impacts through noise mainly from the operation of the mine, the processing plant and the power plant.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The operation of the Project is estimated to be 15 years.				
Impact Extent	Local	Regional	International		
	The impact will only be localised within the area of influence of the Project.				
Impact Scale	Impact scale is considered localised and negligible.				
Frequency	No noise impacts are anticipated during the operation.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be negligible.				
Receptor Sensitivity	Low	Medium	High		
	In terms of noise, all receptors represent residential receptors and therefore receptors' sensitivity is considered high.				
	Negligible	Minor	Moderate	Major	

Significance of Impact					
Impact Significance	Despite the sensitivity of receptors is considered high, predicted noise levels during operations will result in Negligible impact magnitude at all sensitive receptors.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Even though no impacts are anticipated, frequent noise monitoring should be undertaken at the nearest receptors.				

### 3.5.4.2 BLASTING

#### Airblast Overpressure and Ground-borne Vibration

Based on the planned blasting activities, distance at which the relevant criteria will be met has been predicted based on the MIC values (358.08 kg).

If the time interval (delay period) between blasts is at least eight milliseconds, individual detonations can be treated as separate blasts and their airblast overpressure and vibration will not be cumulative.

Furthermore, MIC per detonation is subject to the following parameters:

- The explosive type, loading densities and weights;
- The detonator delays and firing sequence;
- The spacing of holes;
- The distance between the holes and the free or open face;
- The geology (type and condition) of the bedrock; and
- The depth and composition of the earth covering deposit (soil).

The results of the predictions are presented in Table 3.19 and Table 3.20.

**TABLE 3.19 OPEN PIT AIRBLAST OVERPRESSURE RESULTS**

MIC, kg	Time Period	Airblast overpressure Limit (95%) dB(Z)	Distance at which the criteria are met (m)
358.08	Daytime	115	885

**TABLE 3.20 OPEN PIT GROUND-BORNE VIBRATION RESULTS**

MIC, kg	Time period	PPV, mm/s	Distance at which the criteria are met (m)
358.08	Daytime	5	563
		10	365

The predicted distances at which both airblast overpressure and ground-borne vibration criteria will be met are 885 meters.

If no receptors are identified within 885 meters from the operations, the impact significance of blasting activities is expected to be **Negligible**.

### Receptor Sensitivity and Impact Magnitude

**Negligible** impact magnitude is anticipated beyond 885 meters of the operation area, using a MIC of 358.08 kg. Any residential receptors identified within this range will be classified as high-sensitivity receptors, with potential impacts ranging from medium to large magnitude.

### Impact Significance

**Negligible** impacts are anticipated beyond a radius of 885 meters from the operation, based on a MIC of 358.08 kg.

### Additional Mitigation, Management, and Monitoring Measures

If any critical receptor is identified close, or any significant change on the blasting design, then compliance monitoring should be conducted during each blasting event via direct measurement at this location. If the established criteria are exceeded, a blasting mitigation and monitoring plan is necessary to implement corrective actions to minimise the impact.

### Residual Impact Significance

Predicted blasting impacts are summarised in Table 3.21.

**TABLE 3.21 BLASTING NOISE IMPACTS**

Significance of Impact					
Impact	Blasting is likely to increase the airblast overpressure and the ground-borne vibration levels in the vicinity of the Project.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to airblast overpressure and the ground-borne vibration would bare considered to be negative				
Impact Type	Direct	Indirect		Induced	
	Impacts to airblast overpressure and the ground-borne vibration would bare direct impacts, due to blasting activity from the pit areas.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The duration of the mine operation and the associated blasting activity is estimated to be 15 years. Therefore, potential impacts to airblast overpressure and the ground-borne vibration would bare considered to be long term duration.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the area of influence of the Project.				
Impact Scale	Impact scale is considered localised if the amount of 358,08 kg of MIC is not exceeded.				
Frequency	Impacts on airblast overpressure and ground-borne vibration could occur regularly.				
	Positive	Negligible	Small	Medium	Large

Significance of Impact					
Impact Magnitude	Negligible impacts are anticipated at distances greater than 885 meters away from the blasting area, based on a MIC 358,08 kg				
Receptor Sensitivity	Low	Medium	High		
	In terms of noise, all receptors represent residential receptors and therefore receptors' sensitivity is considered high.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a high receptor sensitivity and a negligible impact magnitude will result in negligible impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	During blasting activities, the residual impact is assessed to be Negligible. Even though no impacts are anticipated, frequent blast monitoring should be undertaken at the nearest receptors identified.				

### 3.6 IMPACTS FROM CLOSURE PHASE

Decommissioning activities and associated impacts to environmental noise will be of a very similar nature and extent to those of the pre-construction and construction phases. Impact significance and mitigation will therefore be mostly identical to construction phase. As such, they are not repeated here.

The rehabilitation and closure process and measures to restore disturbed areas will be detailed in a Mine Rehabilitation and Closure and Plan prepared for the Project (a conceptual level Rehabilitation and Closure Plan in Appendix B).



## 4. PHYSIOGRAPHY, GEOLOGY AND SOILS

### 4.1 INTRODUCTION

The Eagle Mountain Gold Project will involve topsoil stripping, with the layer typically less than half a metre deep, within the footprints of the mine pit, processing facilities, and associated infrastructure. To the greatest extent possible, topsoil, overburden, saprolite, and organic material will be removed and stockpiled for use in rehabilitating areas following land disturbance.

The purpose of this section is to provide an evaluation of the potential Project impacts on soils and to describe the environmental measures to avoid, minimise, or mitigate potential adverse effects and enhance beneficial effects of the Project.

### 4.2 DEFINING AREA OF INFLUENCE

From the soil resources perspective, the soils Area of Influence (AoI) is the area located within or near the proposed Project facilities (mine site and the ancillary facilities footprints) that would be affected by the proposed Project. For this EIA, the soils AoI considered the following Project facilities:

- Mine site – mine pit, WSF, TSF, mine infrastructure, workers camp, generators and distribution lines, explosive storage, processing plant, and haul roads.
- Ancillary facilities – access road.

### 4.3 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

#### 4.3.1 IMPACT ASSESSMENT METHODOLOGY

This section discusses the potential impacts of planned activities of the Project on soils. The relevant planned Project activities and the associated potential impacts of these activities on soils are identified, and the significance of each of these potential impacts is assessed in accordance with the methodology described in Volume 1: Chapter 5. A pre-mitigation significance rating (i.e., considering the existing controls included in the Project design) is provided for each potential impact. Any additional mitigation measures applied to supplement these existing controls are described, and a residual significance rating (i.e. considering existing controls and mitigation measures) is then provided for each potential impact.

The planned Project activities will not affect geological resources within Guyana or the Project area. Therefore, this section focuses on potential impacts to soil resources resulting from the Project's planned activities.

#### 4.3.2 POTENTIAL IMPACTS

During the implementation of the Project, the following potential impacts will occur:

- Soil erosion and sedimentation and topsoil loss;
- Rutting and soil compaction; and
- Soil contamination.

### 4.3.3 IMPACT ASSESSMENT CRITERIA

As described in Volume 1: Chapter 5, impact significance is characterised using a standardised approach that considers:

- the sensitivity of the resource; and,
- the magnitude of the potential impact (which is determined based on five factors: type, extent, duration, scale, and frequency).

General definitions for the magnitude factors of type, extent, duration, scale, and frequency are included in Volume 1: Chapter 5. Sensitivity is defined on a resource-specific basis for all resources. The universal designations for sensitivity are: Low, Medium, and High.

The sensitivity criteria and impact magnitude criteria for the soil resources have been provided in Table 4.1 and Table 4.2, respectively. The subsequent subsections will utilise these criteria to assess the impact of the Project activities to soil resources and quality.

TABLE 4.1 SENSITIVITY ASSESSMENT CRITERIA FOR SOIL QUALITY

Impact Type	Sensitivity Criteria (Sensitivity/Importance of Affected Resource)		
	Low	Medium	High
Soil quality related criteria as erosion and loss of topsoil, rutting/compaction and contamination and land change (The extent to which the soil and its quality plays an ecosystem role in terms of supporting biodiversity. This includes its role in supporting a lifecycle stage).	<ul style="list-style-type: none"> <li>The soil quality does not support diverse habitat or populations and/or supports habitat or population of low quality.</li> <li>Disturbed soils do not drain to water or land features that support diverse habitats or are a locally important source of water for communities living nearby.</li> </ul>	<ul style="list-style-type: none"> <li>The soil quality supports diverse habitat or population of flora and fauna and supports habitats commonly available in the study area.</li> <li>Disturbed soils drain to water or land that support diverse habitats or are a locally important source of water for communities living nearby.</li> </ul>	<ul style="list-style-type: none"> <li>The soil quality supports economically important or biologically unique species or provides essential habitat for such species.</li> <li>Disturbed soils drain to water or land features that support economically important or biologically unique species or provide essential habitat for those species or are an important source of water for communities living nearby.</li> </ul>

TABLE 4.2 CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO SOILS

Impact Type	Magnitude of Impact			
	Negligible	Small	Medium	Large
Increase soil erosion and sedimentation; topsoil loss	Less than 10 percent of soils disturbed have medium or high erosion potential and/or are on slopes greater than 20 percent.	More 10 percent, but less than 20 percent, of soils disturbed have a medium or high erosion potential and/or are on slopes greater than 20 percent.	More than 20 percent, but less than 30 percent, of soils disturbed have a medium or high erosion and/or are on slopes greater than 20 percent.	More than 30 percent of soils disturbed have a medium or high erosion potential and/or are on slopes greater than 20 percent.
Soil compaction	Qualitative - No perceptible or readily measurable change from baseline conditions. Scale - Localised area as activity areas.	Perceptible change from baseline conditions but likely to easily revert back to earlier stage with mitigation. Scale - Project area, activity areas and immediate vicinity	Clearly evident (e.g., perceptible and readily measurable) change from baseline conditions and/or likely take time to revert back to earlier stage with mitigation.	Major (e.g., order of magnitude) change in comparison to baseline conditions and/or likely difficult or may not to revert back to earlier stage with mitigation.

Impact Type	Magnitude of Impact			
	Negligible	Small	Medium	Large
	Time - Short duration (few days) or one time as temporary.	not impacting any sensitive receptor. Short term - Only during particular activities or phase of the project lifecycle as civil works or construction phase (few months).	Scale - Project area, activity areas and immediate vicinity impacting sensitive receptor/s. Long term- Spread across several phases of the project lifecycle (few years).	Scale – Regional or international. Permanent change.
Soil contamination	Well within standards	Well within standards	Exceeds Target Value but well within Interventional Value.	Exceeds Interventional Value and needs intervention.

## 4.4 IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASES

During the construction phase, the Project could result in the following types of potential impacts.

### 4.4.1 POTENTIAL IMPACTS

During stripping and excavation, soil erosion and sediment control measures will be applied. Implementing best management practices will help minimise erosion, providing ongoing protection for surface water runoff and groundwater quality.

Additionally, the movement of heavy equipment during clearance and construction activities can significantly affect soil resources. When soil strength is insufficient to support vehicle loads, rutting occurs, creating deep tracks that disturb soil structure and increase susceptibility to erosion. Compaction of vulnerable soils reduces pore space, limiting water infiltration and root penetration. These changes can alter natural hydrological patterns, increase surface runoff, and reduce groundwater recharge. Over time, compaction and rutting diminish soil productivity, impairing its ability to support vegetation and contributing to long-term degradation of soil health.

Risk of impacts to soil quality occur across the full project area, including the process plant area, fuel farm and generators, maintenance area, hazardous waste and materials storage areas, and landfills because of potential leaks to soil of fuel, lubricants, solid and liquid wastes. Embedded control measures have been included in the design of this infrastructure such as armoured and sealed hard standing (ground surfaced with a hard material for parking vehicles on) for ore processing, fuel, reagents and waste storage areas, as well as bunding of liquid storage and usage areas with controlled drainage directed to contact water-treatment facilities (secondary containment).

The mining footprints will result in both temporary and permanent changes to soil quality. These impacts will be mitigated during the mine closure phase, when most affected areas will be capped or covered with stockpiled topsoil and subsequently revegetated.

The main impacts from this Phase are:

- **Increase of soil erosion and sedimentation and topsoil loss:** The construction of the project components will gradually impact the surficial topsoil layers across approximately 418 hectares of land, resulting in the removal, displacement, covering or erosion. For areas that are not disturbed, or areas already disturbed, the Project will not remove or impact any surficial topsoil layers.
- **Rutting and soil compaction:** Will occur due to increased vehicular movement during construction.
- **Soil contamination:** Can occur primarily from fuel storage and dispensing, hazardous materials and waste, accidental spills, and plant maintenance during construction.

### 4.4.2 EXISTING CONTROLS / DESIGN MITIGATION

To address the potential increased soil erosion and sedimentation and topsoil loss:

- During construction, topsoil, overburden, saprolite, and organic materials will be stripped or excavated and stockpiled, to the extent possible, for subsequent rehabilitation of areas

where land disturbance has been completed. However, the volumes of these materials are expected to be low;

- During construction, sediment and water drainage control structures will be installed;
- Diverted channels, sediment ponds, and check dams will be constructed as soon as possible to avoid run-off with high sediment content flow to water courses;
- Construction of area drainage and sediment control structures that relies on:
  - Run-off controls,
  - Source controls near the disturbance,
  - Intermediate controls, and
  - Perimeter controls. Releases from the perimeter controls must meet effluent limits and achieve ambient criteria at downstream compliance points.
- Limit clearing of vegetation and soil cover to necessary areas only. As practicable as possible, undertake land clearance within shortest period possible before commencement of construction activities.

To address the potential for soil rutting and compaction:

- Limit, when practical, off-road access.

To address soil contamination, accidental spills and chemical release:

- All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems with bund capacity in excess of 110 percent of the liquid volume stored there. Floors should be sealed, and all areas roofed to prevent the bunds filling with rain;
- There will be approved temporary waste storage areas located across the Project area, to collect the waste properly until the landfill will be operating;
- Emergency response kits to control any fuel/oil spill should be readily available across the Project area;
- Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill;
- Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines;
- Conduct regular training programs for employees to ensure they are familiar with spill response procedures; and
- Develop and maintain comprehensive emergency response plans that include spill response protocols.

#### 4.4.3 SIGNIFICANCE OF IMPACTS

##### 4.4.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

##### **Increase Soil Erosion and Sedimentation and topsoil loss**

As described in Volume 2: Chapter 5, the soils found within the Project area can exhibit low soil fertility and range from silty sand to clay, which are less susceptible to compaction.

The implementation of the proposed Project will disturb approximately 418 hectares of soil. However, as noted in the baseline sections, certain waterbodies and adjacent areas within the



Project footprint have already been impacted by existing Artisanal and Small-scale Mining (ASM) activities. Table 4.3 provides a summary of the approximate areas of soils that will be disturbed by the various Project components and infrastructure. Potential impacts on soils will arise from the construction of mine facilities and site preparation activities, including vegetation clearance and grubbing, topsoil salvage where feasible, earthworks (cuts and fills), landscape grading, and re-contouring to maintain proper drainage, as well as other associated construction works.

**TABLE 4.3 SUMMARY OF TOTAL HECTARES POTENTIALLY IMPACTED BY THE PROPOSED PLANNED MINE FACILITIES**

<b>Mine Component/Facility</b>	<b>Approximate Total Area Impacted (Ha)</b>	<b>Approximate Area Impacted with Slopes &gt;20% (Ha)</b>	<b>Percentage of Total (%) Represented by Slopes &gt;20%</b>
Mine Pit	137.7	96.8	70.3%
Borrow Pits	14.2	11.4	80.0%
Waste Storage Facility	121.2	27.5	22.7%
Tailings Storage Facility	62.5	30.0	48.0%
Accommodation Camp	1.6	0.6	39.9%
Explosive Magazine Storage	3.0	1.3	44.5%
Processing Plant	6.0	1.9	32.3%
Truck Tie Down Area	4.1	0.0	0.0%
Haul Roads <sup>a</sup>	58.5	50.2	85.9%
<i>Subtotal</i>	<i>408.7</i>	<i>219.8</i>	<i>53.8%</i>
Access Road <sup>b</sup>	9.4	1.2	13.0
<b>Total</b>	<b>418.1</b>	<b>220.9</b>	<b>17.2</b>

<sup>a</sup> The total area includes the main haul road around the southern mine pits.

<sup>b</sup> Includes Main Access Road known as the 'old Potaro-Konawaruk Road' from Mahdia

Ha = Hectares

% = Percentage

Soil erosion and sedimentation represent significant concerns during construction activities. These impacts are anticipated primarily in areas with moderately steep to steep slopes and soils exhibiting medium to high erosion potential. Within the proposed Project footprint, several locations feature slopes greater than 20 percent and are characterised by medium to high susceptibility to erosion (refer to Table 4.1). Short-term and minor impacts are also expected to occur in areas where the soils have high erosion potential and where slopes are less than 20 percent. In addition, changes in the average slope conditions could lead to changes to baseline soil erosion levels and changes in landside frequency.

Based on the baseline, the soils in the Project area did show signs of anthropogenic disturbance and contamination before the Project; therefore, it is considered as overall "**Low**"

quality and sensitivity for soils erosion and sedimentation and topsoil because of its poor agricultural potential, local deforestation and local artisanal mining.

Because the soils found in steep sloped areas have a medium or high erosion potential and are greater than 30 percent of the soils impacted (considered to be of a "**Large**" magnitude) and drain to water resources (streams are receptors of potential erosion during construction) that are of local importance, any additional loss of the topsoil by erosion and increase the incidences of landslides during construction of the proposed Project will have a major effect of this resource.

### **Rutting and Soil Compaction**

Potential impacts resulting from the movement of heavy equipment required to support the planned clearance and construction activities may also impact the soil resources by causing the rutting (rutting occurs when soil strength is not sufficient to support the applied load from vehicle traffic) and compaction of susceptible soils. In general, compaction and rutting can affect hydrology and result in the loss of soil productivity.

The results of the baseline show soils exhibit low soil fertility and range from silty sand to clay, which are less susceptible to compaction, compaction and rutting is not considered a widespread concern; therefore, the sensitivity and magnitude to rutting and compaction are expected to be "**Low**" for sensitivity and "**Medium**" for magnitude.

### **Soil Contamination**

Potential for soil contamination can potentially occur as a result of spills or leaks of lubricants and fuels, and chemicals handled on site that are used during the construction and operation of the mine or produced as a result of these activities.

Based on the baseline, the soil in the Project area did show signs of anthropogenic disturbance and contamination before the Project. Therefore, it is considered as overall "**Low**" quality and sensitivity for soil contamination because of its poor agricultural potential, local deforestation and local artisanal mining. The impact magnitude for soil contamination has been classified as "**Medium**".

## **4.4.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES**

Additional mitigation measures to be implemented during the construction phase are outlined below.

### **4.4.4.1 SOIL EROSION AND SEDIMENTATION AND TOPSOIL LOSS**

- Areas that are no longer required by the Project should be remediated immediately. Avoid the disturbance of areas with steep slopes and areas prone to landslides to the extent possible;
- Maintaining buffers along stream channels and minimising vegetation removal on steep slopes;
- Maintaining water drainage structures and check dams along access roads; and
- Implement a Soil Erosion and Sedimentation Control Plan and good management practices to control soil erosion, stormwater runoff, and sedimentation control (e.g., silt fences, check dams, and implementing progressive revegetation practices).

#### 4.4.4.2 SOIL RUTTING AND COMPACTION

- Vehicles to use only existing roads or those newly constructed for the Project. This limitation will minimise the environmental impact on undisturbed areas and ensure that vehicular activity is confined to designated routes; and
- Areas that were disturbed as part of construction and are no longer required should be remediated immediately.

#### 4.4.4.3 SOIL CONTAMINATION

- To minimise the potential for contamination of soils from accidental spills, control measures will be implemented, including use of secondary containment, drip trays for fuelling, specialised training, inspections and a Spill Prevention, Control and Countermeasures Plan (SPCC). The SPCC Plan describes measures to be implemented by Stronghold Guyana and its contractors to prevent, and if necessary, contain and control inadvertent spill of hazardous material such as fuels, lubricants, and mine operation chemicals;
- Spills of contaminants should be excavated immediately to the depth of contamination, removed and the area suitably rehabilitated. All contaminated material should be suitably disposed of or remediated;
- The Project should prevent any ad hoc maintenance of vehicles/equipment in and around the Project area. All vehicles/equipment should be maintained at a designated workshop. The workshop should include an oil/grease trap;
- Contractors and relevant Project staff should be trained regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact soil resources;
- Store chemicals in the appropriate container with a clear label;
- Spill control measures such as storage and handling of chemicals and fuel in concrete areas with secondary containment implemented to minimise impacts in the event or release;
- Use of release control kits to contain and clean small spills or leakage;
- Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakage;
- Unloading, loading, and refuelling protocols are required for the transfer of diesel, oil and other chemicals are trained to prevent/contain spills and leaks;
- Guidelines and procedures shall be prepared and followed for immediate clean-up actions following any releases;
- Prepare the emergency response plan to cover the event of a chemical spill/leakage; and
- The loading and unloading of dangerous and hazardous material and fuels should be confined to areas that are provided with secondary containment and in line with hazardous material handling procedures and include emergency spill control measures such as shutoff valves and isolation sumps. Spill kits should be provided in all areas where hazardous liquid materials and fuels are stored and handled.

#### 4.4.5 RESIDUAL IMPACT SIGNIFICANCE

Implementation of the proposed mitigation measures provided in Section 4.4.2 will change the impact significance for soil erosion and sedimentation and loss of topsoil, from **Moderate** to

**Minor** negative impact. The Project's impacts on soil compaction and soil contamination will change from **Small** negative impact to **Negligible** negative impacts. Impact assessments are provided in Table 4.4 to Table 4.6.

**TABLE 4.4 IMPACTS ON SOILS DURING CONSTRUCTION — SOIL EROSION AND SEDIMENTATION AND TOPSOIL LOSS**

Significance of Impact					
Impact	Soil erosion, sedimentation and topsoil loss				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to soil quality caused by soil erosion and topsoil loss would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to soil quality would be direct, with soil loss and degradation (soil erosion) on the Project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Change in land-use potential from loss of topsoil by erosion was classified as long-term because the impact’s duration will remain until rehabilitation in the closure phase.				
Impact Extent	Local	Regional		International	
	The impact will be localised within the area of influence of the Project.				
Impact Scale	The project will impact approximately 418 hectares.				
Frequency	Once it occurs, the impact will be long-term.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above (see Table 4.2), the impact is likely to be large.				
Receptor Sensitivity	Low	Medium		High	
	Due to poor soil quality, the receptor’s sensitivity was classified as low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a low resource sensitivity and large impact magnitude will result in a moderate impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Mitigation measures will reduce the impact’s magnitude from large to medium, which will change the impact significance to moderate to minor. These will ultimately be mitigated in the closure phase as soils are restored and rehabilitated over the mining affected area.				

TABLE 4.5 IMPACTS ON SOILS DURING CONSTRUCTION – SOIL RUTTING AND COMPACTION

Significance of Impact					
Impact	Soil compaction and rutting				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to soil quality would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to soil quality would be direct impacts during land preparation and civil works.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The construction phase of the Project is expected to be approximately over two years in duration, which would be considered long-term.				
Impact Extent	Local	Regional		International	
	The impact will be localised only within the Project area.				
Impact Scale	The Project footprint is approximately 418 hectares. Impact might occur over the extent of the Project area.				
Frequency	Impacts to soil quality could occur intermittently during the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be medium.				
Receptor Sensitivity	Low	Medium		High	
	Due to poor soil quality, the receptor’s sensitivity was classified as low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a low resource sensitivity and medium impact magnitude will result in a minor impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Mitigation measures will reduce impact’s magnitude to small, changing the impact significance to negligible.				

TABLE 4.6 IMPACTS ON SOILS DURING CONSTRUCTION – SOIL CONTAMINATION

Significance of Impact					
Impact	Soil contamination				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to soil quality would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to soil quality would be direct impacts during construction phase.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact to soil quality due to soil contamination is considered long-term without mitigation measures.				
Impact Extent	Local	Regional		International	
	The impact will be localised only within the area of influence of the Project.				
Impact Scale	The Project area is approximately 418 hectares, impact might occur over the extent of the Project area.				
Frequency	Impacts to soil quality could occur intermittently during the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be medium.				
Receptor Sensitivity	Low	Medium		High	
	Due to poor soil quality the receptor’s sensitivity was classified as low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a low resource sensitivity and medium impact magnitude will result in a minor impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Mitigation measures will reduce the magnitude of the impact from medium to small, which will reduce the impact significance to negligible.				

## 4.5 IMPACTS FROM OPERATION PHASE

The following potential impacts to soils are predicted to occur in the Operations Phase.

### 4.5.1 POTENTIAL IMPACTS

- Increase soil erosion and sedimentation and topsoil loss:** Disturbed areas in the Project area and the frequent heavy precipitation events increase the potential risk of soil erosion and sedimentation to occur. The ecological potential of any eroded areas may also be affected and diminished, and these effects could extend beyond the Project boundaries affecting environs around the Project area.



- **Soil contamination:** Soil contamination may result from hydrocarbons (e.g., fuel, oil, and lubricants associated with equipment maintenance), improper handling of hazardous materials and waste, or accidental leaks and spills. Additional contamination risks include chemicals such as explosives, which could be introduced through accidental spillage or inadequate handling practices if mitigation measures are not implemented. Contamination by metals could also occur through the release of acid mine drainage (AMD) from waste-rock facilities. However, the likelihood of AMD generation at the site is considered negligible due to the low volumes of potentially acid-generating waste rock and the high abundance of calcium minerals within the waste material which would act as a buffer.

#### 4.5.2 EXISTING CONTROLS / DESIGN MITIGATION

To address the potential increased soil erosion and sedimentation and topsoil loss:

- Sediment control measures would be implemented before discharging to the receiving environment to reduce sediment loads discharging to surface water bodies from Project activities. This includes the development of sediment control structures/dams (sediment ponds) downstream of Project-impacted areas before the start of major earthworks;
- Site grading to ensure appropriate long-term site drainage;
- Progressive regrading and capping of the WSF (the availability of waste rock in large quantities will enable capping of disturbed areas) as it depletes and revegetation using a seedlings facility to be developed in the Project area; and
- Stabilisation of slopes through regrading and revegetation.

To address the potential impacts from soil contamination:

- All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be equipped with secondary containment systems with bund capacity in excess of 110 percent of the liquid volume stored there. Floors should be sealed, and all areas roofed to prevent the bunds filling with rain;
- There will be approved temporary waste storage areas located across the Project area, to collect the waste properly until the landfill will be operating;
- Hazardous waste will not be disposed in the on-site landfill(s). Hazardous waste generated by the Project will be temporarily stored on site pending off-site shipment for treatment and/or disposal at an approved facility by a licensed contractor;
- Contact runoff will be captured and diverted to treatment within the Project area, avoiding contamination of water bodies and external land;
- Emergency response kits to control any fuel/oil spill should be readily available across the Project area;
- Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill;
- Use drain covers or other barriers to prevent the spilled material from entering stormwater drains;
- Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines;
- Conduct regular training programs for employees to ensure they are familiar with spill response procedures; and

- Develop and maintain comprehensive emergency response plans that include spill response protocols.

### 4.5.3 SIGNIFICANCE OF IMPACTS

#### 4.5.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

During the operational phase, soil will remain the main sensitive receptor. Additional disturbance to soil resources will be minimal, limited to the expansion of mine pits and the enlargement of waste rock and topsoil stockpiles. To manage soil erosion and sedimentation from pits and exposed slopes, a stormwater management system will be implemented. This system will include stormwater ditches designed to collect surface runoff from disturbed areas, such as stockpiles of waste rock, mineralised material, and topsoil, as well as alongside roads where necessary. Collected stormwater will be directed to sedimentation ponds, which will allow suspended solids to settle before the water is discharged to the environment. Progressive rehabilitation and closure will be carried out in areas and for components where operations cease during the life of mine (LOM), with reclamation activities aimed at restoring soil quality in these locations. However, the majority of the site will remain disturbed until the end of the LOM.

During this phase, there is also a risk of soil contamination from spills or leaks of fuels, lubricants, and chemicals used or generated during mining operations. Where necessary, erosion control devices will be installed to reduce turbidity in waterways connected to stormwater ditches. Based on the baseline, the soils in the Project area did show signs of anthropogenic disturbance and contamination before the Project; therefore, it is considered as overall “**low**” quality and sensitivity for soils erosion and sedimentation and for soil contamination because of its poor agricultural potential, local deforestation and local artisanal mining.

The impact magnitude for this analysis for soil erosion has been classified as “**Large**”, because some areas of the Project will remain disturbed during the operational phase. The impact magnitude for soil contamination has been classified as “**Medium**”.

### 4.5.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional mitigation measures to be implemented during the operation phase are outlined below.

To address the potential increased soil erosion and sedimentation and topsoil loss:

- Areas that are no longer required by the Project should be remediated immediately. Avoid the disturbance of areas with steep slopes and areas prone to landslides to the extent possible;
- Maintaining buffers along stream channels and minimising vegetation removal on steep slopes;
- Implement a Soil Erosion and Sedimentation Control Plan and good management practices to control soil erosion, stormwater runoff, and sedimentation control (e.g., silt fences, check dams, implementing progressive revegetation practices); and

- Implement a concurrent rehabilitation program (i.e., a Mine Rehabilitation and Closure Plan) during Operations that minimises the amount of land that will be disturbed at one time.

To address the potential for soil contamination:

- To minimise the potential for contamination of soils from accidental spills, control measures will be implemented, including use of secondary containment, drip trays for fuelling, specialised training, inspections and a Spill Prevention, Control and Countermeasures Plan (SPCC). The SPCC Plan describes measures to be implemented by Stronghold Guyana and its contractors to prevent, and if necessary, contain and control inadvertent spill of hazardous material such as fuels, lubricants, and mine operation chemicals;
- Spills of contaminants should be excavated immediately to the depth of contamination, removed and the area suitably rehabilitated. All contaminated material should be suitably disposed of or remediated;
- The Project should prevent any ad hoc maintenance of vehicles/equipment in and around the Project area. All vehicles/ equipment should be maintained at a designated workshop. The workshop should include an oil/grease trap;
- Contractors and relevant Project staff should be trained regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact soil resources;
- Store chemicals in the appropriate container with a clear label;
- Spill control measures such as storage and handling of chemicals and fuel in concrete areas with secondary containment implemented to minimise impacts in the event of release;
- Use of release control kits to contain and clean small spills or leakage;
- Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakage;
- Unloading, loading and refuelling protocols are required for the transfer of diesel, oil and other chemicals are trained to prevent/contain spills and leaks;
- Guidelines and procedures shall be prepared and followed for immediate clean- up actions following any releases;
- Prepare the emergency response plan to cover the event of a chemical spill/ leakage; and
- The loading and unloading of dangerous and hazardous material and fuels should be confined to areas that are provided with secondary containment and in line with hazardous-material handling procedures and include emergency spill control measures such as shutoff valves and isolation sumps. Spill kits should be provided in all areas where hazardous liquid materials and fuels are stored and handled.

#### 4.5.5 RESIDUAL IMPACT SIGNIFICANCE

Implementation of the proposed mitigation measures provided in Section 34.5.4 will change the impact significance of the Project's impacts on soils for both soil erosion and contamination and topsoil loss. As such, the impacts associated with soil erosion would change from **Moderate** negative impact to **Minor** negative impact, while the impacts associated soil

contamination will change from **Minor** negative impact to **Negligible** negative impacts. The impact significance is provided in Table 4.7 and Table 4.8.

**TABLE 4.7 IMPACTS ON SOILS DURING THE OPERATIONAL PHASE – SOIL EROSION AND SEDIMENTATION AND TOPSOIL LOSS**

Significance of Impact					
Impact	Soil Erosion and Sedimentation and Topsoil loss				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to soil quality would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to soil quality would be direct impacts through soil loss and erosion on the Project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Soil erosion and loss of topsoil was classified as long-term, because the impact’s duration will remain until closure.				
Impact Extent	Local	Regional		International	
	The impact will be localised only within the area of influence of the Project.				
Impact Scale	The project will impact approximately 418 hectares.				
Frequency	Once it occurs, the impact will be long-term.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be large (see Table 4.2).				
Receptor Sensitivity	Low	Medium		High	
	Due to poor soil quality, the receptor’s sensitivity was classified as low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The combination of a low resource sensitivity and large impact magnitude will result in a moderate impact significance.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Mitigation measures will reduce the impact’s magnitude to medium. These will ultimately be mitigated in the closure phase as soils are restored and rehabilitated over the mining affected area.				

**TABLE 4.8 IMPACTS TO SOILS DURING THE OPERATIONAL PHASE – SOIL CONTAMINATION**

Significance of Impact		
<b>Impact</b>	Soil contamination	
<b>Impact Nature</b>	<b>Negative</b>	Positive
	Neutral	
	Potential impacts to soil quality would be considered to be negative.	

Significance of Impact				
Impact Type	Direct		Indirect	
	Induced			
Impact Duration	Impacts to soil quality would be direct impacts during the operational phase.			
	Temporary	Short-term	Long-term	Permanent
Impact Extent	The impact on soil quality due to soil contamination is considered long-term.			
	Local		Regional	International
Impact Scale	The impact will be localised only within the area of influence of the Project.			
Impact Scale	The Project area will impact approximately 418 hectares. Impacts might occur across the Project area.			
Frequency	Impacts to soil quality could occur intermittently during the operational phase.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Large			
Receptor Sensitivity	Based on the characteristic above, the impact is likely to be medium.			
	Low		Medium	High
Impact Significance	Due to poor soil quality, the receptor’s sensitivity was classified as low.			
	Negligible	Minor	Moderate	Major
Residual Impact	The combination of a low resource sensitivity and medium impact magnitude will result in a minor impact significance			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Large			
	Negligible	Minor	Moderate	Major
Residual Impact Significance	Mitigation measures will reduce to magnitude of the impact to small, which reduces the impact significance to negligible.			

## 4.6 IMPACTS FROM CLOSURE PHASE

The rehabilitation and closure of the proposed mining areas and mining supporting facilities will have little additional impacts on the soil resources of the Project area. Because rehabilitation and closure activities involve the restoration of disturbed and WSF disposal areas to a landform that approximates and blends in with the surrounding landform, no or minimal impacts to the soils are expected. Table 4.3 provides a summary of the areas of soil expected to be disturbed by the proposed Project infrastructure and WSF, the majority of which will be rehabilitated.

The rehabilitation process involves salvaging and reusing available growth media (organic and topsoil mineral layers), overburden, and saprolite in a timely manner, revegetating disturbed areas with native species, ripping hard-packed roads to encourage revegetation, controlling erosion, controlling invasive non-native plants and noxious weeds and monitoring results. In addition, the rehabilitation will include measures to control erosion, manage storm water runoff, minimise dust generation, and establish vegetation.

The rehabilitation and closure process and measures to restore disturbed areas will be detailed in a Mine Rehabilitation and Closure and Plan prepared for the Project (a conceptual level

Rehabilitation and Closure Plan in Appendix B). The long-term objectives of the Rehabilitation and Closure Plan are to establish structures that will facilitate the establishment of self-sustaining plant communities that are complementary of the surrounding landscape.



## 5. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

### 5.1 INTRODUCTION

This Chapter presents the landscape and visual impact assessment (LVIA) for the Eagle Mountain Gold Mine Project.

### 5.2 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

The impact assessment methodology is detailed in Volume 1: Chapter 5 of this Environmental Impact Assessment (EIA). Whilst linked, landscape and visual effects are considered separately. Landscape effects relate to the landscape as a resource and are, therefore, concerned with landscape features or fabric. In comparison, visual effects are the effects on views and visual amenity as experienced by people.

The LVIA is based on currently available data of the Project and has been undertaken in accordance with best practice guidance.

Using defined designations, the methodology provides the definitions of how impacts are described in terms of:

- Type;
- Extent;
- Scale;
- Duration; and
- Frequency.

#### 5.2.1 LANDSCAPE

##### 5.2.1.1 SENSITIVITY OF LANDSCAPE RESOURCES

Sensitivity is a combination of the value of the landscape and the susceptibility of the landscape to change.

The value of a landscape will, to an extent, reflect landscape designations and the level of importance they signify. In comparison, the susceptibility of a landscape will vary depending on the:

- Pattern and scale of the landscape;
- Sense of enclosure and tranquillity;
- Existing land use;
- Condition of the landscape; and
- Scope for mitigation which would be in keeping with the existing landscape.

The value of the landscape and the susceptibility of the landscape to change are combined using professional judgement and in accordance with best practice guidance. However, the sensitivity of a landscape can also vary depending on the type of development proposed. A summary of the associated criteria associated with landscape sensitivity is set out in Table 5.1.

TABLE 5.1 LANDSCAPE SENSITIVITY CRITERIA

Landscape Sensitivity	Criteria
Low	A moderately valued landscape, perhaps a locally important landscape, or where its character, land use, pattern and scale may have the capacity to accommodate development.
Medium	A landscape protected by a structure plan or national policy designation and/or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate development.
High	A landscape protected by a regional (structure plan) or national designation and/or widely acknowledged for its quality and value; a landscape with distinctive character and limited ability to accommodate development.

#### 5.2.1.2 LANDSCAPE MAGNITUDE OF CHANGE

The magnitude of change is determined through considering the size or scale, geographic extent, duration, and reversibility of the impact. The typical criteria in determining the magnitude of change on the landscape is set out in Table 5.2.

TABLE 5.2 LANDSCAPE MAGNITUDE OF CHANGE CRITERIA

Landscape Magnitude	Criteria
Negligible	An imperceptible, barely or rarely perceptible change in landscape characteristics.
Small	A small change in landscape characteristics over a wide area or a moderate change either over a restricted area or infrequently perceived.
Medium	A moderate change in landscape characteristics, frequent or continuous, and over a wide area, or a clearly evident change either over a restricted area or infrequently perceived.
Large	A clearly evident and frequent/continuous change in landscape characteristics affecting an extensive area.

#### 5.2.1.3 SIGNIFICANCE OF LANDSCAPE EFFECTS

When determining the significance of landscape effects, the following should also be considered:

- The loss of mature or diverse landscape elements or features is likely to be more significant than the loss of new or uniform elements;
- Effects on character areas, which are representative, may be more important than the loss of areas in poor condition and/ or in degraded areas. Significance is not directly related to planning policy;
- The loss of landscape characteristics, elements, or features will be given greater weight if they are identified as being of high value. As a result, effects on nationally designated areas are likely to be more significant than effects on areas of local value; and
- The sensitivity of the landscape is dependent on both the attributes of the landscape and the characteristics of a development. Landscapes with a high sensitivity to the

development proposed are more likely to be seriously affected in comparison to those with a lower sensitivity.

## 5.2.2 VISUAL EFFECTS

### 5.2.2.1 SENSITIVITY OF VISUAL RECEPTORS

Visual sensitivity is a combination of the value attached to views and the receptiveness of the visual receptor to change. The receptiveness of a visual receptor to change will vary depending on the:

- Location and context of the view;
- Extent to which people's attention or interest may be focused on the view and their visual amenity.
- Occupation or activity of people experiencing the view;

The criteria relating to the sensitivity of visual receptors is detailed in Table 5.3.

**TABLE 5.3 SENSITIVITY CRITERIA OF VISUAL RECEPTORS**

Sensitivity	Visual Receptor
Low	Small numbers of visitors with interest in their surroundings. Viewers with a passing interest, not specifically focused on the landscape e.g. workers, commuters. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being low.
Medium	Small numbers of residents and moderate numbers of visitors with an interest in their environment. Larger numbers of recreational road users. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being medium.
High	Larger numbers of viewers and/or those with proprietary interest and prolonged viewing opportunities, for example, residents and users of attractive and well-used recreational facilities. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being high.

### 5.2.2.2 VISUAL MAGNITUDE OF CHANGE

The visual magnitude of change is determined by the following factors:

- Size or scale;
  - The scale of change in the view, in consideration of the loss of and/or addition of features and change in composition;
  - The degree of contrast or integration of new features and/or other changes;
  - The nature of the view, the relative amount of time it would be experienced for, and whether the views would be full, partial, or glimpsed.
- Geographical extent;
  - The distance from the Proposed Development;
  - The angle of the view in relation to the main occupation of the receptor; and
  - The extent over which change in the view would be visible.
- Duration;
  - The length of time over which the effect would be experienced; and

- Reversibility;
  - If the change can be reversed, is wholly or partially reversible, or cannot be reversed, e.g., permanent.

Table 5.4 sets out the criteria for determining the visual magnitude of change.

**TABLE 5.4 VISUAL MAGNITUDE OF CHANGE CRITERIA**

Visual Magnitude	Criteria
Negligible	A change which is barely visible at very long distances, or visible for a very short duration, perhaps at an oblique angle, or which blends with the existing view.
Small	Minor changes in views at long distances, or visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view.
Medium	Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a more wide-ranging, less concentrated change across a wider area.
Large	Major changes to the view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of the view.

### 5.3 IMPACTS FROM THE PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The pre-construction and construction phase includes all activities, such as construction, commissioning, and start-up, that are required to build the mine and bring the processing plant into commercial operation. It is understood that visual impacts will occur during the construction of the Project. The pre-construction and construction phase of the Project is anticipated to last for 2 years. However, these impacts would be phased and restricted to the construction period, and as a result, effects would be short-term and temporary in nature.

#### 5.3.1 POTENTIAL IMPACTS

##### 5.3.1.1 LANDSCAPE

The Project is located within an area characterised by thick tropical jungle. Artisanal mining activities in the area have resulted in significant land degradation. However, many areas characterised by deforestation due to historical mining have since regrown into (secondary) tropical jungle vegetation. The presence of the plant and waste storage is likely to result in **Minor** impacts to the landscape value. Key activities that are likely to have **Moderate** impacts on landscape value include:

- Site preparation;
- Excavation; and
- Vegetation clearance.

### 5.3.1.2 VISUAL

The proposed construction activities have the potential to result in impacts on visual receptors such as residents, recreational users, and travellers. No infrastructure is being constructed at the summit or the ridgeline of the mountain and will not be visible to local communities. The key construction activities with the potential to result in visual impacts include:

- Construction lighting;
- Construction and upgrading of roads, opening of borrow pits;
- Increased dust from traffic movements and operations of earth-moving and other heavy equipment,
- Special load movement and storage;
- The installation and movement of major pieces of equipment (e.g. excavators and mills);
- The development of temporary facilities for traffic;
- Construction of the processing plant, main power plant, warehouse, maintenance shops, administration building, and first aid and safety offices;
- Construction of the main camp, including offices and worker accommodations.

### 5.3.2 EXISTING CONTROLS AND DESIGN MITIGATION

The controls to be implemented for the Project will include:

- The extent of the construction areas should be limited to within Project design parameters where possible to minimise impact to surrounding area, as well as areas disturbed by construction activity are suitably top soiled and vegetated/covered as soon as is possible after final shaping;
- Existing tracks or roads should be used for access where possible. Internal access roads will be constructed to reduce traffic and any adverse impacts on the existing public road;
- Dust from roads and work areas should be controlled during the dry season with watering and/or application of non-toxic dust surfactants;
- Demarcate Project boundaries and minimise areas of surface disturbance to within Project design parameters. Where limits are to be exceeded, prior internal and/or external permitting must be obtained. Where possible, locate laydown areas and construction camps in areas that are already disturbed and/or cleared of vegetation;
- Regular maintenance of the construction site to minimise waste;
- Use non-ultraviolet (UV) lights, where possible;
- Design Project facilities to avoid or limit the visibility of lighting from visual receptors;
- Reduce exterior lighting and implement operational strategies to reduce light spillage;
- Implement a restoration plan including replanting of indigenous species, landscaping and rehabilitation of construction yards; and
- Structures should have a non-reflective finish, and the colour should be appropriate in order to merge itself as much as possible within the landscape.

### 5.3.3 SIGNIFICANCE OF IMPACTS

#### 5.3.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

##### **Impact Significance – Landscape**

The potential impacts from the pre-construction and construction phase on landscape will mainly include site preparation, excavation, and vegetation clearance. Impacts will be short-term, temporary, and limited to areas within and adjacent to the Project design parameters.

The value of the landscape surrounding the Site was raised as a concern during stakeholder consultations. However, it is important to note that artisanal mining activities in the area have resulted in significant land degradation. As a result, the sensitivity of the landscape to aesthetic changes, is assessed as **Low**.

The Project will lead to a small change in landscape characteristics, and as a result, the magnitude of change is assessed as **Small**. The significance of impacts, therefore, is considered to be **Negligible**.

##### **Impact Significance – Visual**

The pre-construction and construction phase is likely to result in visual impacts associated with plant construction and the associated traffic and transport.

Sensitivity is expected to be **Low** and the magnitude of change visual would be **Medium**. As such, the significance of impacts is considered to be **Minor**.

#### 5.3.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

The additional mitigations measures to minimise impacts include:

- Temporary roads providing access to site compounds and work areas will be clear and tidy and dust will be controlled;
- Monitoring will be undertaken to ensure that visual screening and dust control measures for the Project are implemented effectively; and
- Outdoor lighting will be as unobtrusive as possible and will be shielded and directed downwards to prevent spill, particularly in the direction of residential properties. The use of tall mast lights will be carefully assessed before being used especially at the gates and around fencing.

#### 5.3.5 RESIDUAL IMPACT SIGNIFICANCE

With the implementation of both embedded and additional mitigation measures, the landscape and visual effects can be limited and controlled. As a result, as shown in Table 5.5, the residual negative impact for landscape will be of a **Minor** significance.



**TABLE 5.5 LANDSCAPE AND VISUAL IMPACTS DURING PRE-CONSTRUCTION AND CONSTRUCTION PHASE**

Significance of Impact					
Impact	Landscape alteration and visual intrusion				
Impact Nature	Negative	Positive		Neutral	
	Negative impacts from presence of construction activities.				
Impact Type	Direct	Indirect		Induced	
	Direct visual impact and impact to landscape.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The construction phase of the Project is expected to be completed in 24 months, which would be considered short-term. The impact to landscape and visual due to land preparation and civil work is expected to be transient.				
Impact Extent	Local	Regional		International	
	Impact scale is considered localised and small.				
Impact Scale	Impact scale is considered localised and small.				
Frequency	Impacts to landscape and visual receptors could occur intermittently during the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the landscape magnitude of change is assessed as Small and the visual magnitude of change is assessed as Medium.				
Receptor Sensitivity	Low	Medium		High	
	The receptors sensitivity is likely to be low				
Impact Significance	Negligible	Minor	Moderate	Major	
	The significance of the Project on landscape and visual is considered to be Negligible and Minor, respectively.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Upon considering the mitigation measure, the residual impact is assessed to generally be Negligible.				

## 5.4 IMPACTS FROM OPERATION PHASE

### 5.4.1 POTENTIAL IMPACTS

#### 5.4.1.1 LANDSCAPE

The Project's key activities that are likely to have negative impacts on landscape include site preparation, vegetation clearance and excavation.

These activities are not anticipated to occur during the operation phase of the Proposed Development, and as a result, operational landscape impacts are not considered.

#### 5.4.1.2 VISUAL

The operation phase of the Proposed Development has the potential to cause significant visual impacts. The key facilities resulting in visual impacts resulting during the operational phase include:

- Processing Plant;
- Waste Dump;
- Waste Storage Facility;
- Tailings Storage Facility;
- Mine Pits;
- Dust; and
- Lighting

#### 5.4.2 EXISTING CONTROLS / DESIGN MITIGATION

The controls to be implemented for the Project include the following:

- Use only downward-facing lighting with shielding that illuminates only the area that needs illumination and use only the minimum amount and intensity of lighting necessary for safe operation;
- Use non-ultraviolet (UV) lights, where possible; and
- Reduce exterior lighting and implement operational strategies to reduce light spillage.

#### 5.4.3 SIGNIFICANCE OF IMPACTS

The key elements of the Project with the potential to visually impact the surrounding areas are either restricted to not exceed the maximum height of the surrounding regional topography, or be very remote from any potential sensitive receptors, to potentially impact surrounding areas.

The significance of the visual effect is, therefore, considered to be **Minor**.

#### 5.4.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

The mitigation measures associated with the operation of the Proposed Development are anticipated to be the same as those identified for the construction phase (see Sections 5.3.2 and 5.3.4).

#### 5.4.5 RESIDUAL IMPACT SIGNIFICANCE

With the implementation of both the embedded controls and the additional mitigation measures, the visual impact of the Proposed Development during the operation phase can be limited and controlled. As a result, the residual negative impact is assessed as **Minor** (Refer to Table 5.6).

TABLE 5.6 VISUAL IMPACTS DURING THE OPERATION PHASE

Significance of Impact					
Impact	Visual intrusion				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to visual would be considered to be negative				
Impact Type	Direct	Indirect		Induced	
	Direct visual impact.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The operational phase of the Project is expected to be 15 years, which would be considered long-term. The impact to landscape and visual due to land preparation and civil work is expected to be permanent.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised.				
Frequency	Impacts to visual could occur continuously during the operational phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Medium.				
Receptor Sensitivity	Low	Medium		High	
	The sensitivity is likely to be Low, depending on the location of the receptors				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a low sensitivity and medium magnitude will result in a negligible minor impact significance, depending on the location of the receptors.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Upon considering the mitigation measure, the residual impact is assessed to generally be Minor.				

## 5.5 IMPACTS FROM CLOSURE PHASE

### 5.5.1 LANDSCAPE AND VISUAL

Project closure will take place upon the cessation of operation. Activities associated with closure are anticipated to be similar to those during construction, but with a shorter duration and a lower volume of works. The landscape and visual impacts resulting from closure are, therefore, assumed to be similar to those identified during the construction phase. As such, they have not been repeated here.

The rehabilitation and closure process and measures to restore disturbed areas will be detailed in a Mine Rehabilitation and Closure and Plan prepared for the Project (a conceptual level

Rehabilitation and Closure Plan in Appendix B). The long-term objectives of the Rehabilitation and Closure Plan are to establish structures that will facilitate the establishment of self-sustaining plant communities that are complementary of the surrounding landscape.

## 6. SURFACE WATER

### 6.1 INTRODUCTION

This chapter assesses potential impacts of the Project on surface-water hydrology and water quality within the Surface Water Area of Influence (SW AoI) arising from Project activities across pre-construction, construction, operation, and closure phases. It follows the ESIA's core assessment approach set out in Volume 1, Chapter 5, with the detailed delineation of the SW AoI and the impact methodology presented in the sections that follow.

The assessment integrates engineering design inputs and technical studies for Eagle Mountain, including the catchment-scale HEC-HMS hydrologic model developed by Barr Engineering and Global Resource Engineering (GRE) to characterise existing conditions and the 3D transient groundwater flow model developed for the Hydrogeology Impact Assessment to account for groundwater–surface-water interactions. Key activity pathways considered are pit dewatering, TSF/WSF construction and operation, drainage diversions and sediment controls, ore processing and treated discharges, earthworks and haul/access roads, and camp/utilities, recognising embedded design and operational controls.

Potential effects are evaluated against applicable Guyanese requirements and relevant international benchmarks (including IFC Performance Standards and EHS Guidelines), with WHO drinking-water guideline values applied where relevant to receptor use. Cumulative influences from third-party activities are addressed where hydrologic connectivity exists. Sediment quality is assessed separately in the Soils IA; in this chapter, suspended sediment is considered only insofar as it affects water quality or hydrologic function. Further detail on Project activities and design assumptions is provided in Volume 1, Chapter 2 (Project Description), and technical modelling details are provided in the supporting hydrology and hydrogeology appendices (Appendix F-4).

### 6.2 DEFINING AREA OF INFLUENCE

The Surface Water Area of Influence (SW AoI) is delineated on the basis of hydrologic connectivity and encompasses the on-site sub-catchments intersected by Project activities and the connected downstream corridors where Project-related changes in flow regime or water quality could plausibly occur. Boundaries are defined using topographic divides, mapped drainage pathways, anticipated discharge and control points from the Project Description, and outputs from the hydrologic and hydrogeologic models.

The Area of Influence for surface water and groundwater is presented on a single map within the groundwater impact assessment section (Volume 3: Chapter 7). Topographically, the Project area sits in a valley framed by high landforms and straddles a drainage divide between the Potaro and Konawaruk basins. To the east, the Eagle Mountain dolerite sill forms a clear hydraulic divide; whereas to the west, a prominent ridge forms the watershed boundary. As such, water drains in a general north-south direction within the Project area. North-draining waters flow via the Mahdia River to the Potaro River, while south-draining waters follow Minnehaha Creek to the Konawaruk River. Tributaries feeding these systems include Kettledrum and Elephant creeks on the Mahdia side, and Deer, Bacchus, and Baboon creeks on the Minnehaha side.

Based on the geographic setting described above and the nature of Project activities, the SW AoI comprises the facility and near-field drainage area - the pits, WSF/TSF, processing/ROM areas, camp and utilities, fuel/chemical storage, sediment/attenuation ponds, and haul/access roads - together with their immediate contributing sub-catchments, diversions, and engineered outfalls. It then extends along the hydrologically connected receiving waters - north via the Mahdia River to its confluence with the Potaro River and south via Minnehaha Creek to its confluence with the Konawaruk River - as a conservative corridor for cumulative screening given seasonal high flows and legacy disturbance. Due to the gaining stream conditions in the area and the potential baseflow changes from dewatering, the SW AoI also includes reaches within the modelled drawdown envelope where groundwater-surface-water exchanges may influence low-flow behaviour. Lastly, the SW AoI captures existing/proposed discharge points, sediment-pond outlets, monitoring stations, and any sensitive receptors relevant to surface-water pathways. Catchments separated by topographic divides with no engineered transfers, and reaches beyond the first connected confluence where no reasonable pathway exists, are excluded.

### 6.3 IMPACT ASSESSMENT METHODOLOGY

The approach used to assess the potential impacts to surface water resources within the AoI are described below. This assessment applied the ESIA method in Volume 1, Chapter 5 and implemented the chapter's magnitude, sensitivity and significance matrices to evaluate with-Project changes in surface-water hydrology and quality. It consolidated evidence from the Project Description, the established baseline hydrologic context and receptor mapping within the SW AoI, and the available model outputs used to characterise expected changes in hydrology in the area.

- **Step 1:** Pathway-receptor combinations within the SW AoI were identified by tracing mapped drainage networks, topographic divides, engineered conveyances/outfalls, and plausible sensitive uses along the connected Mahdia and Minnehaha corridors, drawing on the Project activity footprint and the established baseline surface water conditions within the Project area.
- **Step 2:** Impact characteristics for each pathway-receptor pair were defined in accordance with the ESIA method - type, extent, duration, scale, frequency and reversibility - and, for unplanned events (e.g., accidental releases), likelihood was assigned qualitatively (or semi-quantitatively where data allowed).
- **Step 3:** Magnitude was assigned as the degree of change at the receptor using multiple lines of evidence, with numerical model outputs providing the quantitative basis where available. Hydrologic modelling informed predicted changes in flow regime and timing, while the transient groundwater model informed expected baseflow interactions. The predicted water-quality changes were benchmarked against international guidelines or standards where relevant.
- **Step 4:** Receptor value/sensitivity was determined using the ESIA criteria in Volume 1, Chapter 5- considering criteria for ecological function, human use, cultural/legislative status and recovery potential.
- **Step 5:** Significance was derived by combining magnitude and sensitivity per the impact matrix. After the initial significance of each impact had been characterised, appropriate mitigation measures were identified in line with the Mitigation Hierarchy. Priority was given



to measures applied at the source of the impact to avoid or reduce the magnitude arising from the associated Project activity; any remaining effects on the resource/receptor were then addressed through abatement or compensatory measures (including offsets where appropriate), thereby reducing the residual significance once all reasonably practicable source controls had been implemented.

## 6.4 SURFACE WATER MODELLING

A numerical surface-water flow model was developed by GRE, with support from Barr Engineering (2025), to simulate how the catchment responded to Project-related changes in landform and drainage and to provide the hydrologic basis for assessing potential effects on receiving waters across the Mahdia River and Minnehaha Creek systems over the different Project phases.

HEC-HMS was used as the hydrologic modelling platform for this assessment. HEC-HMS is an industry-standard rainfall-runoff modelling system that supports event and continuous simulation of sub-basin hydrology and channel routing, providing a configurable environment for setting up, running, and calibrating watershed models.

For this Project, the existing-conditions model was calibrated to an observed Minnehaha Creek storm hydrograph and then executed across the 2000–2024 NASA-normalised climate record at a daily time step. For with-Project conditions, a mosaic DEM was applied, sub-basins were delineated, and drainage ditches were estimated to route non-contact water around pits, TSF, waste-rock facilities, and plant areas; parameters from the calibrated case were transferred or scaled to the future configuration.

The model produced discharge hydrographs and runoff time series at key outlets for both baseline and with-Project layouts. These outputs were provided to the site-wide water balance and were integrated with the transient 3D groundwater model to support the surface-water quantity assessment. In addition, controlled-discharge time series and receiving-water flows were also used in the surface-water quality assessments.

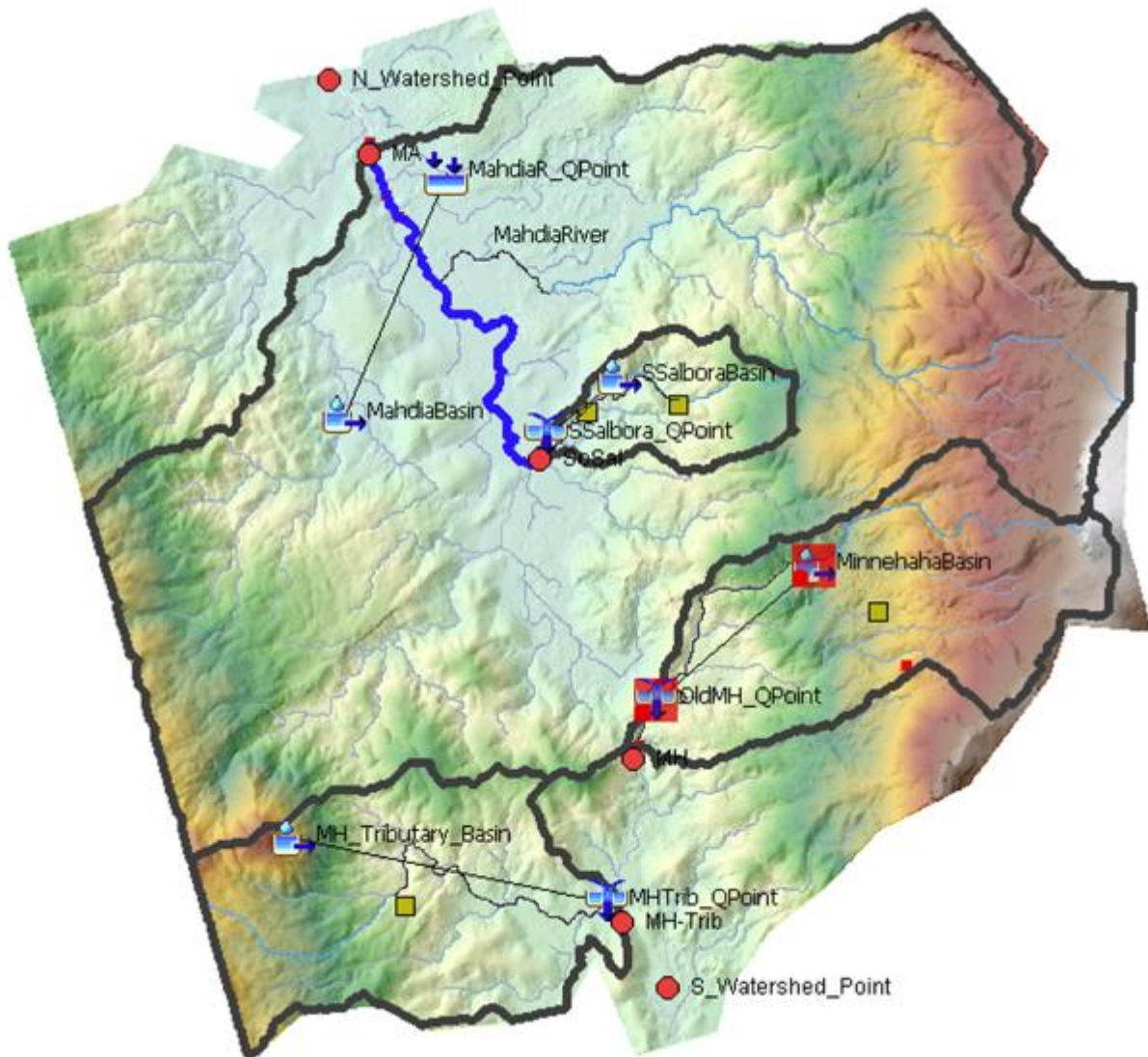
Further details on parameterisation, domain/sub-basin setup, calibration, and model limitations are presented in GRE's report in Appendix F-4.

## 6.5 MODEL RESULTS

### 6.5.1 SURFACE WATER FLOW MODEL

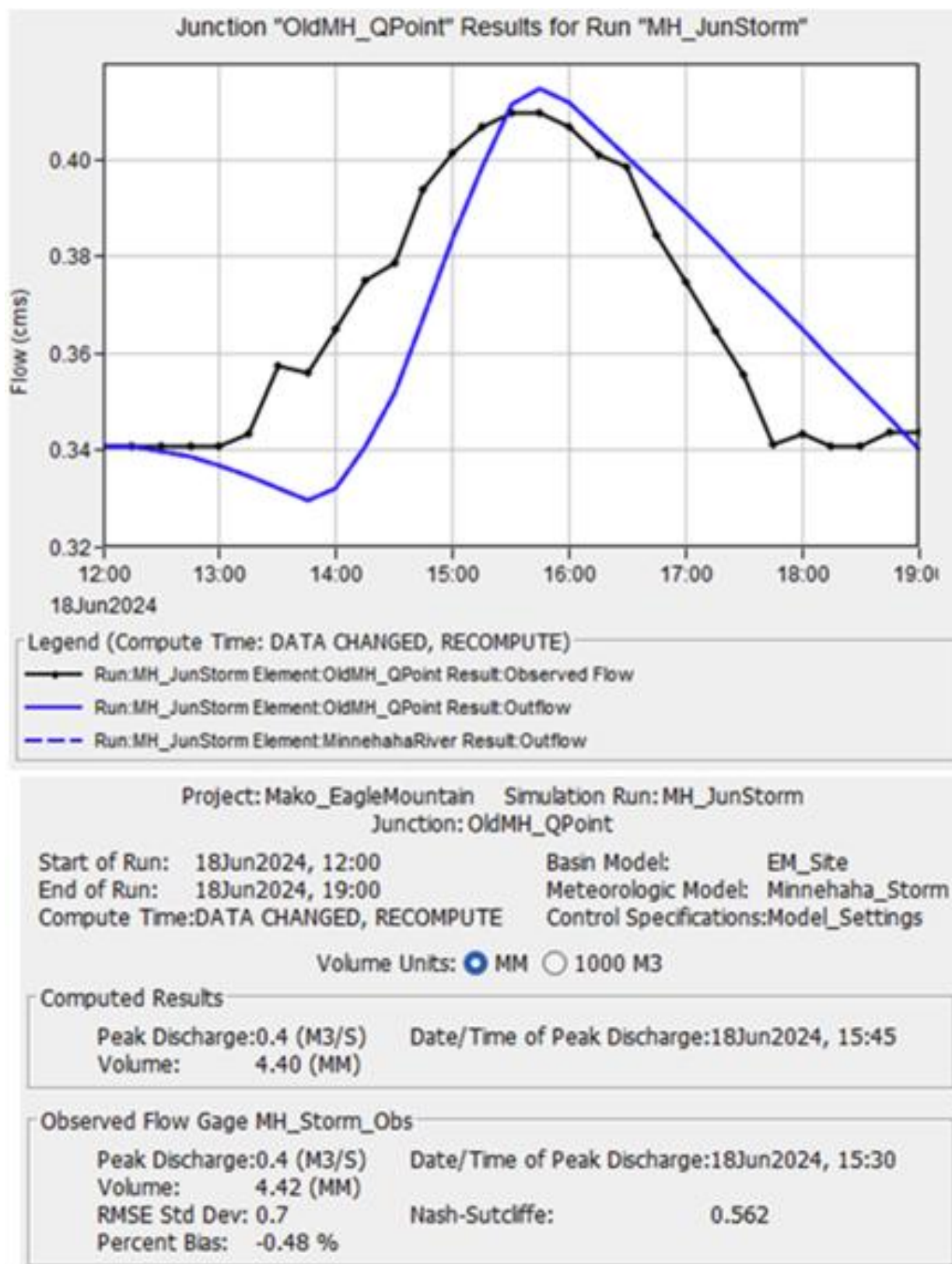
The existing-conditions HEC-HMS model generated discharge time series for the delineated sub-basins and routed flows to key receiving nodes (shown in Figure 6.1). Calibration against the Minnehaha storm record reproduced the event's peak timing and volume within the limits of the observed dataset (Figure 6.2), providing a reasonable basis to extend simulations across the 2000–2024 climate record at a daily time step for baseline interpretation.

FIGURE 6.1 HEC-HMS SUBBASINS AND RECEIVING NODES FOR THE EXISTING-CONDITIONS MODEL



Source: GRE, 2026

FIGURE 6.2 HEC-HMS MODEL HYDROGRAPH SHOWING SIMULATED VS OBSERVED FLOW AT MINNEHAHA CREEK



Source: GRE, 2026

Under with-Project conditions, a mosaic DEM was applied to represent end-of-mine-life landforms. Sub-basins were delineated based on the landscape and routing of drainage ditches around pits, tailings facilities, waste-rock facilities, and plant areas. The parameters from the calibrated case were then transferred or scaled to the future configuration. The model produced outputs comprising daily runoff for each of the 45 delineated sub-basins, which were later summed to annual totals per sub-basin for use in the site-wide water balance and design workflows. Screening results reported by GRE indicated that existing runoff ratio for the Minnehaha Creek sub-basin (used for calibration) is 0.162. In contrast, the future conditions runoff ratio is 0.206 for all subbasins except the two subbasins representing the buildings (Plant Site and Blast Magazine), which were considered 100% impervious.

### 6.5.2 SITE-WIDE WATER BALANCE

The site-wide water balance was developed in GoldSim to integrate climate forcing, HEC-HMS runoff (from the surface-water flow model), groundwater model outputs, and plant design parameters, with the objective of providing answers to three questions: whether the Project could reliably meet water demand associated with a 5,000 tonne per day ore production under dry conditions; how much mine-impacted water (MIW) could be generated and from which sources; and whether any controlled discharges would have implications for receiving-water quality. Given the design “data-freeze,” GRE simulated a snapshot intended to bracket high-risk water-quality conditions: covering mining year 15, when the TSF is full. The conceptual site-wide water balance and process flow diagrams that framed these simulations are shown in Figure 6.3 and Figure 6.4.

FIGURE 6.3 EAGLE MOUNTAIN CONCEPTUAL WATER BALANCE MODEL

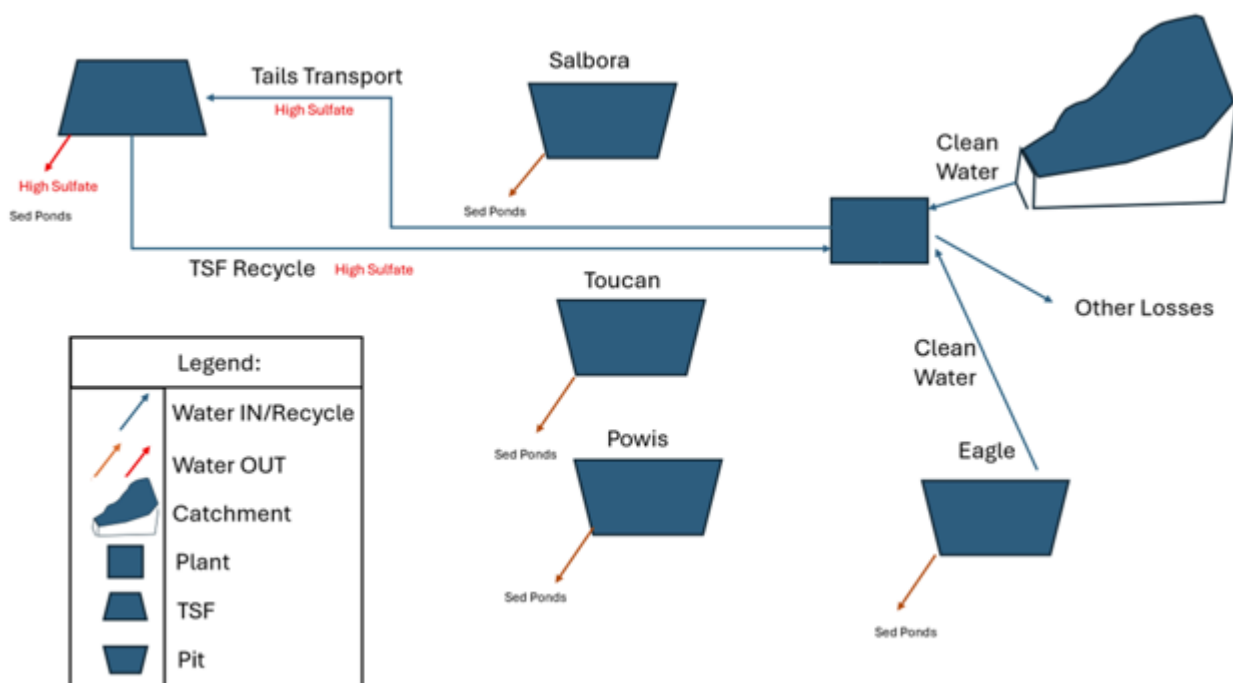
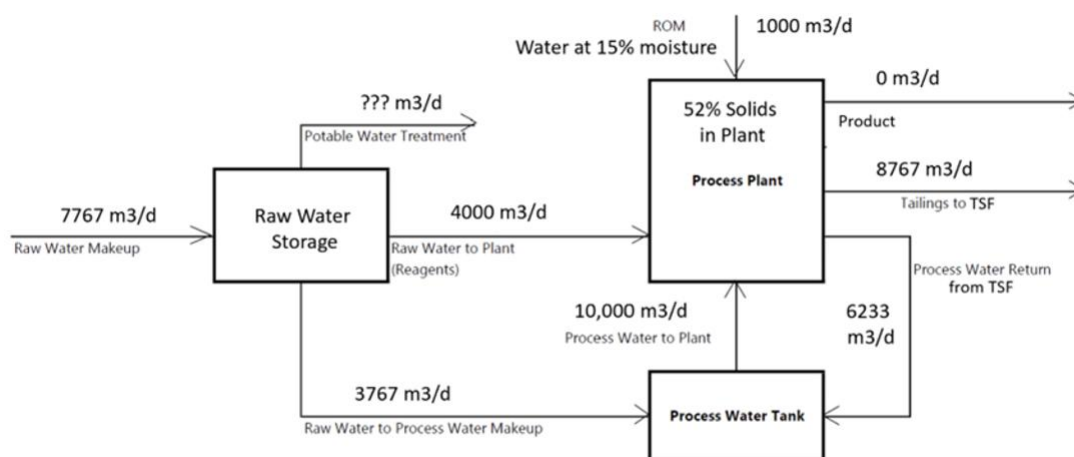


FIGURE 6.4 EAGLE MOUNTAIN CONCEPTUAL PROCESS FLOW DIAGRAM



\*Based on diagram provided by C. McKenzie 07-24-25

GoldSim linked the Mill & Plant, Pits, and TSF elements to hydrologic inputs and operational storages. These elements ingested daily runoff series from the HEC-HMS model and pit dewatering inputs to produce time-series balances under the snapshot.

The plant-supply time series plot for 2045 showed no deficit—even in the driest modelled conditions—and frequently indicated surplus, which is consistent with the humid rainforest setting. GRE presented these outputs as seasonal panels for wet, median, and dry years; surpluses plot above zero and any shortfalls (if present) would plot below zero (Figure 6.5 to Figure 6.7). These graphics supported the conclusion that process demand for 5,000 tpd could be maintained with the modelled sources.

FIGURE 6.5 WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY WET SEASON

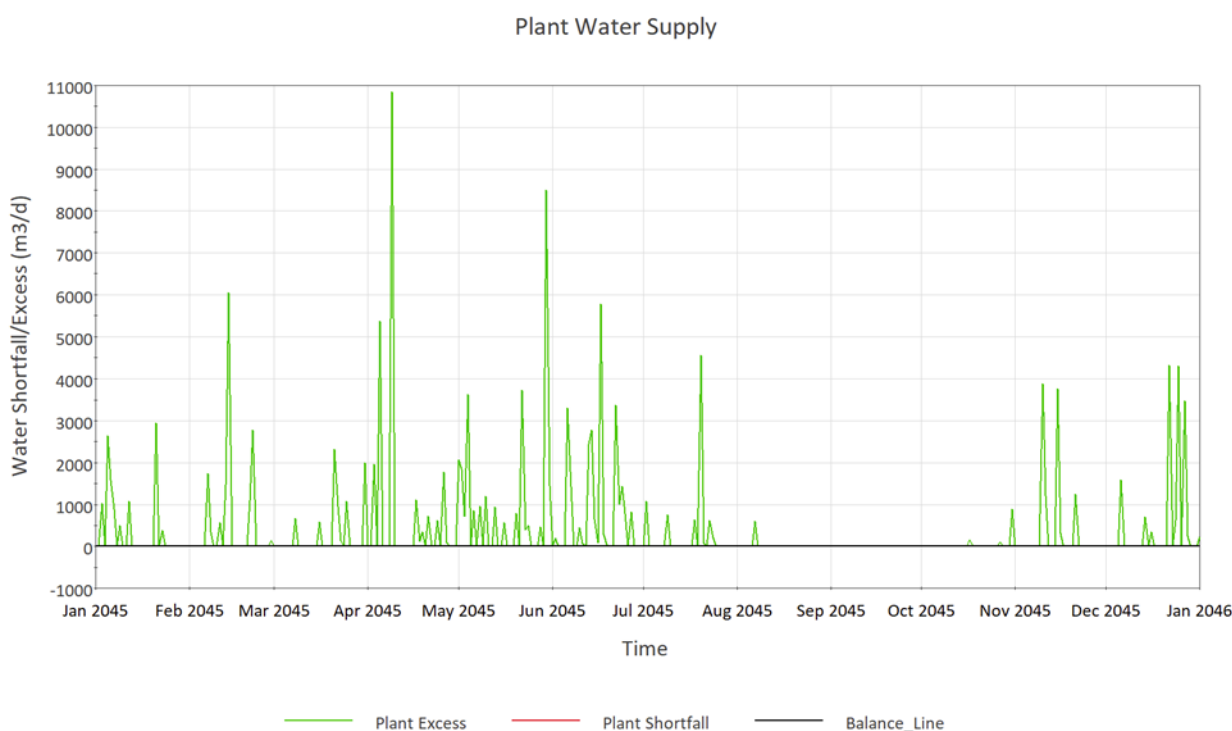




FIGURE 6.6 WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY AVERAGE SEASON

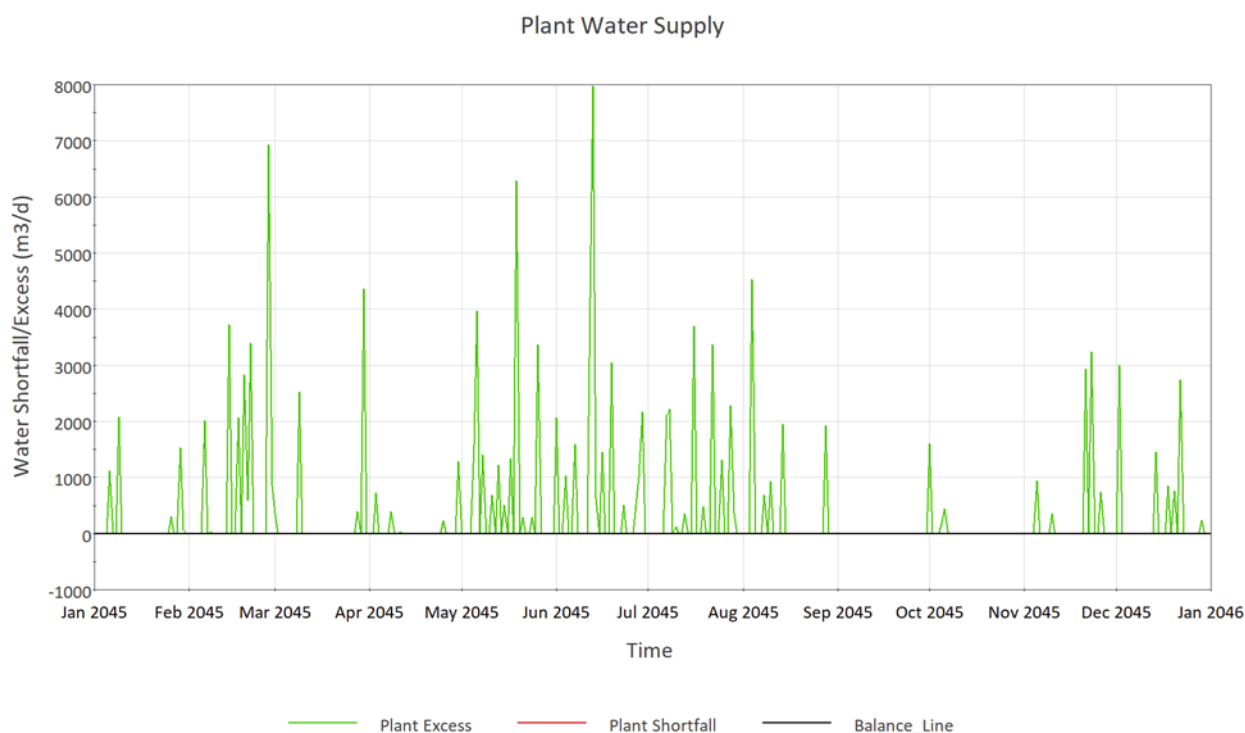
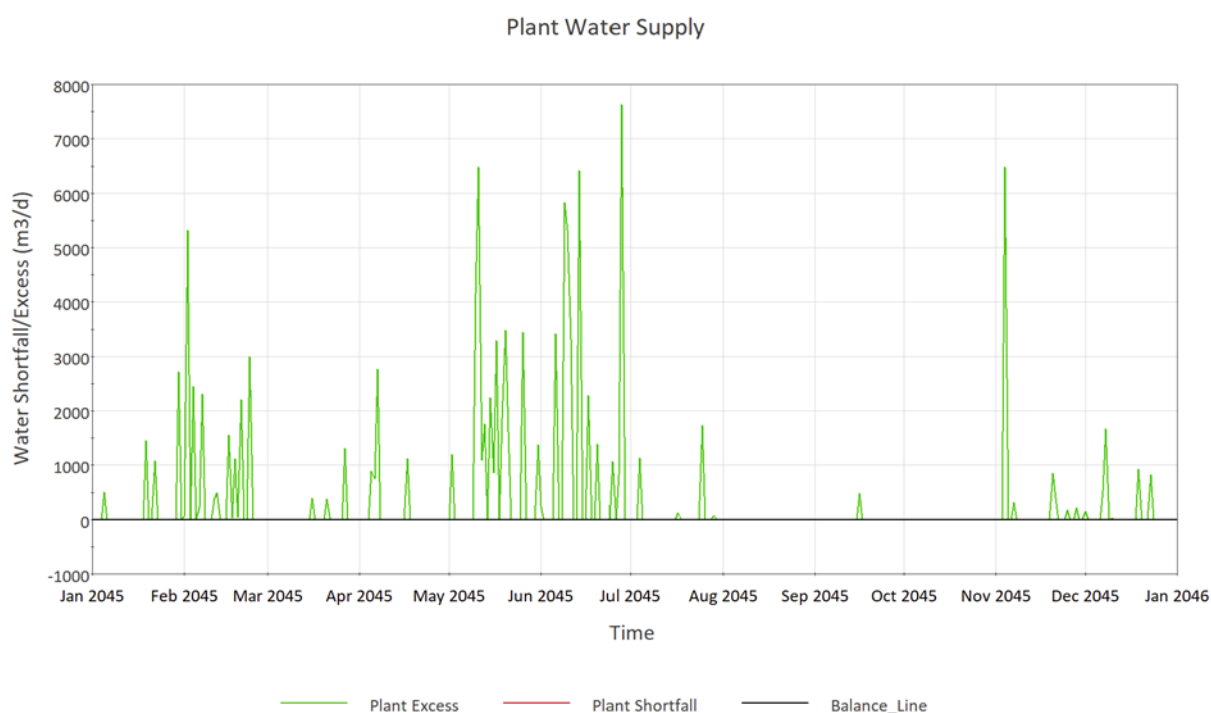


FIGURE 6.7 WATER BALANCE MODEL RESULTS, PLANT WATER SUPPLY DRY SEASON



GRE reported no excess discharge because recycle to the plant met storage requirements; therefore, no river-mixing analysis was needed for this. GRE also noted that TSF discharged after a relatively modest cumulative inflow (9,560 m<sup>3</sup>) from rainfall and runoff; the discharge



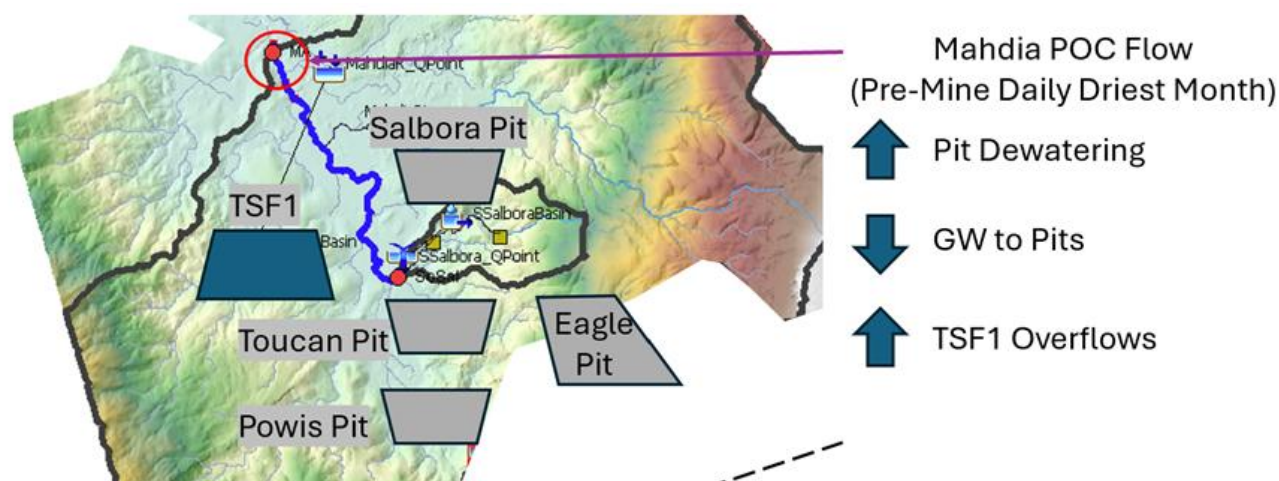
volume-versus-time series were tabulated and were forwarded to the surface-water quality assessment for receiving-water mixing evaluations.

The water-balance results required recognition of several screening-level constraints: the model covered a one-year snapshot, rather than a full life-of-mine chronology, and inherited sensitive runoff-coefficient assumptions from the HEC-HMS surface-water model. The TSF hydrology used a fixed 20% pond / 80% beach split pending detailed design; the magnitude of tailings-entrained water—likely the site’s largest water sink—remained uncertain pending consolidation/entrainment testwork; climate forcing relied partly on NASA infill and may not fully capture site-specific micro-climates; and the analysis reflected a “data-freeze” layout, including provisional storage sizing for TSF and sediment ponds, that is expected to evolve with optimisation. GRE therefore recommended updating the balance as monitoring and engineering mature so that pond operating bands, recycle/bleed set-points, and discharge controls remain aligned with compliance and support continuous processing.

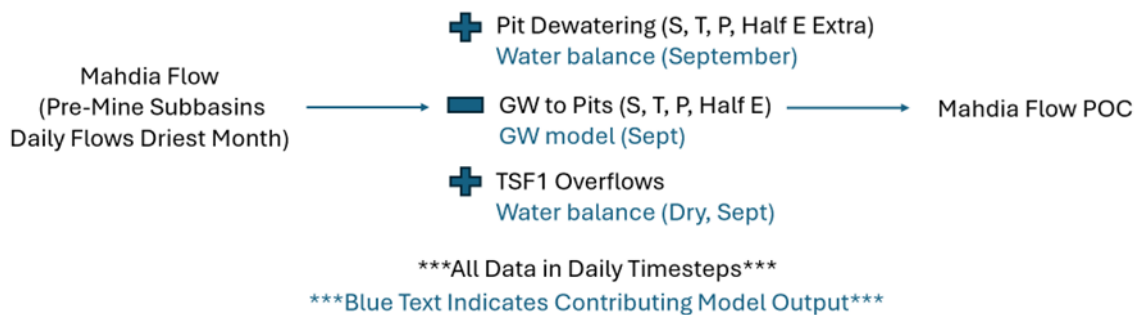
### 6.5.3 SURFACE WATER QUANTITY ASSESSMENT

GRE assessed how mining would alter flows in the Mahdia River and Minnehaha Creek systems by combining outputs from the groundwater model (to quantify loss of natural baseflow to gaining streams), the HEC-HMS surface-water model (to provide daily runoff), and the site-wide GoldSim water balance (to represent operational water routing and potential TSF controlled discharges). The assessment was framed at end-of-mine-life (Year 15), when hydrologic changes are greatest, with Eagle pit dewatering split 50:50 between the two watersheds because the pit straddles the divide; the pathways of additions (pit dewatering and any TSF controlled discharge) and subtractions (reduced groundwater contribution) are shown in Figure 6.8 and in Figure 6.9. To provide a conservative test of compliance during low flows, GRE applied these changes to the “Pre-Mine Daily Driest Month”—September 2020 from the NASA-normalised record.

FIGURE 6.8 SURFACE WATER QUANTITY CONCEPTUAL MODEL



**FIGURE 6.9 SURFACE WATER QUANTITY CONCEPTUAL MATHEMATICAL MODEL FOR MAHDIA RIVER**



The “with project” hydrologic system differs from the pre-mining hydrologic system in the following ways:

- Both the Mahdia River and Minnehaha Creek watersheds are going to gain water/flow from pit dewatering (after proper sediment control)
  - The Salbora, Powis, and Toucan pit dewatering water will be discharged to the Mahdia River
  - One-half of the Eagle Mountain pit dewatering water will go to the Mahdia River, and one-half will go to the Minnehaha Creek.
- During wet periods, the Mahdia River will gain flow from excess water discharge from either the plant or TSF.
- Both drainage basins will see increased runoff because the impacted land surfaces including pit walls, pit bottoms, disturbed ground, TSF ponds, and TSF beaches have higher unit runoff (runoff per unit area, per unit time) than fully-vegetated ground.
- Transpiration, a large part of a tropical water balance, will be decreased as vegetation is removed.
- In impacted areas, water that previously flowed into streams will be re-routed to pit sumps, tailings ponds, or surface water diversions. Some impacted areas will not have runoff per-se (such as water that falls inside the TSF). This water must be properly accounted for in the “with project” model.
- Unimpacted areas within the project footprint will have the same runoff, but may be diverted into channels.
- ~2534 m<sup>3</sup>/day can be considered “consumed” by mining operations (see Figure 6.4). Most of this is water entrainment in the tailings.

#### 6.5.3.1 PRE-MINING STREAM FLOWS

Because abundant water is available in the wet season, GRE performed a deterministic water quantity impact assessment on the pre-mining driest month (September 2020) from the NASA dataset. An analysis of dry conditions will provide insight to water quantity impacts for the “worst case scenario” possible for the site. Table 6.1 shows the discharge of each river during the selected timeframe and forms the “low flow baseline”.

**TABLE 6.1 PRE-MINING DRIEST MONTH FLOW RATES DISCHARGE**

<b>Driest Simulated Month:</b>	<b>Mahdia River</b>	<b>Minnehaha Creek</b>
	Average Daily Flow m <sup>3</sup> /day	
Week 1	6,963	2,316
Week 2	3,398	1,130
Week 3	2,522	839
Week 4	2,100	698
Total Monthly Flow (m <sup>3</sup> )	109,952	36,570

It is against this baseline that GRE will ascertain if the mining project increases or decreases streamflow during the driest time of the year at the point of compliance. The area upgradient from the Mahdia POC is ~ 19,700,000 m<sup>2</sup>. This equates to a flow per square meter of roughly 5.5 litres of baseflow per square meter, per month. For the Minnehaha Creek, that value is 4.4 Liters of baseflow per square meter, per month.

#### 6.5.3.2 DRY SEASON DEWATERING

The transient groundwater model has a bi-modal recharge function corresponding to the bi-modal wet season of the site. As a result, it is capable of determining the seasonal variation of pit dewatering. It is important to note that very little seasonal variation was predicted. For example, at end-of mine life, the difference in Salbora groundwater inflows between wet and dry seasons was ~5%. This is because of the time lag effect of groundwater. (It should be noted that the actual dewatering (including direct precipitation) removed from the sumps will be strongly and rapidly influenced by any rainfall.)

As a result, in rain-free periods, the pit sumps receive a steady flow rate corresponding to the values shown in Section 7.3.1.2.

#### 6.5.3.3 MAHDIA RIVER STREAM FLOWS, DRY MONTH

Calculating the Mahdia River dry month flows requires the accounting of baseflow discharge from impacted basins, unimpacted basins, and mine water management practices.

Pre-mining runoff conditions and gaining stream behaviour are expected to persist across most non-contact watersheds. Several upgradient and upstream catchments are not impacted by mining activities, while others are only marginally affected, primarily through water diversion rather than land-use change. Large portions of the watershed above the point of compliance therefore continue to contribute baseflow during mining.

With this context, the following applies at the point of compliance during a representative dry-month condition:

- Discharge from TSF: This is equal to 0 m<sup>3</sup>/day. TSF still stores water, but discharges none.
- Discharge from pit groundwater inflows (Section 7.3.1.2)
  - Discharge from Salbora GW inflows (pit dewatering): a minimum of 650 m<sup>3</sup>/day, and a maximum of 4500 m<sup>3</sup>/day.

- Discharge from Toucan GW Inflows (pit dewatering): a minimum of zero, a maximum of 2000 m<sup>3</sup>/day.
- Discharge from Powis GW Inflows (pit dewatering), a minimum of 1300 m<sup>3</sup>/day and a maximum of 3300 m<sup>3</sup>/day.
- One Half the discharge from Eagle Mountain, a minimum of 1150 m<sup>3</sup>/day, a maximum of 2000 m<sup>3</sup>/day.
- Consumptive use by the plant of ~2500 m<sup>3</sup>/day. This is constant throughout the year, yet during the dry month, it is sourced from TSF reclaim water and pit dewatering.
- During mining, not all areas have runoff. No runoff areas and areas that would be double-counting water (for example, gaining streams within pit extents) must be subtracted from the balance at a rate equal to the baseflow per square meter calculated in Section 6.5.3.1 multiplied by the area with these conditions.
- During mining, some impacted sub-basins have equal discharge.

The equation then becomes:

$$\begin{aligned}
 \text{With project flows} &= \text{Unimpacted Drainage Discharge} \\
 &+ \text{Pit Dewatering} \\
 &- \text{"double count" areas} \\
 &- \text{no runoff areas} \\
 &- \text{Consumptive use}
 \end{aligned}$$

Table 6.2 shows the results of this calculation and the predicted increase in dry season baseflows as mining progresses.

**TABLE 6.2 WITH-PROJECT STREAMFLOW DISCHARGE INCREASE IN DRIEST SEPTEMBER, MAHDIA RIVER**

Model Period	Increase in Baseflow Rate from Mining (m <sup>3</sup> /day)	Increase in total Baseflow m <sup>3</sup> /month
Years 0-1	2,509	75,276
Years 3-5	3,026	90,788
Years 6-13	7,026	210,788
Years 13-14	9,026	270,788

Returning to the values shown in Table 6.1, the minimum increase in surface water flows occurs at the beginning of mining, and is an increase of ~68%. By the end of mine life, this increase is equivalent to ~2.4 times higher baseflow (~270,000 m<sup>3</sup>/month additional water in the "dry September" worst case).

#### 6.5.3.4 MINNEHAHA CREEK STREAM FLOWS

A similar condition exists for the Minnehaha Creek. This drainage receives ½ of the Eagle Mountain dewatering water but has no consumptive use by the plant (which is in the other drainage basin). It does have a modest "double count" area within the EM pit rim. The

calculation results in a net increase in dry season baseflow in all stages of mine life, and is shown in Table 6.3.

**TABLE 6.3 WITH-PROJECT STREAMFLOW DISCHARGE INCREASE IN DRIEST SEPTEMBER, MINNEHAHA CREEK**

Model Period	Increase in Baseflow from Mining (m <sup>3</sup> /day)	Increase in total Baseflow m <sup>3</sup> /month
Years 0-1	1,541	46,258
Years 3-5	1,541	46,258
Years 6-13	2,041	61,258
Years 13-14	1,191	35,758

Looking at the driest conditions, the project will at least double dry season Minnehaha Creek flows.

In summary, the results show that even under the driest climate conditions, the discharge to the Mahdia and Minnehaha watersheds are expected to increase. Eagle Mountain, as well as the communities downstream, are not expected to incur a water shortage as a result of mining operations and can expect increased water flows in the Mahdia and Minnehaha river systems.

#### 6.5.3.5 MODEL LIMITATIONS

The following comprises the assumptions and limitations of the predictive model for surface water quantity.

- Climate: rainfall is the only climate parameter accounted for in the streamflow baseline values.
- Runoff: changes in runoff due to the development of mine infrastructure are estimated from the water balance and from the unit discharge assumptions discussed above.
- Precipitation: The precipitation record for Eagle Mountain specifically only spanned 2022 through 2024. All other years, 2000 through 2021, were developed from NASA satellite data. Additional weather data will need to be developed to improve this and other models.
- Additional Accompanied Limitations: this section of the report relies on the output of several models developed by GRE and the GRE-Barr team. Within each of these models and as discussed previously, the assumptions/limitations of these models and their results then impact the results of this model. Thus, any and all changes or improvements made to the models mentioned in this section which generate different outputs must be used to revise the model results of this section.

### 6.5.4 SURFACE WATER QUALITY ASSESSMENT

#### 6.5.4.1 INTRODUCTION

Eagle Mountain's geochemical testing indicates that tailings are non-acid generating and largely inert with respect to ARD/ML, but the tailings supernatant—the process water used to slurry tailings—contains elevated salts and select metals relative to applicable benchmarks and therefore requires careful management before any controlled discharge to surface waters. In undiluted form, sulphate in supernatant spans roughly 2,100–4,000 mg/L (Table 6.4)

depending on ore type and mine phase (saprolite early-life vs. hard-rock late-life), exceeding the U.S. EPA secondary drinking-water reference of 250 mg/L for sulphate's aesthetic effects. In addition, several IFC/WBG EHS Mining effluent parameters also exceed guideline values in raw supernatant (notably total cyanide up to 21 mg/L, chromium(VI) up to 0.268 mg/L, copper up to 2.31 mg/L, and iron up to 5.24 mg/L), whereas other metals such as lead, mercury, nickel, and zinc were at or below IFC guideline values in the bench tests. These contrasts reflect systematic chemistry differences between saprolite-hosted and hard-rock circuits and were carried through to the modelling.

**TABLE 6.4 SUPERNATANT CHEMISTRY AND STANDARDS**

Parameter (mg/L)	Saprolite, Early Mine Life	Hard rock, Late Mine Life	Saprolite, Early Mine Life	Hard rock, Late Mine Life	US EPA Secondary Drinking Water Standards	WBG EHS Runoff Guidelines
	Eagle Mountain		Salbora			
Sulphate	2100	4000	2100	3700	250	NR
Weak Acid Dissociable Cyanide	0.42	<0.1	0.89	<0.1	NR	0.5
Total Cyanide	4.19	5.91	1.52	21	NR	1
Arsenic	0.0046	0.0088	0.0054	0.0046	NR	0.1
Cadmium	0.000055	0.0046	0.000055	0.000062	NR	0.05
Chromium (VI)	0.268	0.00017	0.0416	0.00012	NR	0.1
Copper	0.025	2.31	0.051	0.284	NR	0.3
Iron	1.68	2.96	0.064	5.24	NR	2
Lead	0.0296	0.0122	0.00507	0.00355	NR	0.2
Mercury	0.00012	0.00020	<0.00001	<0.00001	NR	0.002
Nickel	0.0431	0.0196	0.0004	0.0005	NR	0.5
Zinc	0.003	0.27	<0.002	<0.002	NR	0.5
Total Nitrogen	NR	NR	NR	NR	NR	10
Total Phosphorus	0.031	0.025	0.01	0.011	NR	2
Total Suspended Solids	NR	NR	NR	NR	NR	50

A key piece of context is the tailings detoxification test set-up. The laboratory program deliberately targeted CN<sub>wad</sub> < 1 mg/L—a stricter target than is anticipated for routine plant operations—and achieved this using elevated sodium metabisulfite doses. GRE notes this configuration likely increased sulphate in the bench supernatant relative to expected operations, making the supernatant inputs conservative with respect to sulphate for downstream assessments. Because the site-wide water balance shows there will be periods



with excess water requiring controlled discharge from TSFs during operations, GRE evaluated whether mixing with receiving waters would achieve IFC/WBG EHS effluent values and the EPA 250 mg/L sulphate reference at realistic discharge ratios. To do so, GRE used PHREEQC to model the geochemical behaviour of the discharge-to-river mixtures, accounting for dilution, equilibrium, solubility, and precipitation reactions. For clarity and to limit uncertainty, only analytes above detection limits were included as model constituents, and chloride was used as the charge-balance ion because it is unregulated in this context and does not materially perturb the speciation of the assessed constituents. The purpose of the modelling is to determine weighted-average discharge-to-river ratios that consistently meet applicable IFC/WBG thresholds and the EPA sulphate reference under the site's controlled-discharge regime.

Ultimately, the principal risk driver for surface-water quality is sulphate—amplified conservatively by the bench detox setting—while total cyanide, copper, chromium (VI), and iron can exceed IFC values in undiluted supernatant depending on mine phase. The management approach is therefore to demonstrate compliance through modelled mixing at the discharge points to the Mahdia River and Minnehaha Creek systems using PHREEQC, with inputs stratified by ore type (saprolite vs. hard-rock) and mine life stage. Subsequent subsections of the assessment use the water-balance-derived discharge context and the modelled chemistry to define discharge-to-river ratios that achieve IFC/WBG and EPA sulphate objectives under controlled-discharge conditions.

#### 6.5.4.2 TAILINGS STORAGE FACILITY – WATER BALANCE

Planned tailings management maximises reclaim to keep water in circuit, so the TSF water balance is governed by tailings deposition (solids plus supernatant) and direct rainfall, with controlled discharge only when ponded water would exceed the maximum operational pond volume. For the geochemical mixing assessment, GRE treated any water above that pond capacity as the discharge volume requiring treatment and release. Under operating conditions, the TSF is unlikely to discharge because reclaimed water is routed back to the plant. Once deposition into the TSF stops it is expected to experience significant controlled discharges before closure, because its inputs are then dominated by incident rainfall and runoff rather than ongoing reclaim from deposition. These assumptions and outcomes are taken directly from GRE's site-wide water balance snapshot and are the basis for the receiving-water mixing analyses that follow.

#### 6.5.4.3 MAHDIA RIVER FLOW RATES

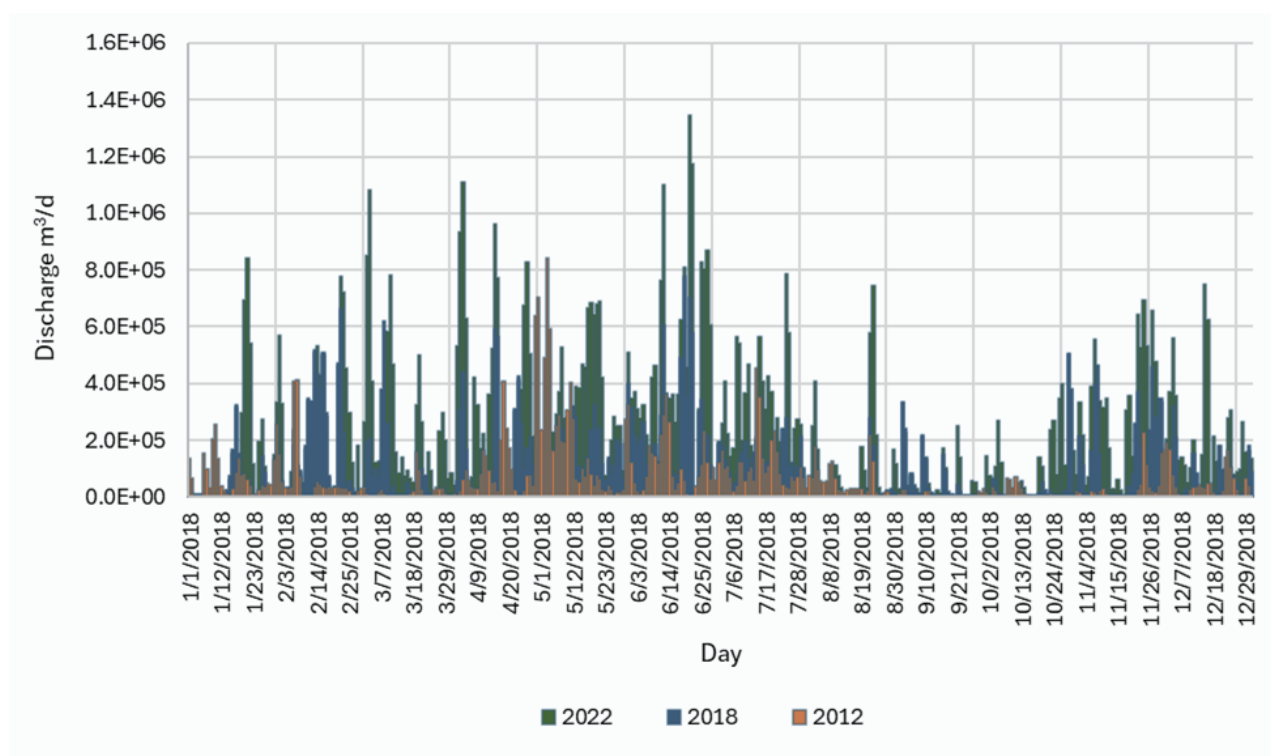
The Mahdia River is the receiving water for any controlled discharges from the TSF. GRE measured dry-season baseflow at 578,711 mE / 262,883 mN using a FlowTracker2, recording 0.278 m<sup>3</sup>/s ( $\approx$  24,036 m<sup>3</sup>/d) on 28 January 2025 and 0.313 m<sup>3</sup>/s ( $\approx$  27,000 m<sup>3</sup>/d) on 2 February 2025 (Table 6.5), these measurements form the basis of the low-flow regime used in the mixing assessment.

TABLE 6.5 MAHDIA RIVER MEASURED FLOW RATES

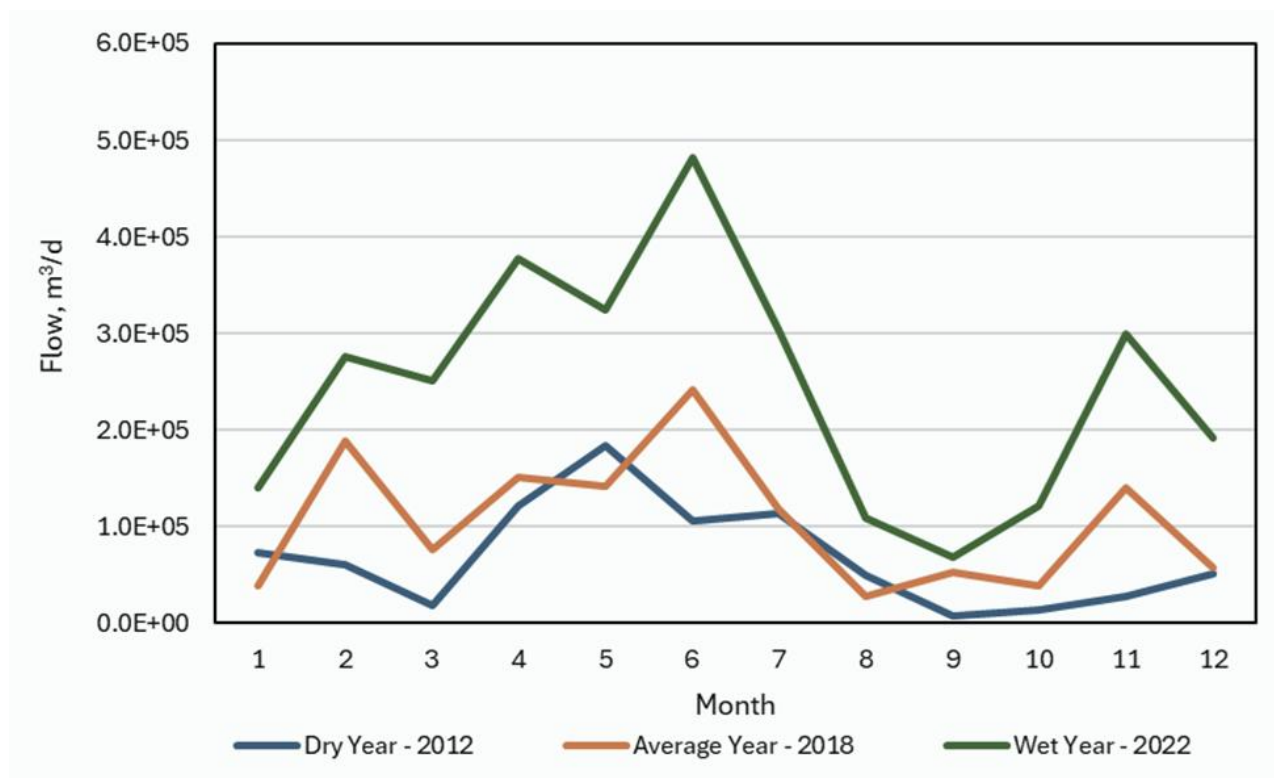
Date (DD/MM/YYYY)	Time	Flow (m <sup>3</sup> /s)	Flow (m <sup>3</sup> /day)
28/1/2025	12:57	0.2782	24,036
2/2/2025	06:45	0.3125	27,000

To characterise the full envelope of receiving-water conditions, Barr Engineering combined NASA-normalised precipitation (2000–2024) with watershed areas to develop a site-wide watershed discharge model, identifying 2022 as the wettest year, 2012 as the driest, and 2018 as the median. Figure 6.10 illustrates the pronounced day-to-day variability in river discharge across these representative climates. For PHREEQC mixing, GRE simplified the time series to average Mahdia River discharge by month derived from Barr’s model (see Figure 6.11), ensuring consistency between the TSF discharge series from the water balance and the receiving-water series used for dilution calculations.

FIGURE 6.10 DISCHARGE TO MAHDIA RIVER DURING WET, MEDIAN, AND DRY CONDITIONS



**FIGURE 6.11 AVERAGE MONTHLY MAHDIA RIVER FLOW UNDER VARYING PRECIPITATION CONDITIONS**



#### 6.5.4.4 PHREEQC MODEL RESULTS

Routine monitoring of the Mahdia River and Minnehaha Creek began in early 2025, with two laboratory sampling rounds—21 January 2025 and 22 March 2025—analysing total and dissolved metals, sulphate, and other relevant parameters, while field measurements of pH, temperature, electrical conductivity, and dissolved oxygen were taken periodically from March through June 2025. Therefore, the PHREEQC assessment presented in this report is based on data available at the time of reporting (January–June 2025), while surface water quality monitoring remains ongoing.

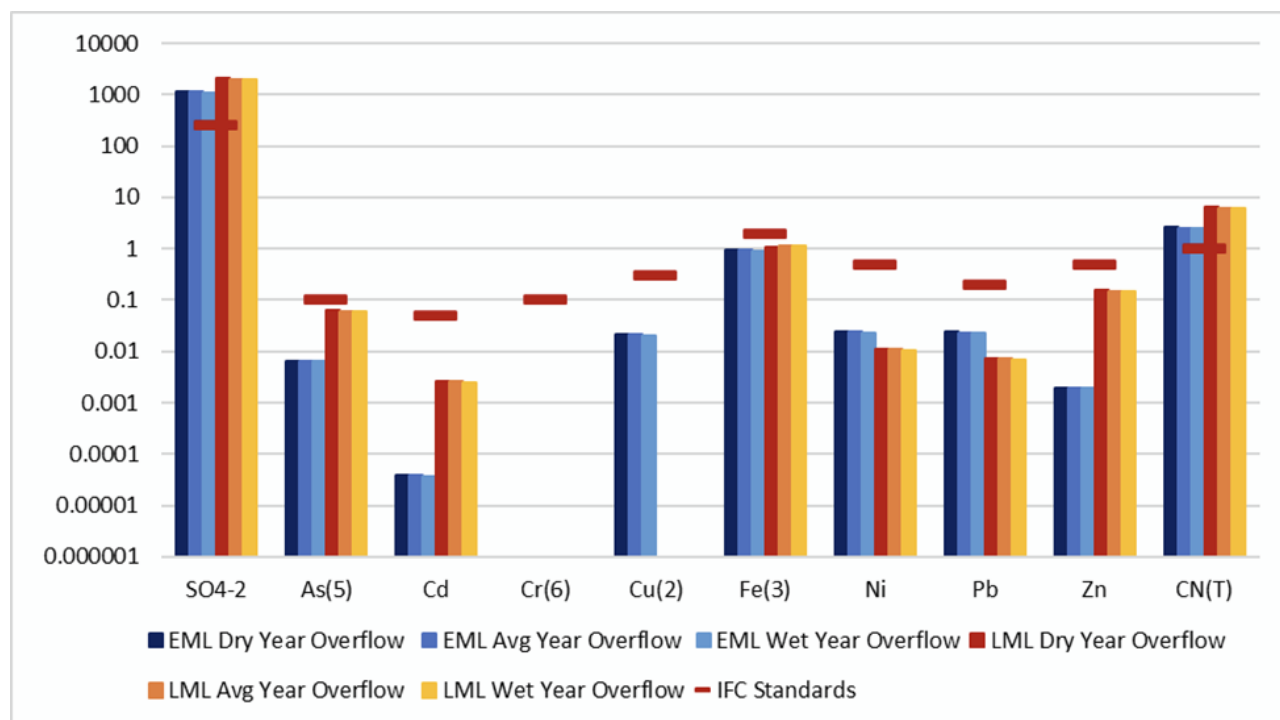
For modelling consistency, GRE averaged the available river-water results to create a single composition for each river and excluded analytes reported below laboratory detection limits (these were considered insignificant for speciation and mass-balance and therefore not included as model constituents). Chloride was adopted as the charge-balance ion because it is unregulated in this context and does not materially perturb the speciation of assessed constituents in the modelled mixtures. One pragmatic adjustment was required for numerical stability: Minnehaha Creek alkalinity was increased from the measured 5.2 mg/L to 21 mg/L to allow the PHREEQC solver to converge. These inputs and adjustments substantiate the mixing scenarios presented in the subsequent subsections.

#### TSF

GRE used PHREEQC to determine the discharge-to-river mixing ratios that achieve the applicable IFC/WBG EHS effluent values and the U.S. EPA 250 mg/L sulphate reference, using the supernatant chemistries in Table 6.4 as source terms. For TSF, the discharge water

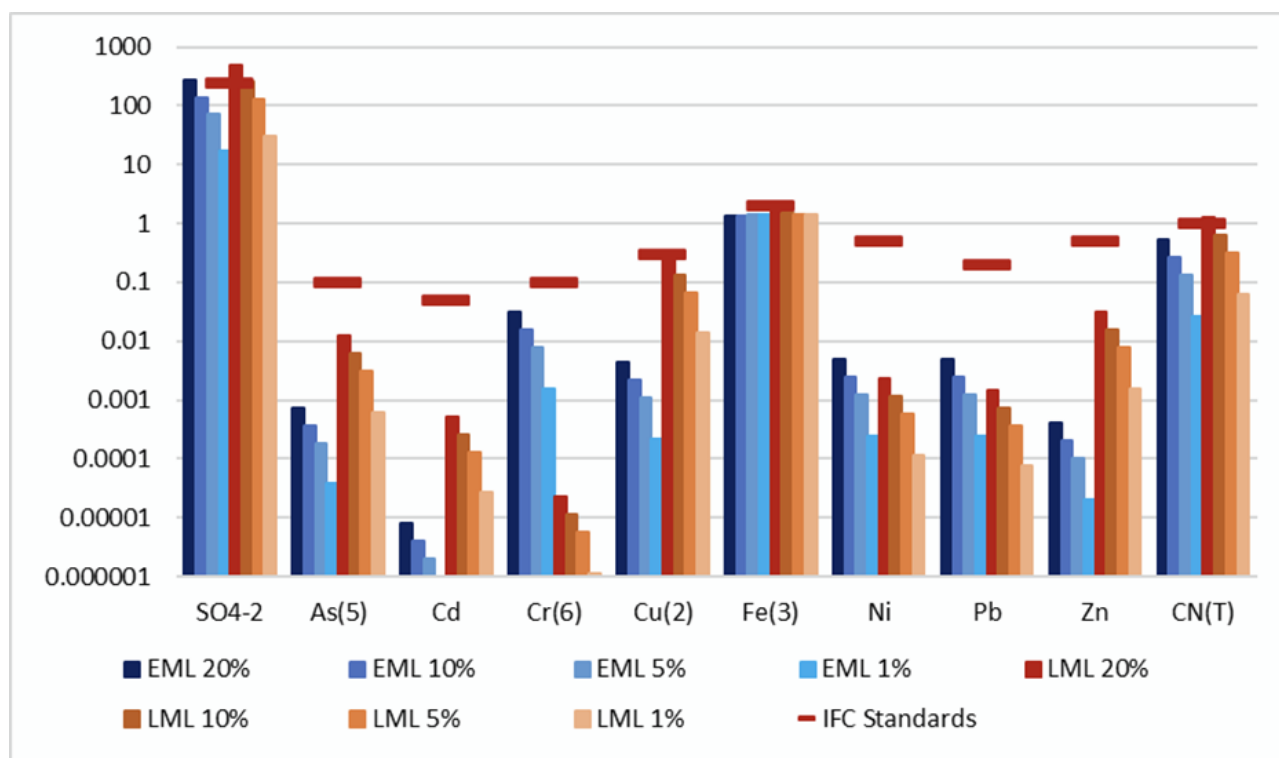
chemistry for dry, average, and wet conditions was first derived by mixing incoming supernatant with tailings deposition water, precipitation, and beach runoff within the pond. Results were evaluated for two operating phases: Early Mine Life (EML, saprolite), which assumes only saprolite tailings deposition at a 4:1 Eagle Mountain : (Salbora + Toucan) ratio, and Late Mine Life (LML, hard rock), which assumes only hard-rock tailings deposition at the same 4:1 ratio with no additional contaminant contribution from previously deposited saprolite (buried in the facility). The resulting TSF discharge (“overflow” in GRE’s figure title) chemistries under different precipitation regimes are presented in Figure 6.12.

**FIGURE 6.12 TSF OVERFLOW WATER QUALITY UNDER VARYING PRECIPITATION CONDITIONS**



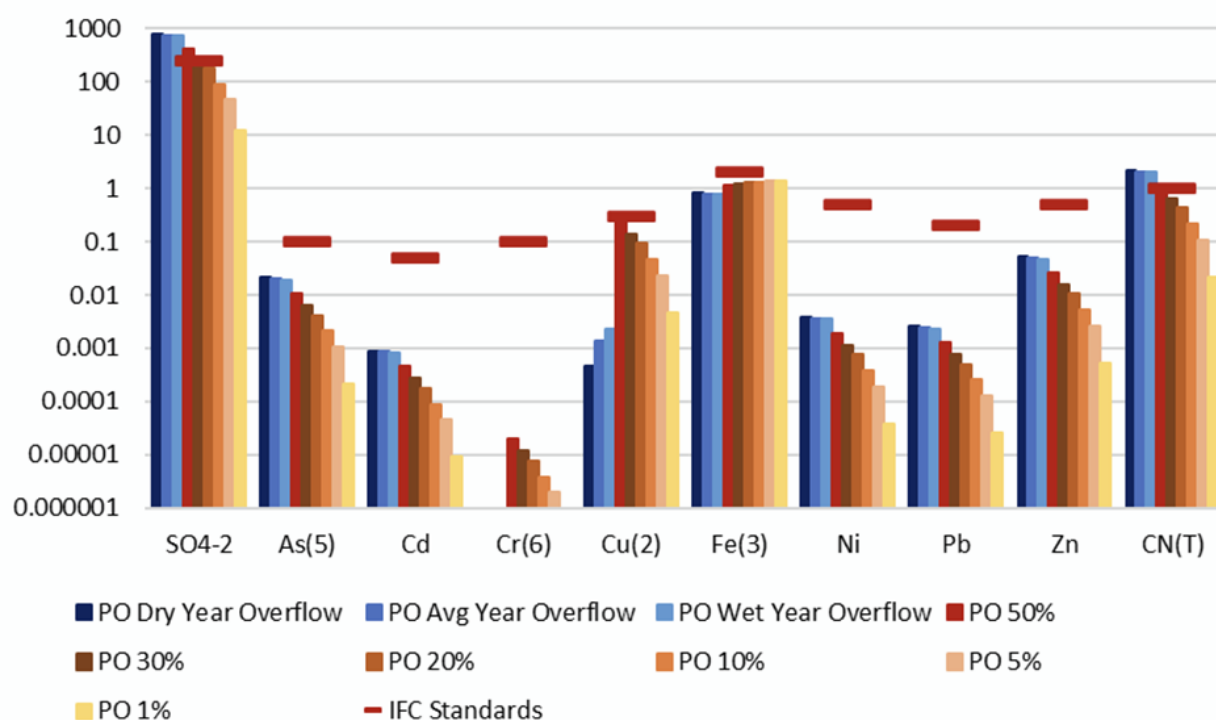
On its own (prior to river mixing), based on unoptimised testwork the TSF discharge is predicted to exceed standards for sulphate and total cyanide in both EML and LML, necessitating dilution in the receiving water. Figure 6.13 compares modelled Mahdia River + TSF discharge mixtures across a range of volume fractions (legend percentages denote the proportion of TSF discharge in the mixture; e.g., “LML 20%” is 20% TSF discharge + 80% Mahdia River water). The modelling indicates LML generally represents the higher-risk chemistry, consistent with bench tests that showed higher metals and sulphate in hard-rock supernatant than saprolite. Importantly, most regulated metals remain below IFC values even at a 20% TSF contribution, whereas sulphate is the limiting constituent. To meet the EPA 250 mg/L sulphate reference in the receiving environment, based on current projections the TSF contribution must be  $\leq 10\%$  of the Mahdia River flow under the modelled dry-year condition (i.e.,  $\leq 10\%$  by volume at the point of mixing).

FIGURE 6.13 TSF MIXING MODEL CONTAMINANT CONCENTRATIONS



Once TSF deposition ceases, inflows become dominated by rainfall and beach runoff, with no ongoing return of fresh supernatant from active deposition. To represent this post-operation (PO) state, GRE modelled the TSF pond as 407,835 m<sup>3</sup> and mixed the residual supernatant with precipitation (assumed pH 5.5) and beach runoff over wet, average, and dry conditions; the resulting PO discharge chemistries and the corresponding Mahdia River mixing outcomes are shown in Figure 6.14. In the raw PO discharge, sulphate and total cyanide are the only parameters predicted to exceed standards; after mixing, a 20% TSF (PO): 80% Mahdia River ratio meets all assessed discharge standards. GRE notes that discharge quality should improve over time in the inactive state as cumulative rainfall further dilutes the ponded water.

FIGURE 6.14 TSF MIXING MODEL, INACTIVE STATE CONTAMINANT CONCENTRATIONS



### Pond Sizing

To meet water-quality objectives at the point of release, the project will provide settling/mixing ponds so that TSF water and natural waters can be stored, equalised, and clarified before controlled discharge. Although the site-wide water balance does not predict significant discharge volumes from the TSF during operations, a pond is still required to buffer any episodic excess and to allow sediment settling prior to discharge to the receiving rivers. Overall, the surface-water modelling provides a coherent, hydraulically consistent basis for decision-making: a calibrated HEC-HMS baseline is coupled with future-conditions runoff across delineated sub-basins, linked to groundwater-driven baseflow changes, and aligned with the site-wide GoldSim water balance, with receiving-water quality evaluated through PHREEQC mixing—so that runoff, dewatering additions, and controlled-discharge time series are internally consistent and transparently sourced to GRE's methods and figures. However, interpretation should remain within the documented bounds of GRE's approach: future HMS runs were executed at a daily timestep (smoothing sub-daily peaks); climate forcing draws on NASA-normalised precipitation blended with on-site records; the water balance employs snapshot operating states under a reclaim-heavy strategy; groundwater-surface-water coupling is based on a PFS-level model with pit development represented by selected shells; and the empirical baseline remains dry-season-weighted in places, with some ungauged reaches—factors appropriate for screening and fully disclosed in GRE's report. Nevertheless, the modelling outputs are suitable to support the impact assessment that follows.



## 6.6 IMPACTS FROM PRE-CONSTRUCTION/CONSTRUCTION PHASE

During the pre-construction and construction phases, the Project could result in the following types of potential impacts:

### 6.6.1 POTENTIAL IMPACTS

During the pre-construction and construction phases, surface-water effects are expected to be localised, short-term, and predominantly event-driven, arising while earthworks, road upgrades, pad formation, TSF starter/WSF earthworks, camp installation, and early commissioning activities proceed. The construction water-management intent is to maintain clean/dirty-water separation, intercept contact water via drains/culverts and sedimentation (attenuation) ponds, settle suspended solids, and allow controlled discharge only when acceptance criteria are met under permitted conditions and applicable guidelines. Initial pit water and any early dewatering flows encountered during excavation are routed to the construction sedimentation pond for settling rather than directly to natural channels.

- **Impacts due to Short-term elevation in suspended solids (TSS) and turbidity at construction outfalls:** Exposed saprolite/soils on pads, stockpiles, laydown/borrow areas, and road works can mobilise fines during storms. This pathway is credible in the site context given baseline evidence of event-driven TSS variability. Installing/upgrading culverts/bridges for internal and access roads can produce short-duration turbidity pulses and, if undersized or not staged with energy dissipation, can cause backwater, overtopping or local scour until works are stabilised.
- **Impacts due to potential contamination of site drains from fuels, oils and construction chemicals:** Although low-likelihood with standard controls, accidental releases at laydown or refuelling areas could acutely degrade runoff quality if secondary containment and spill-response measures are not rigorously applied during works.

### 6.6.2 EXISTING CONTROLS/DESIGN MITIGATION

The following measures are employed to minimise/prevent potential impacts on surface water during pre-construction/construction:

- Maintain clean/dirty-water separation; isolate runoff from disturbed areas to the construction pond network; route clean water around works.
- Erosion and sediment control measures, including silt fences, check dams, sediment basins, and stabilised drainage channels, will be established.
- The extent of open, unvegetated ground will be minimised to reduce the mobilisation and transport of fine sediments.
- Fuel and chemical storage areas will be fully contained and bunded to prevent spills from running off into water courses.
- Refuelling and equipment maintenance will be conducted on impermeable pads to eliminate the risk of hydrocarbon infiltration.
- Spill-prevention and spill-response equipment will be provided on site, enabling rapid containment and clean-up of any accidental releases.
- Hazardous materials will be stored in secure, weather-protected facilities with leak-proof floors to prevent contamination.

- Explosives housekeeping (if blasting occurs): Enforce zero-loss loading; recover misfires/spillage; deploy perimeter sumps around blast/work pads and pump back to the construction pond prior to compliant release.

### 6.6.3 SIGNIFICANCE OF IMPACTS

#### 6.6.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

Sensitivity follows the ESIA method in Volume 1, Chapter 5 (ecological function, human use, cultural/legislative value). Magnitude is assessed for the construction phase only, prior to any additional mitigation measures.

#### **Short-term elevation in suspended solids (TSS) and turbidity at construction outfalls and from the stockpiles**

The potential increase in suspended solids and turbidity during the construction phase represents a **negative, direct** impact on local surface water bodies. Elevated TSS levels may arise from ground-disturbance activities, earthworks, and stormwater runoff from temporary stockpiles, particularly during rainfall events that mobilise exposed soils and disturbed sediments. The impact is expected to occur **intermittently**, mainly during periods of active construction or during storm events that generate runoff before stabilisation measures are fully implemented.

The duration of the impact is **short-term**, limited to the construction period prior to the establishment of permanent drainage controls, erosion-and-sediment-control measures, and stockpile stabilisation. The extent is **local**, confined to immediate downstream areas of construction outfalls and drainage pathways receiving runoff from stockpiles, and is not anticipated to propagate across the wider catchment.

Given the limited spatial extent and temporary nature of these activities, the scale and magnitude of the impact are assessed as **small**. Nevertheless, the sensitivity of the receiving surface waters is considered **medium**, as these watercourses may support ecological functions or downstream water uses. Short-lived sediment peaks have the potential to affect aquatic habitats and water-quality conditions, particularly during intense rainfall.

Taking these factors into account, the overall impact significance is assessed as **minor** prior to the implementation of mitigation measures.

#### **Potential contamination of site drains from fuels, oils and construction chemicals**

During the pre-construction and construction phases, there is a potential for hydrocarbon or chemical releases arising from activities such as refuelling, equipment maintenance, handling of lubricants, and the use of construction chemicals within laydown or work areas. If such materials enter the site's drainage system, they could temporarily affect water quality at construction outfalls. This represents a **negative, direct** impact on local surface waters, as any loss of containment could transport pollutants into near-field channels before on-site controls take effect.

The impact is considered **temporary**, as any release would be isolated, with no ongoing source anticipated under proper management. The extent of the impact is expected to be at **site level**, confined to the Project area and limited to drainage pathways immediately downstream of construction areas.

The scale of the impact is assessed as **small**, reflecting the presence of containment measures such as bunded storage, impermeable pads, and spill-response equipment already embedded in the construction design. In addition, all construction-related waters (including any contaminated runoff requiring management) are routed to the construction sedimentation ponds, which provides controlled discharge following settling. These provisions significantly reduce the likelihood and consequence of releases reaching natural channels.

The frequency of such events is considered **unlikely**, as spills are expected to be rare with standard procedures, training, and supervision in place. As a result, the magnitude of the impact is assessed as **small**, given the combination of containment measures and immediate response readiness.

The sensitivity of the receiving environment is assessed as **medium**, applied conservatively for near-field outfalls and headwater channels where potential releases can create short-term water-quality effects.

Taking these factors together, the overall pre-mitigation impact significance is assessed as **Minor**. Although a residual risk exists, the small magnitude and the moderate sensitivity of nearby receptors mean that impacts are limited by containment systems and emergency-response provisions.

#### 6.6.3.2 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional actions may be required to mitigate, manage and monitor impacts to surface water resources. The following mitigation measures may be applied during the construction phase:

- Existing hydrology studies will be updated using newly collected flow rate and hydrological data to enhance the understanding of streamflow characteristics within and around the Project Area of Influence (AoI) and associated ancillary facilities. These studies will incorporate data from surface water monitoring gauge stations, water level surveys, and periodic stream discharge measurements.
- Stage clearing and cut/fill so that the active disturbed area matches available attenuation/settling capacity; defer bulk earthworks during peak wet-season weeks if storage or discharge windows are constrained.
- Provide perimeter drains and sumps at borrow pits and laydown yards and pump recoverable waters (if required) to the construction sedimentation pond for settling prior to compliant discharge.
- Install temporary surface covers (e.g. geotextiles) in sensitive areas to prevent sediment-laden runoff from infiltrating into drainage channels.
- Train construction personnel in surface water-protection practices, including correct handling of materials and spill-response procedures.
- Monitor short-term surface water discharge and quality around active construction areas to detect unexpected changes.

#### 6.6.3.3 RESIDUAL IMPACT SIGNIFICANCE

With the additional measures implemented, internal project tributaries and near-field construction outfalls (treated as Medium sensitivity) remain Minor for hydrology and TSS/turbidity, and Negligible for spill risk (with enhanced readiness drills and QA/QC). For the Mahdia River (Medium), residual significance remains Negligible for hydrology - construction

contact waters are intercepted and settled in the on-site sedimentation pond and there is no routine TSF process-water discharge in this phase - and Minor for TSS/turbidity, with Negligible spill-related significance. For the Minnehaha Creek (Medium), residual significance mirrors Mahdia River: hydrology Negligible, TSS/turbidity Minor, and spill-related Negligible, as exposure during construction is limited to pond-treated releases. No impact remains to the community water-supply basin. These impacts are summarised in Table 6.6 to Table 6.7 below.

**TABLE 6.6 IMPACTS ON SURFACE WATERS DURING PRE-CONSTRUCTION / CONSTRUCTION - SHORT-TERM ELEVATION IN TSS AT CONSTRUCTION OUTFALLS**

Significance of Impact					
Impact	The potential increase in suspended solids and turbidity during the construction phase due to earthworks.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to surface water hydrology are considered negative.				
Impact Type	Direct	Indirect		Induced	
	Excavation, grading, and vegetation clearance directly interact with surface waters, potentially intersecting the local streams.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The disturbance occurs during active construction activities, including excavation, grading, and infrastructure development. Consequently, the impact duration for the construction phase is classified as Short-term. However, some earthworks will continue during the operational phase, and these potential impacts are addressed separately in the Operation Phase Impact Assessment section.				
Impact Extent	Local	Regional		International	
	The impact will be within the Project’s Area of Influence.				
Impact Scale	Negligible	Small	Medium	Large	
	The impact is confined to construction footprints and immediate outfalls; runoff remains within natural watershed boundaries via the site drainage concept.				
Frequency	Intermittent during active earthworks within the construction footprint.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the magnitude is small.				
Receptor Sensitivity	Low	Medium		High	
	Headwater channels and near-field outfalls exhibit rapid hydrological responses to storm events; therefore, a Medium sensitivity rating is applied. The Mahdia water source is approximately 500 m from the Salbora pit boundary, making it relatively close and important for the community. It is not immediately adjacent, so sensitivity is classified as Medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The magnitude of disturbance is small and localised, the presence of a community water supply within 500 m increases the importance of the receptor. Combined with its medium sensitivity and the potential for intermittent interaction during construction, the overall Impact Significance is assessed as Minor.				
Residual Impact					

Significance of Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Following the implementation of standard mitigation measures, the residual impact magnitude is assessed as negligible, resulting in an overall residual impact significance of negligible.				

**TABLE 6.7 IMPACTS ON SURFACE WATERS DURING PRE-CONSTRUCTION / CONSTRUCTION POTENTIAL CONTAMINATION OF SITE DRAINS FROM FUELS, OILS AND CONSTRUCTION CHEMICALS**

Significance of Impact					
Impact	Hydrocarbon or chemical releases from refuelling/maintenance or laydown areas reaching site drains and construction outfalls.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to surface water quality are negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts are direct if contaminants enter the drainage system; design requires bunded storage, impermeable pads and spill-response readiness, with discharge via the construction sedimentation pond.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Effects are short-term and acute if incidents occur; no ongoing source is anticipated with proper management.				
Impact Extent	Local	Regional		International	
	The impact will be local within the Project’s Area of Influence.				
Impact Scale	Negligible	Small	Medium	Large	
	Small, given containment and immediate response provisions.				
Frequency	Unlikely events are rare with controls and training; zero releases is the objective.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Magnitude is small given bunding, pads and response equipment embedded in the design.				
Receptor Sensitivity	Low	Medium		High	
	Headwater channels and near-field outfalls exhibit rapid hydrological responses to storm events; therefore, a Medium sensitivity rating is applied. The Mahdia water source is approximately 500 m from the Salbora pit boundary, making it relatively close and important for the community. It is not immediately adjacent, so sensitivity is classified as Medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Minor – based on potential contamination risk, receptor importance, and persistence of pollutants if unmanaged.				
Residual Impact					

Significance of Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	With additional mitigation measures, residual magnitude and significance are Negligible.				

## 6.7 IMPACTS FROM OPERATIONS PHASE

During the operations phase, the Project could result in the following types of potential impacts:

### 6.7.1 POTENTIAL IMPACTS

During operations, surface-water effects are governed by the site-wide water-management concept: clean/dirty water separation, collection of contact water and pit dewatering in engineered drains/ditches, attenuation and settling prior to controlled discharge (only when acceptance criteria are met under permit conditions and applicable guidelines, and high recirculation of process water from the TSF). As such, the following impacts are associated with the operations phase:

- **Impacts on surface waters due to baseflow reduction as a result of pit dewatering:** Pit dewatering during operations may reduce groundwater contributions to nearby surface watercourses, leading to a temporary decrease in baseflow and associated reductions in streamflow. The magnitude of this impact depends on the degree of hydraulic connectivity, existing baseflow conditions, and the duration and intensity of dewatering activities.
- **Impacts due to erosion and sedimentation:** Potential impacts to surface water and sediment quality through erosion of soils from cleared land leading to sedimentation in local streams.
- **Impacts due to uncontrolled discharge of mining effluents:** Potential impacts to surface water and sediment quality through the discharge of mining effluents.
- **Impacts due to potential seepages from TSF and WSF:** Potential impacts to surface water and sediment quality from uncollected seepage from the TSF and the WSF.
- **Impacts due to potential spills from fuels, oils and construction chemicals:** Potential impacts to surface water and sediment quality through the unlikely event of an unplanned release of petroleum products or other contaminants.

### 6.7.2 EXISTING CONTROLS/DESIGN MITIGATION

The following measures are employed to minimise/prevent potential impacts on surface water during operations:

- Installation and active management of sediment ponds collecting water from all major disturbance areas, including construction areas, borrow areas, WSF, and pit workings. Sediment ponds will provide retention time to facilitate the settling of suspended solids before discharge into the environment.



- Maintain clean/dirty-water separation; route contact water and pit dewatering flows through attenuation/sedimentation ponds prior to any compliant, controlled discharge. Capture clean upgradient runoff through appropriately designed interception ditches and diversion channels.
- All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems.
- Emergency response kits to control any fuel/oil spill should be readily available across the Project area.
- Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill.
- Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines.
- Conduct regular training programs for employees to ensure they are familiar with spill response procedures.
- Develop and maintain comprehensive emergency response plans that include spill response protocols.

### 6.7.3 SIGNIFICANCE OF IMPACTS

#### 6.7.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

The following sensitive receptors to project activities during being identified during the Project's operation phase:

#### **Impacts on surface waters due to baseflow reduction as a result of pit dewatering**

Pit dewatering and associated groundwater drawdown during operations may alter river flows by reducing the natural groundwater contributions that sustain dry-season baseflow in nearby watercourses. This constitutes a **negative, direct** impact, as baseflow to streams may be reduced, because groundwater no longer discharges naturally to the streams. The impact is considered **long-term**, persisting for the duration of active dewatering and ceasing only once pits begin to flood or close. The extent of influence is **local**, potentially affecting the Mahdia River and Minnehaha Creek systems within the Project's Area of Influence.

Based on GRE's groundwater modelling results, including zone budget analyses and assessment of minimum flows, the scale of the impact is assessed as **medium**, with no material no material impact on the Mahdia water supply is predicted, as cross-basin groundwater exchange across the ridge and dolerite dyke remains negligible and within model uncertainty throughout the mine life.

The overall magnitude of the impact is considered **negligible**, as the existing numerical groundwater-flow model shows that pit dewatering is expected to create insignificant cross-basin exchange (GRE, 2026). Receptor sensitivity is assessed as low, as the Mahdia Water Supply falls out of the zone of influence.

Considering the combination of negligible impact magnitude and low receptor sensitivity, the overall impact significance is rated as **Negligible** prior to mitigation.

### Impacts due to erosion and sedimentation

During the operational phase, erosion of disturbed surfaces, haul roads, operational benches, and drainage corridors may generate increased sediment loads in runoff, resulting in elevated turbidity and suspended-sediment inputs to nearby surface watercourses. This represents a **negative, direct** impact, as eroded material can be mobilised during storm events and conveyed through site drainage networks to local streams. The impact is considered **short-term** and intermittent, occurring primarily during high-intensity rainfall periods or when exposed surfaces have not yet been stabilised. The extent of the impact is **local**, confined to receiving watercourses immediately downstream of operational drainage pathways.

Given the spatially limited nature of erosion sources and the presence of operational water-management controls, the impact scale and magnitude are assessed as **small**. Receptor sensitivity is assessed as **medium**, recognising that local streams provide important ecological functions and may be vulnerable to short-duration increases in sediment loads. Considering these factors, the overall significance of the impact is assessed as **Minor** prior to the implementation of mitigation measures.

### Impacts due to uncontrolled discharge of mining effluents

Uncontrolled discharge of mining effluents during operations has the potential to introduce contaminants (such as suspended solids, hydrocarbons, dissolved metals, or residues from process and contact water) into nearby surface watercourses. Such releases may occur if containment systems, pumping infrastructure, or treatment facilities fail to function as intended, allowing untreated or partially treated water to enter natural drainage pathways. This represents a **negative, direct** impact on surface waters because any loss of containment would immediately affect downstream water quality.

The impact would be **short-term** and linked to discrete failure events rather than continuous processes, with effects diminishing once the discharge is stopped and corrective actions are implemented. The extent of influence is **local**, confined to streams directly downstream of the release point. Given the limited spatial footprint of drainage pathways and the expectation that any uncontrolled discharge would be timely detected and addressed, the scale and magnitude of the impact are assessed as **small**. The frequency of such events is **intermittent**, reflecting their association with abnormal conditions such as equipment malfunction and/or overtopping during extreme rainfall.

Receptor sensitivity is considered **medium**, recognising that local watercourses support ecological functions and may be moderately vulnerable to short-duration water-quality degradation. Taking into account the small magnitude and medium sensitivity, the overall significance of this impact is assessed as **Minor** prior to mitigation.

### Impacts due to potential seepages from TSF and WSF

Potential impacts arising from seepage, contact-water drainage, or sediment-laden runoff from major surface stockpiles such as the WSF and TSF, if they were to occur, would be **negative**. These impacts are considered **direct**, as contaminated water from these sources may enter surface-watercourses without intermediate processes once mobilisation.

While the Eagle Mountain lithologies do not indicate a significant potential for ARD or metal leaching under current assessment conditions, proactive planning remains essential. The

impact, if any, would be **long term** while the influence is expected to remain **local**, confined to channels downstream of the WSF and TSF footprints with **small** impact scale.

Geochemical static testing indicates a low overall risk of ARD formation, with only one of 50 waste-rock samples classified as potentially acid-generating and generally low metal enrichment. Although kinetic testing highlights a localised metal-leaching concern, it is associated with the transition material from Salbora, which is a rare rock type on site. The frequency of the impact is therefore not expected to be continuous. Considering this geochemical profile and the potential for sediment or metal mobilisation, the impact magnitude is assessed as **small**.

While the Mahdia Water Supply intake/weir is located upgradient of the Salbora Pit and physically separated from the WSF-2 and TSF drainage catchments, surface-water resources remain sensitive due to their domestic and agricultural use. Consequently, receptor sensitivity is assessed as **medium**.

Overall, the combination of small magnitude and medium sensitivity results in a **minor** impact significance prior to mitigation.

### Impacts due to potential spills from fuels, oils and chemicals

During the operational phase, accidental spills or leakages of fuels, lubricants, hydraulic oils, and operational chemicals may occur during equipment use, refuelling, storage, or transfer activities. If these substances enter the site's operational drainage network, they may be conveyed to nearby streams, resulting in short-term deterioration of surface-water quality. This impact is **negative** and **direct**, as any spill that reaches the drainage system can affect receiving waters without intermediate processes. The impact is **short-term** and intermittent, typically associated with isolated failure events such as equipment malfunctions or operator error. Its extent remains **local**, limited to watercourses immediately downstream of affected operational areas.

Given the relatively small volumes involved and the presence of engineered controls (such as bunded storage, impermeable refuelling pads, spill-response kits, and trained personnel) the scale and magnitude of the impact are assessed as **small**. Receptor sensitivity is considered **medium**, acknowledging that local streams support ecological functions and may serve community or resource-use roles, making them moderately vulnerable to short-duration contamination episodes. The overall impact significance is therefore assessed as **Minor** prior to implementation of additional mitigation measures.

#### 6.7.3.2 IMPACT SIGNIFICANCE

Using the method in Volume 1, Chapter 5: Internal project tributaries/operational outfalls (treated as Medium for conservatism) are Minor for hydrology and Minor for TSS/turbidity. Mahdia River (Medium) is Minor for hydrology (net flow increase at compliance due to dewatering routing) and Minor for water quality. Minnehaha Creek (Medium) is Minor for hydrology and Minor for water quality under the controlled-discharge regime. The community water-supply creek has no impact during operations.

#### 6.7.3.3 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

- In order to minimise baseflow reduction in surface waters, progressive and adaptive dewatering management will be implemented to minimise unnecessary lowering of

groundwater levels. Dewatering rates will be adjusted based on the operational monitoring data and the updated modelling studies to maintain safe operating conditions in the pits.

- Controlled discharge routing will be maintained to ensure that all dewatering water is directed through the site's attenuation ponds and engineered drainage channels before release, reducing hydrological disruption at downstream points.
- A targeted groundwater and surface-water monitoring network will be maintained around the Mahdia River and Minnehaha Creek and local streams to track groundwater-level changes and verify any emerging trends in baseflow reduction.
- Operational water reuse will be maximised, including reuse of pit water in mining and processing circuits, reducing the overall requirement for continuous dewatering discharge.
- Erosion and sediment control measures will be maintained along discharge pathways to prevent secondary turbidity impacts associated with increased dewatering flows.

#### 6.7.3.4 RESIDUAL IMPACT SIGNIFICANCE

With the above measures in place, internal operational outfalls are Minor for hydrology and Minor for TSS/turbidity (event-driven and short-lived); Mahdia River remains Minor for hydrology (net operational increases managed within the ponded/controlled-release system) and Minor for water quality; Minnehaha Creek remains Minor for hydrology and Minor for water quality under the controlled-discharge regime, and there is no residual impact to the community water-supply creek. The impacts anticipated during the operations phase of the Project are summarised in Table 6.8 to Table 6.12 below:

**TABLE 6.8 IMPACTS ON SURFACE WATERS DURING OPERATION - BASEFLOW REDUCTION AS A RESULT OF PIT DEWATERING**

Significance of Impact					
Impact	Pit dewatering and subsequent groundwater drawdown during operations may alter river flows by reducing the natural groundwater contributions that sustain dry-season baseflow in nearby watercourses.				
Impact Nature	Negative		Positive	Neutral	
	This would be a negative potential impact as baseflow to streams may be reduced, because groundwater no longer discharges naturally to the streams.				
Impact Type	Direct		Indirect	Induced	
	The reduction in streamflow is a direct hydrological consequence of the dewatering activity itself.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Persists while dewatering is active during the operation phase; ceases as pits flood/close.				
Impact Extent	Local		Regional	International	
	The extent of influence is local, potentially affecting the Mahdia and Minnehaha systems within the Project's Area of Influence.				
Impact Scale	Negligible	Small	Medium	Large	
	Based on GRE's groundwater modelling results, including zone budget analyses and assessment of minimum flows, no material impact on the Mahdia water supply is predicted, as cross-basin groundwater exchange across the ridge and dolerite dyke remains negligible and within model uncertainty throughout the mine life.				
Frequency	Continuous during operations, varying with dewatering rate.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Negligible, as the existing numerical groundwater-flow model shows that pit dewatering is expected to create insignificant cross-basin exchange (GRE, 2026).				
Receptor Sensitivity	Low		Medium	High	
	Receptor sensitivity is assessed as low, as the Mahdia Water Supply falls out of the zone of influence.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the combination of negligible impact magnitude and low sensitivity, the overall impact significance is rated as negligible prior to mitigation.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The impact magnitude is expected to remain negligible.				

TABLE 6.9 IMPACTS ON SURFACE WATERS DURING OPERATION - EROSION AND SEDIMENTATION

Significance of Impact					
Impact	Erosion of disturbed surfaces, haul roads, operational benches, and drainage corridors may generate increased sediment loads in runoff, resulting in elevated turbidity and suspended-sediment inputs.				
Impact Nature	Negative		Positive	Neutral	
	This is a negative impact, as eroded material can be conveyed through the local streams.				
Impact Type	Direct		Indirect	Induced	
	Direct impact, as eroded material can be mobilised during storm events and conveyed through site drainage networks to local streams.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact is considered short-term and intermittent, occurring primarily during high-intensity rainfall periods or when exposed surfaces have not yet been stabilised.				
Impact Extent	Local		Regional	International	
	The extent of the impact is local, confined to receiving watercourses immediately downstream of operational drainage pathways.				
Impact Scale	Negligible	Small	Medium	Large	
	Given the spatially limited nature of erosion sources, the impact scale is assessed as small.				
Frequency	Intermittent, occurring primarily during high-intensity rainfall periods or when exposed surfaces have not yet been stabilised.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Given the spatially limited nature of erosion sources and the presence of operational water-management controls, the impact magnitude is assessed as small.				
Receptor Sensitivity	Low		Medium		High
	Receptor sensitivity is considered medium, recognising that local streams provide ecological functions and may be susceptible to short-duration increases in sediment loads.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering these factors, the overall significance of the impact is assessed as Minor prior to the implementation of mitigation measures.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	With appropriate additional mitigation measures, the impact magnitude is expected to decrease from small to negligible, resulting in a residual impact significance of Negligible.				



**TABLE 6.10 IMPACTS ON SURFACE WATERS DURING OPERATION - UNCONTROLLED DISCHARGE OF MINING EFFLUENTS**

Significance of Impact					
Impact	The impact arises where containment, pumping, or treatment systems fail to capture and manage effluents prior to compliant discharge.				
Impact Nature	Negative		Positive	Neutral	
	Uncontrolled effluent discharge results in deterioration of water quality and poses risks to ecological and human receptors.				
Impact Type	Direct		Indirect	Induced	
	The release flows directly into receiving watercourses without treatment or attenuation, leading direct water-quality degradation.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Effects are linked to the discrete event causing the loss of containment. Once the discharge is stopped and the system restored, impacts diminish.				
Impact Extent	Local		Regional	International	
	Consequences would be confined to near-field streams downgradient of the release location, with limited propagation through the wider catchment if contained quickly.				
Impact Scale	Negligible	Small	Medium	Large	
	The scale is limited by the spatial footprint of the drainage network and the expected volume of potential releases.				
Frequency	Such events occur intermittently, under abnormal conditions (equipment failure, overtopping, operator error, extreme rainfall exceeding design capacity).				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	With established operational water-management systems in place, the magnitude of uncontrolled discharges is expected to be small, though short-term exceedances of water-quality criteria may occur.				
Receptor Sensitivity	Low		Medium	High	
	Downstream watercourses have ecological value and may support community or resource-use functions. They remain moderately sensitive to contamination.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the small magnitude, local extent, and medium sensitivity, the overall significance of an uncontrolled discharge event is assessed as Minor prior to the application of mitigation measures.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	With the application of appropriate additional mitigation measures, the residual impact significance is reduced to Negligible.				

**TABLE 6.11 IMPACTS ON SURFACE WATERS DURING OPERATION - POTENTIAL SEEPAGES FROM TSF AND WSF**

Significance of Impact					
Impact	Potential seepage, contact-water drainage, or sediment-laden runoff from the Waste Storage Facility (WSF) and Tailings Storage Facility (TSF) may introduce contaminants into nearby streams, resulting in deterioration of surface-water quality.				
Impact Nature	Negative	Positive		Neutral	
	Contaminated runoff or seepage degrades surface water quality and may affect ecological and community water use and water quality.				
Impact Type	Direct	Indirect		Induced	
	Any release from the WSF or TSF enters surface-watercourses without intermediate processes, causing an immediate impact.				
Impact Duration	Temporary	Long-term	Long-term	Permanent	
	Once contamination reaches natural streams, water-quality effects may persist until the source is stabilised or controlled, especially for constituents associated with ARD/ML or metal mobilisation.				
Impact Extent	Local	Regional		International	
	Downstream effects are expected to remain localised, limited to watercourses downstream of the WSF and TSF footprints.				
Impact Scale	Negligible	Small	Medium	Large	
	The potential for persistence seepage from large stockpiles is assessed as a small scale rating.				
Frequency	Once a pathway for contamination is established, pollutant mobilisation may continue during rainfall and runoff events until corrective action is taken.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Geochemical assessments indicate low ARD potential and generally low metal enrichment. Therefore, the magnitude is considered small.				
Receptor Sensitivity	Low	Medium		High	
	The receptor sensitivity is assessed as medium as groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Based on the low risk of ARD and moderate risk of metal leaching, and the existing controls in mine waste management, the impact magnitude is considered as small. Given groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area, receptor sensitivity is assessed as medium and the impact significance is rated as minor.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	With the implementation of additional mitigation measures, the residual impact magnitude is expected to reduce to a negligible level, resulting in a negligible residual impact significance.				

**TABLE 6.12 IMPACTS ON SURFACE WATERS DURING OPERATION - POTENTIAL SPILLS FROM FUELS, OILS AND CHEMICALS**

Significance of Impact					
Impact	Contamination during the handling of fuel, oil and chemicals.				
Impact Nature	Negative		Positive	Neutral	
	Spilled hydrocarbons or chemicals degrade water quality, posing risks to aquatic habitats and downstream users.				
Impact Type	Direct		Indirect	Induced	
	Contamination risk arises immediately from operational activities involving fuel handling, refuelling, and chemical use.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Effects are typically limited to the duration of the spill event and the time required to contain and remediate contamination.				
Impact Extent	Local		Regional	International	
	The influence is expected to remain within the immediate drainage catchments adjacent to operational facilities.				
Impact Scale	Negligible	Small	Medium	Large	
	Spill volumes are expected to be limited, and operational controls (bunding, designated refuelling areas, rapid response protocols) restrict the scale of potential releases.				
Frequency	Intermittent linked to refuelling and chemical handling events; not continuous but recurring throughout construction.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	With containment measures, impermeable pads, spill kits, and trained personnel in place, the magnitude of potential contamination is expected to be small.				
Receptor Sensitivity	Low		Medium		High
	Receptor sensitivity is assessed as medium as local surface-watercourses support ecological functions and may have community or resource-use roles.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Minor – based on potential contamination risk, receptor importance, and persistence of pollutants if unmanaged.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Negligible – after implementing mitigation measures such as secondary containment, designated refuelling areas, and spill response protocols.				

## 6.8 IMPACTS FROM CLOSURE PHASE

Closure and rehabilitation of mined areas and support facilities at Eagle Mountain are anticipated to have limited, predominantly short-term effects on surface-water and sediment quality. Disturbed landforms, including the WSF and TSF, will be regraded to stable slopes, capped with saprolite to reduce infiltration and erosion, and revegetated to maintain long-term stability and low runoff velocities, thereby limiting pathways for sediment or contaminant transport to streams.

During implementation, temporary exposure of soils may produce localised erosion until vegetation establishes; these risks will be managed through continued application of the Soil Erosion and Sedimentation Control Plan and site good practice for stormwater and sediment control throughout closure, with discharge compliance verified at the defined compliance points.

Long-term water management at the TSF and across the site will be established as needed, and infrastructure decommissioned and removed in line with the Project Description; where pit lakes form, backfilling or pit-lake management will be implemented as appropriate to ensure stable levels and acceptable water quality at compliance points. In addition, throughout demobilisation, the Spill Prevention, Control and Countermeasures measures will continue to prevent and manage accidental releases from residual machinery and transport.

## 7. GROUNDWATER

This chapter presents the assessment of potential impacts on groundwater conditions within and surrounding, the Project area. To evaluate how the Project may influence groundwater levels, flows, and groundwater–surface water interactions, a three-dimensional (3D) transient groundwater numerical flow model was developed.

To achieve these objectives, Global Resource Engineering (GRE) constructed and applied the model using Visual MODFLOW Flex, enabling a simulation of groundwater behaviour and Project-related impacts.

The numerical model has been developed to achieve two main objectives. First, it quantifies the volume of groundwater that will be generated through pit dewatering as mining progresses over time. Second, it evaluates the potential effects of this dewatering on nearby surface water features, including changes in river flows and groundwater levels in the wider hydrogeological system.

The model results are presented in the following sections, while GRE's full report on the hydrogeological fieldwork and numerical modelling is provided in Appendix F.

### 7.1 DEFINING THE AREA OF INFLUENCE

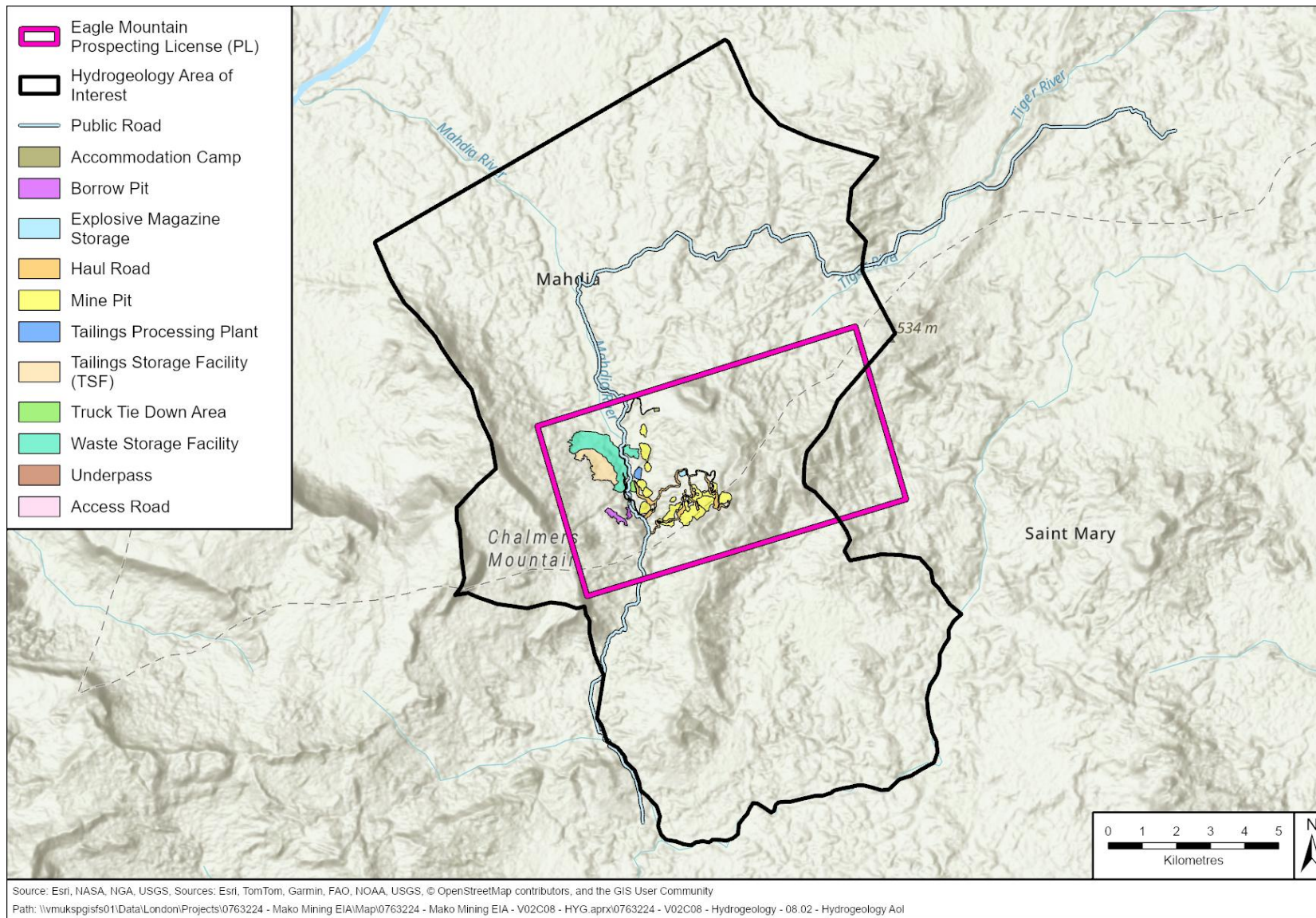
Information on the area of influence has been obtained from the ESIA Support Report by GRE (2026) and summarised in the sections below.

The Project area is located within a valley and bordered by high landforms such as ridgetops. The boundary of the sub-catchment is defined along the existing ridgeline. To the east, the area is enclosed by a dolerite sill (Eagle Mountain), which functions as a hydraulic divide. To the west, the boundary is outlined by a combination of the Mahdia River and a prominent ridge. It is worth noting that east and west of the proposed Eagle Mountain operations, the topography is characterised by undulations with the most prominent high points on the eastern and western sides of the area of influence. These boundaries define the outer hydraulic limits within which groundwater flow and potential project-related changes could occur, rather than implying that measurable impacts are expected across the entire area, particularly in locations where no project infrastructure is currently planned.

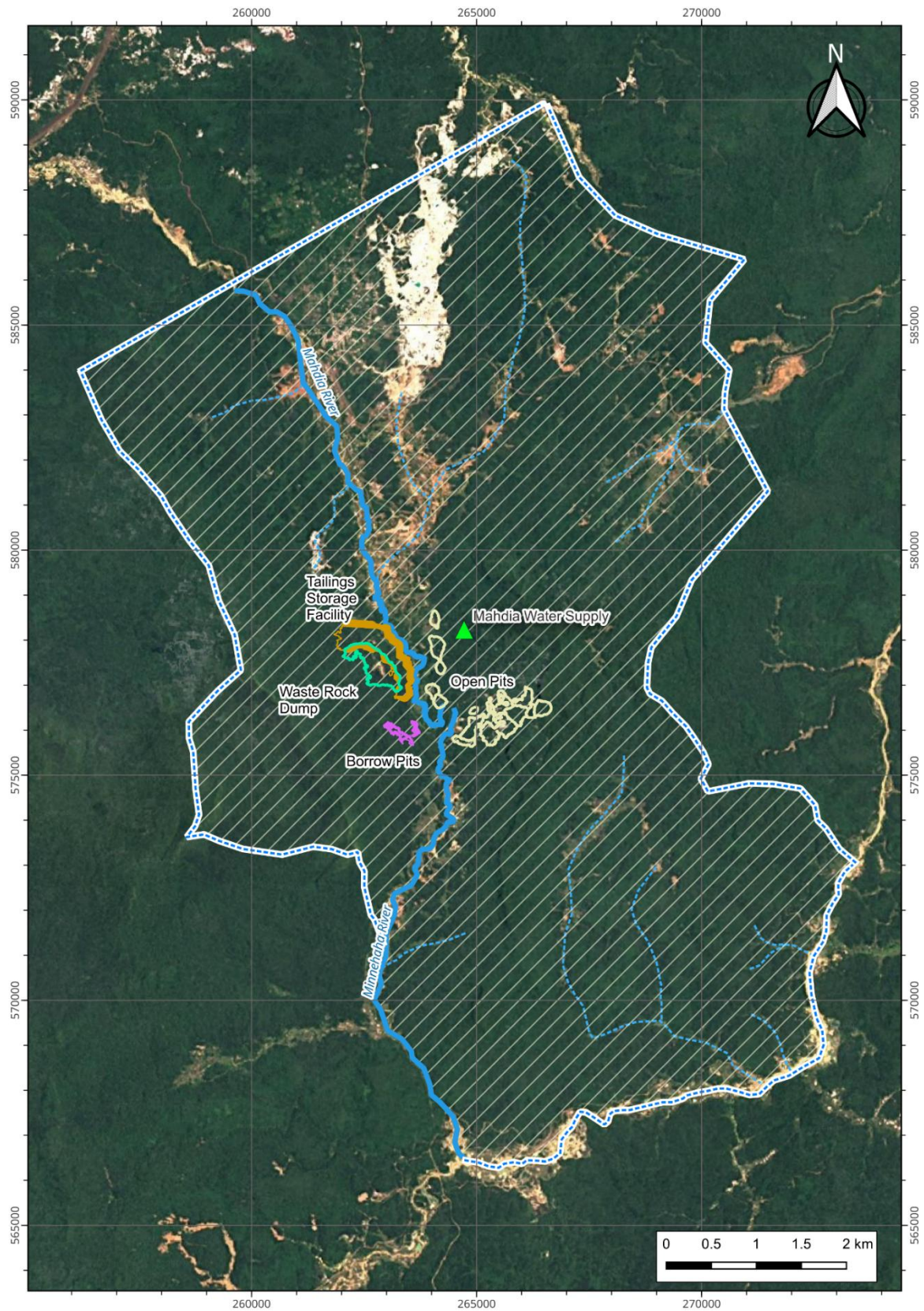
The northern boundary is primarily defined by the Mahdia River, which drains the area to the north and eventually flows into the Potaro River. To the south, the boundary of the area of interest is marked by the Minnehaha Creek, which drains the Project area to the south and ultimately feeds into the Konawaruk River. The Mahdia River drains most of the area, whereas the Minnehaha Creek drains most of the Project's Mineral Resource area. The Mahdia River and Minnehaha Creek are the final discharge points for groundwater within the Project area.



FIGURE 7.1 GROUNDWATER AREA OF INFLUENCE







## 7.2 IMPACTS FROM PRE-CONSTRUCTION/CONSTRUCTION PHASE

During the construction phase, the Project could result in the following types of potential impacts:

### 7.2.1 POTENTIAL IMPACTS

Although the potential impacts during the pre-construction/construction are generally temporary and localised, it requires consideration to ensure the protection of groundwater resources and groundwater-dependent surface water systems.

Potential impacts during this phase are outlined below:

- **Disturbance of shallow groundwater:** Initial site preparation (such as vegetation clearance, grading, and excavation) may locally disturb shallow groundwater flow paths. In areas where the water table is near the surface, excavation works can temporarily expose or intersect groundwater, leading to minor seepage inflows into construction excavations. These effects are expected to be short-term and will diminish once construction activities advance or backfilling occurs.
- **Localised changes to recharge pattern:** Earthworks and temporary spoil placement may alter natural infiltration rates by exposing bare ground or compacting soils. These changes can temporarily reduce recharge in compacted areas or increase infiltration in newly exposed, more permeable surfaces. Such impacts are generally limited to the active construction footprint and stabilise once permanent infrastructure is established, and surfaces are rehabilitated or compacted to design specification.
- **Contamination during the handling of fuel, oil, and chemicals:** Construction activities involve the use of fuels, oils, and small quantities of construction chemicals. Accidental spills or improper storage could pose a risk to groundwater quality, especially in recharge areas with permeable soils. These risks are manageable through standard mitigation measures, including secondary containment, spill response procedures, and designated refuelling areas.

Aquifer testing indicates that the saprolite has relatively low hydraulic conductivity (ranging from 4.03E-06 cm/s to 5.94E-05 cm/s) and will limit the contaminant transport within this unit. Depth to groundwater (from the vibrating wire piezometers) ranges from approximately 1.5 m to 45 m and is generally greater than 10 m below ground level, although localised areas with a shallow water table are present. These shallow-groundwater zones are more vulnerable to potential impacts than areas where the water table occurs at greater depths.

### 7.2.2 EXISTING CONTROLS / DESIGN MITIGATION

Following key measures are employed to minimise / prevent potential impacts on groundwater during pre-construction/construction phase of the Project.

- Erosion and sediment control measures, including silt fences, check dams, sediment basins, and stabilised drainage channels, will be established.
- The extent of open, unvegetated ground will be minimised to reduce the mobilisation and transport of fine sediments.
- Temporary surface covers (e.g. geotextiles) will be installed in sensitive areas to prevent sediment-laden runoff from infiltrating into the subsurface.

- Fuel and chemical storage areas will be fully contained and bunded to prevent spills from entering the soil or groundwater.
- Refuelling and equipment maintenance will be conducted on impermeable pads to eliminate the risk of hydrocarbon infiltration.
- Spill-prevention and spill-response equipment will be provided on site, enabling rapid containment and clean-up of any accidental releases.
- Hazardous materials will be stored in secure, weather-protected facilities with leak-proof floors to prevent contamination.
- Construction personnel will be trained in groundwater-protection practices, including correct handling of materials and spill-response procedures.
- Short-term groundwater level and quality monitoring will be undertaken around active construction areas to detect unexpected changes.

### 7.2.3 SIGNIFICANCE OF IMPACTS

#### 7.2.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

##### **Disturbance of shallow groundwater**

The disturbance of shallow groundwater during construction activities is considered a **negative** impact because it can alter local groundwater flow paths and lead to minor seepage into excavations. Although these effects are temporary, they represent an undesirable change to natural conditions. This impact is classified as **direct**, as it results immediately from activities such as excavation, grading, and site preparation, with no intermediate processes involved.

The duration of the impact is **short-term**, limited to the construction phase when earthworks and infrastructure development occur. While some earthworks will continue during the operational phase, those impacts are addressed separately in the Operation Phase Impact Assessment section. The extent of the impact is **local**, confined to the construction footprint and its immediate surroundings, and the scale is localised and small, as the disturbance is restricted to specific areas where shallow groundwater intersects excavation zones. The impact occurs intermittently, coinciding with active earthworks rather than continuously throughout the phase.

Consequently, the magnitude is assessed as **small**, given its limited spatial extent and short duration.

While it is 500 m from the Salbora Pit boundary to the Mahdia water intake/weir, the source waters are much further away and upstream. The receptor sensitivity is, therefore, considered **low**. Based on a small magnitude and low sensitivity, the initial impact significance is assessed as **negligible**.

##### **Localised changes to recharge pattern**

The potential for localised changes to recharge patterns during construction is considered a **negative** impact because earthworks and temporary spoil placement can alter natural infiltration rates. Exposing bare ground or compacting soils may temporarily reduce recharge in some areas while increasing infiltration in others, leading to short-lived changes in groundwater recharge dynamics.



This impact is classified as **direct**, as it results immediately from construction activities such as grading, excavation, and spoil placement, without intermediate processes. The duration is **short-term**, limited to the construction phase when earthworks are active. Once permanent infrastructure is established and surfaces are rehabilitated or compacted to design specifications, recharge patterns are expected to stabilise. The extent of the impact is **local**, confined to the construction footprint and its immediate surroundings, and the scale is localised and small, as changes occur only within areas directly affected by earthworks.

The impact occurs intermittently, coinciding with active earthworks and spoil placement rather than continuously throughout the construction phase. Consequently, the impact magnitude is assessed as **small**, given the limited spatial extent, short duration, and minor, reversible changes to infiltration and recharge. The receptor sensitivity is considered **low**, as the changes are temporary and localised, and standard mitigation measures, such as controlled spoil placement and surface stabilisation, further reduce risk.

Based on a small magnitude and low-to-medium sensitivity, the initial impact significance is assessed as **negligible**.

### **Contamination during the handling of fuel, oil, and chemicals**

The potential for contamination during the handling of fuel, oil, and chemicals is considered a **negative** impact because accidental spills or improper storage can degrade groundwater quality, posing risks to both the environment and community health. These risks arise directly from construction activities such as refuelling, fuel transport, and chemical use, without intermediate processes. While minor spills may occur during construction, these will be managed in accordance with existing control measures. As a result, the associated impact is expected to be **short-term** in duration.

The extent of the impact is **local**, confined to areas where fuel and chemicals are stored or handled, though migration through groundwater could extend slightly beyond the immediate footprint. The scale is localised, limited to specific handling and storage zones, and the frequency is intermittent, linked to refuelling and chemical handling events rather than continuous throughout the phase. The magnitude is assessed as **small**, depending on spill size and response time, and the receptor sensitivity is considered **low** as the source waters are much further away and upstream.

Based on these factors, the initial impact significance is assessed as **negligible**.

### **7.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES**

The existing measures listed in Section 7.2.4 focus on the different aspects during the pre-construction and construction phase of the Project. It is considered that the existing measures are sufficient to identify, track and mitigate impacts on the groundwater resource volumes and qualities, but also to identify any unforeseen or unplanned areas of impact.

The management and mitigation measures will be amended and expanded as necessary, should any impact emerge that are not monitored, managed or mitigated sufficiently during the operational phase.

### 7.2.5 RESIDUAL IMPACT SIGNIFICANCE

After implementing mitigation measures, including proper surface management and erosion control, spill prevention and containment, the residual impact magnitude is **negligible**, resulting in an overall residual impact significance of **negligible**. Impact assessments are provided in Table 7.1 to Table 7.3.

**TABLE 7.1 IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION – DISTURBANCE OF SHALLOW GROUNDWATER**

Significance of Impact					
Impact	Disturbance of shallow groundwater due to construction activities.				
Impact Nature	Negative	Positive		Neutral	
	The expected disturbance of shallow groundwater due to construction activities is negative.				
Impact Type	Direct	Indirect		Induced	
	Excavation, grading, and vegetation clearance directly interact with shallow groundwater flow paths, potentially exposing or intersecting the water table.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The disturbance occurs during active construction activities, including excavation, grading, and infrastructure development. Consequently, the impact duration for the construction phase is classified as Short-term, as it is limited to the period of construction works. However, some earthworks will continue during the operational phase, and these potential impacts are addressed separately in the Operation Phase Impact Assessment section.				
Impact Extent	Local	Regional		International	
	The disturbance is confined to the construction footprint and immediate surroundings where excavation and grading occur. The effect is spatially limited to areas where shallow groundwater intersects with site preparation activities.				
Impact Scale	Impact scale is considered localised and small.				
Frequency	Intermittent during active earthworks within the construction footprint.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is considered to be small.				
Receptor Sensitivity	Low	Medium		High	
	The intake pipe for the Mahdia Water Supply, which is important to the community, is approximately 500 m from the Salbora pit boundary. While the boundary is 500 m to the Mahdia water intake/weir, the source waters are much further away and upstream. The receptor sensitivity is, therefore, considered low.				
	Negligible	Minor	Moderate	Major	

Significance of Impact					
Impact Significance	Based on a small magnitude and low sensitivity, the initial impact significance is assessed as <b>negligible</b> .				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Following the implementation of standard mitigation measures, the residual impact magnitude remains negligible, resulting in an overall residual impact significance of negligible.				

**TABLE 7.2 IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION – LOCALISED CHANGES TO RECHARGE PATTERN**

Significance of Impact					
Impact	Localised changes to groundwater recharge pattern.				
Impact Nature	Negative		Positive	Neutral	
	The expected changes to natural infiltration and recharge patterns are negative.				
Impact Type	Direct		Indirect	Induced	
	Excavation, grading, and vegetation clearance directly interact with shallow groundwater with potential localised to recharge pattern.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration for the construction phase is classified as Short-term, as it is limited to the period of construction works. However, some earthworks (i.e. open pit development) will continue during the operational phase, and these potential impacts are addressed separately in the Operation Phase Impact Assessment section.				
Impact Extent	Local		Regional	International	
	The localised changes to recharge pattern are confined to the construction footprint and immediate surroundings where excavation and grading occur.				
Impact Scale	Impact scale is considered localised and small.				
Frequency	Intermittent during active earthworks within the construction footprint.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is considered to be small.				
Receptor Sensitivity	Low		Medium	High	
	The intake pipe for the Mahdia Water Supply, which is important to the community, is approximately 500 m from the Salbora pit boundary. While the boundary is 500 m to				



Significance of Impact					
	the Mahdia water intake/weir, the source waters are much further away and upstream. The receptor sensitivity is, therefore, considered low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Based on a small magnitude and low sensitivity, the initial impact significance is assessed as <b>negligible</b> .				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Following the implementation of standard mitigation measures, the residual impact magnitude remains negligible, resulting in an overall residual impact significance of negligible.				

**TABLE 7.3 IMPACTS ON GROUNDWATER DURING PRE-CONSTRUCTION / CONSTRUCTION - CONTAMINATION DURING THE HANDLING OF FUEL, OIL, AND CHEMICALS**

Significance of Impact				
Impact	Contamination during the handling of fuel, oil and chemicals.			
Impact Nature	Negative	Positive		Neutral
	The potential contamination of groundwater during the handling of fuel, oil and chemicals is negative.			
Impact Type	Direct	Indirect		Induced
	Contamination risk arises immediately from construction activities involving fuel handling, refuelling, and chemical use.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	While minor spills may occur during construction, these will be managed in accordance with existing control measures. As a result, the associated impact is expected to be short-term in duration.			
Impact Extent	Local	Regional		International
	Confined to areas where fuel and chemicals are stored or handled, but potential migration through groundwater could extend slightly beyond the footprint.			
Impact Scale	Impact scale is considered localised and small, limited to specific handling and storage zones, though severity depends on spill size and soil permeability.			
Frequency	Intermittent linked to refuelling and chemical handling events; not continuous but recurring throughout construction.			

Significance of Impact					
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Small – depends on spill volume and response time; generally low if mitigation measures are implemented promptly.				
Receptor Sensitivity	Low		Medium		High
	While the project is 500 m to the Mahdia water intake/weir, the source waters are much further away and upstream. Therefore, the receptor sensitivity is assessed low.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Based on a small magnitude and low sensitivity, the initial impact significance is assessed as <b>negligible</b> .				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Following the implementation of standard mitigation measures, the residual impact magnitude remains negligible, resulting in an overall residual impact significance of negligible.				

## 7.3 IMPACTS FROM OPERATION PHASE

### 7.3.1 POTENTIAL IMPACTS

Open pit mining, which requires deep excavations that reach below static groundwater level might impose potential environmental impacts on groundwater resources. In order to maintain safe and stable conditions for mining during the operational phase of the Project, the open pit area needs to be dewatered. The dewatering process can potentially modify the water balance which might further create potential impacts on nearby water sources. To understand, potential groundwater inflow rates to the open pits, the numerical groundwater flow model was used (Section 7.3.1.1).

During the operation phase, the Project could result in the following types of potential impacts:

- **Impacts on groundwater volumes and flow patterns:** Dewatering of the aquifers around the opencast pit areas will continue during the mine's life. As each pit area increases in depth and extent, the vertical drawdown and zone of influence of the groundwater level drawdown around each pit area will increase. This will alter natural groundwater gradients and flow directions, potentially reducing groundwater availability in surrounding aquifers.
- **Impacts on surrounding groundwater users:** The drawdown caused by pit dewatering may affect nearby groundwater users, including community water supply sources located within the radius of influence. Reduced water levels could lead to decreased well yields or reduction in base flow for springs and surface waters. The severity of this impact will

depend on the proximity of these users to the pit and the depth of their wells relative to the drawdown cone.

- **Impacts on stream flow volumes:** Lowering groundwater levels can reduce baseflow contributions to streams and wetlands in the area. This reduction in groundwater discharge may lead to decreased stream flow volumes, particularly during dry periods when baseflow is a critical component of stream hydrology. Such changes could affect aquatic habitats and surface water availability downstream.
- **Impacts on groundwater quality due to potential seepages from Waste Rock Dump (WRD) and Tailings Storage Facility (TSF):** There is a potential risk of seepage from the waste rock dump and tailings storage facility into underlying groundwater. These facilities may contain water with elevated concentrations of dissolved solids or other contaminants, which could infiltrate through permeable soils if not properly lined or managed. If seepage occurs, it could degrade groundwater quality over time, particularly in areas hydraulically connected to surface waters and/or nearby water supply sources.

#### 7.3.1.1 NUMERICAL GROUNDWATER FLOW MODEL

A numerical groundwater flow model was developed by GRE (2026) to simulate how the hydrogeological system responds to changes associated with mining activities. This model was applied to evaluate anticipated impacts on groundwater resources and the surrounding environment, particularly surface water systems, across the different phases of the proposed mining development.

Visual MODFLOW Flex was used as the groundwater modelling platform for this assessment. It is an industry-standard, finite-difference groundwater modelling software that provides an interface for configuring, running, and calibrating MODFLOW simulations in 3D. For this Project, GRE selected the MODFLOW-NWT solver to represent site conditions, because of its capability in nonlinear processes (such as drying and rewetting).

The model domain was defined to extend sufficiently beyond the main mine infrastructure to minimise boundary effects and to ensure adequate topographic coverage. GRE developed a finite-difference grid across all model layers to simulate groundwater conditions with maximum accuracy within and around the planned pit areas, while maintaining reasonable computational efficiency.

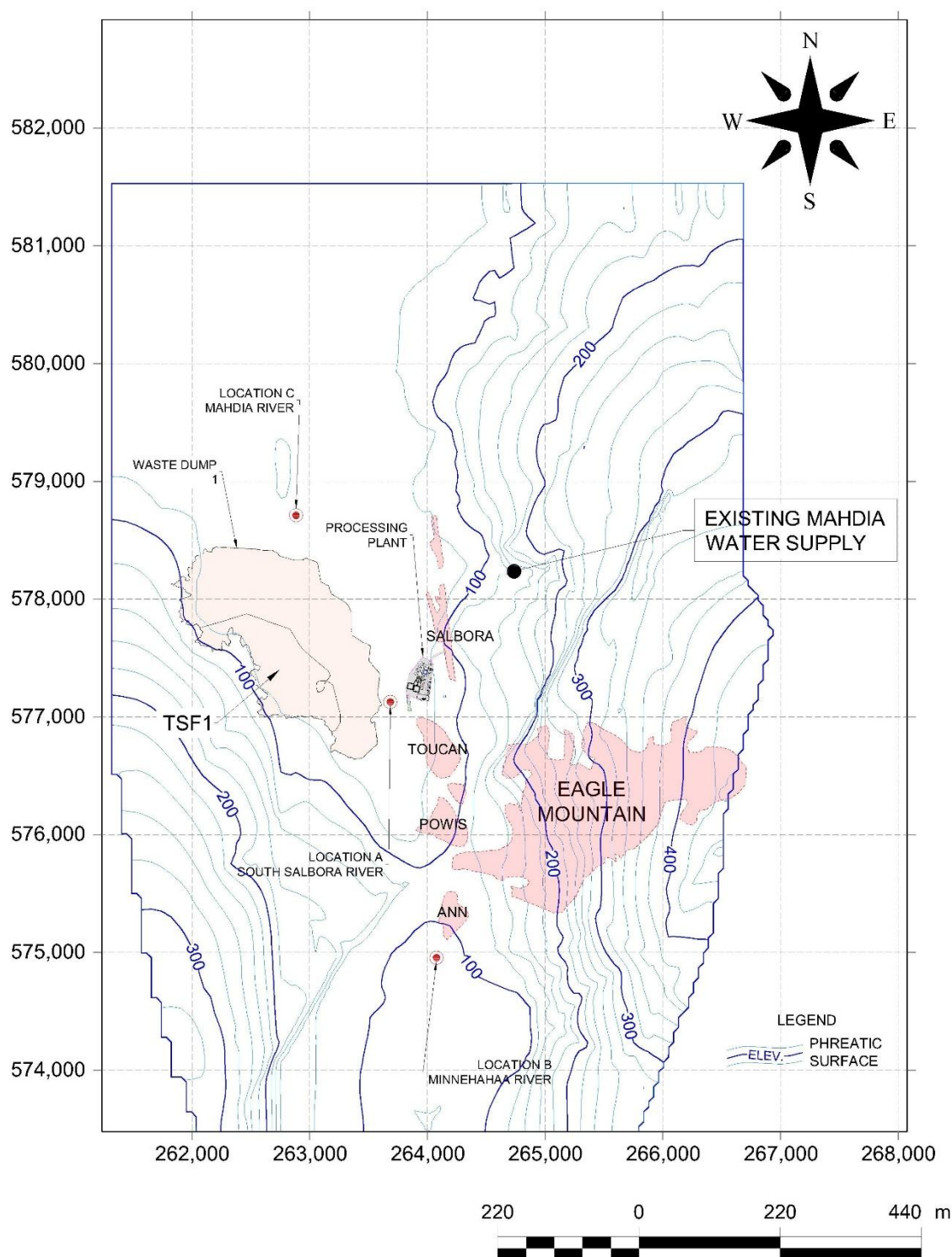
Details on the model hydraulic properties, boundary conditions and model calibration are given in GRE's full report in Appendix F.

#### 7.3.1.2 MODEL RESULTS

##### Groundwater Table

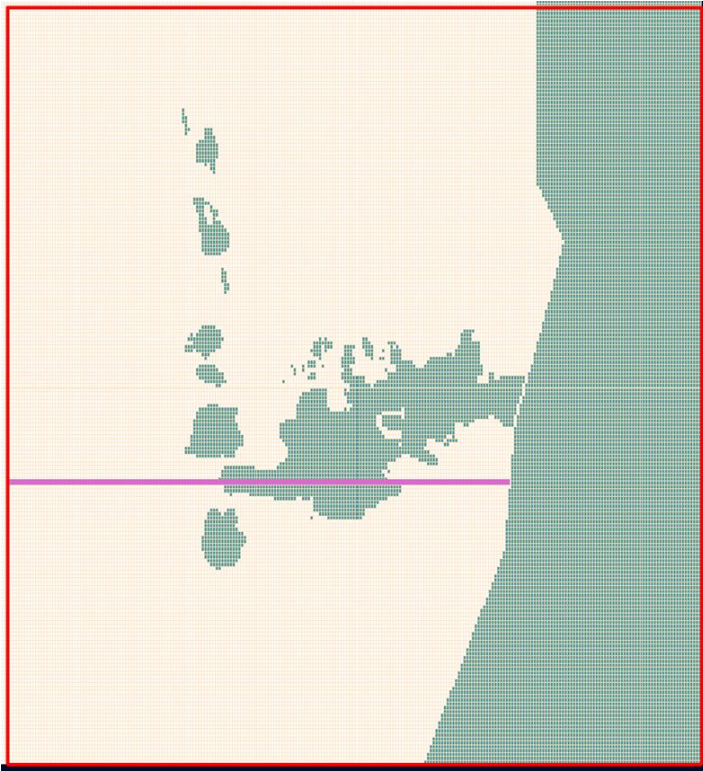
Figure 7.2 presents the pre-mining groundwater table for the project area, based on a steady-state simulation of the numerical groundwater flow model (GRE, 2026). Groundwater elevations vary spatially across the site, with contour values generally ranging from approximately 200 m to 400 m above sea level. Under pre-mining conditions, groundwater flow is from areas of higher groundwater elevation towards areas of lower elevation, including adjacent valley systems and river corridors.

FIGURE 7.2 PRE-MINING GROUNDWATER TABLE ELEVATION MAP



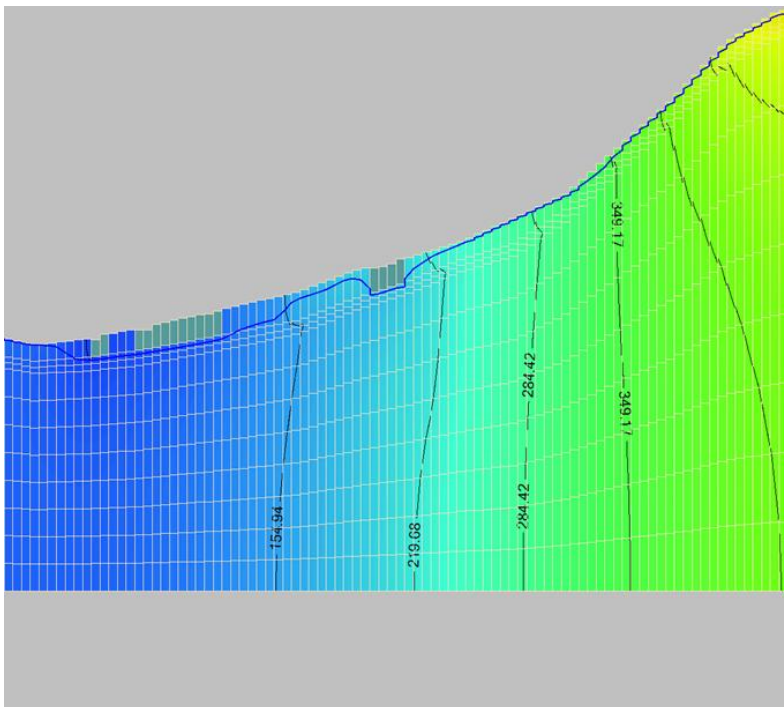
The numerical groundwater flow model, constructed by GRE (2026), simulated the drawdown of the water table resulting from pit dewatering activities. Figure 7.3 shows the location of the selected cross-section, while Figure 7.4 through Figure 7.7 illustrate how pit excavation influences the water table.

FIGURE 7.3 LOCATION OF CROSS-SECTION FOR TRANSIENT GROUNDWATER MODEL PITS WATER TABLE (PURPLE LINE)



Source: GRE, 2026

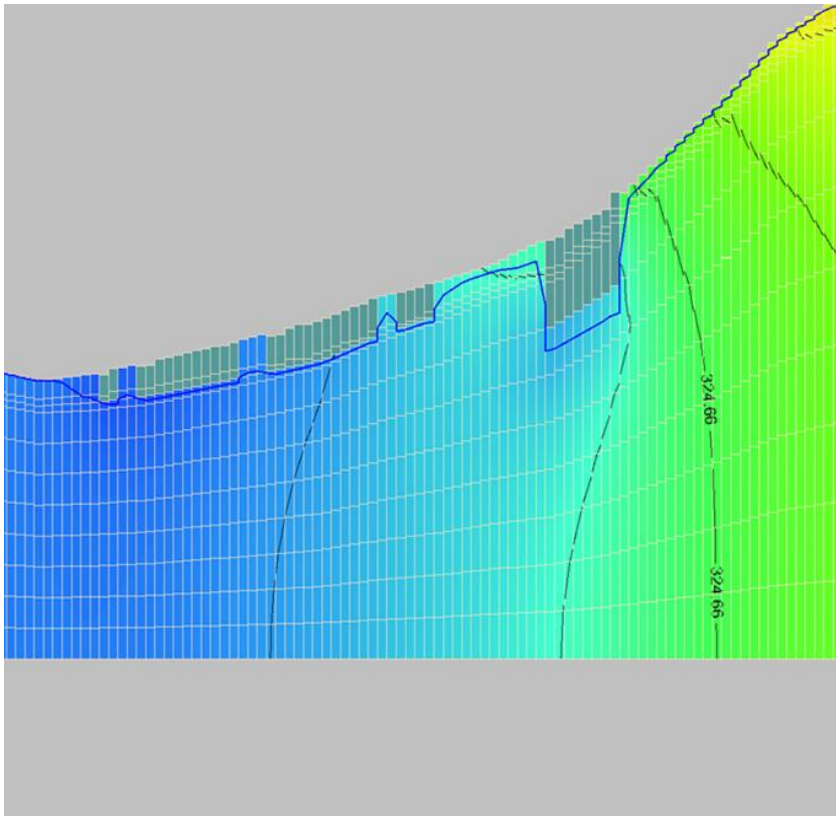
FIGURE 7.4 TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 1 WATER TABLE



Source: GRE, 2026

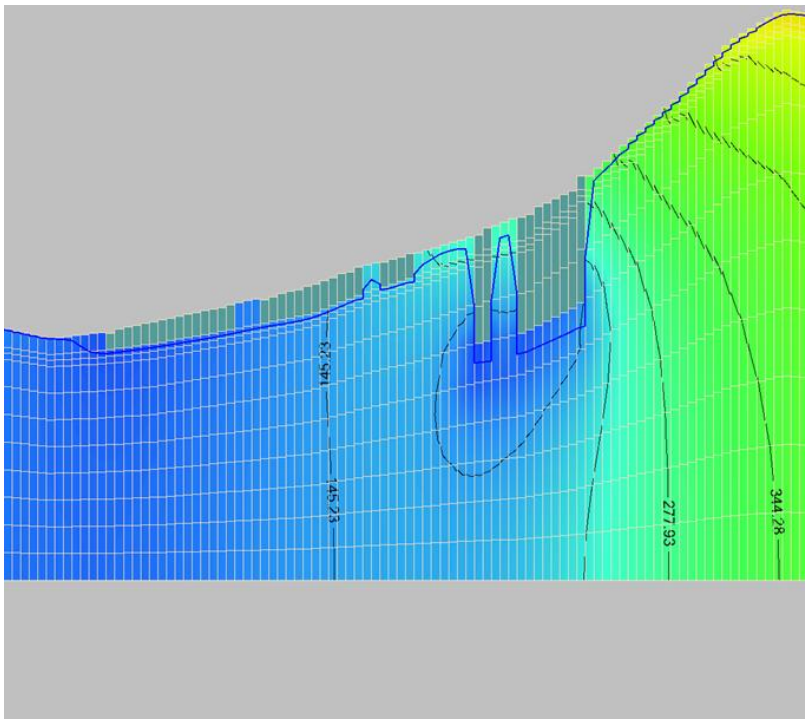


FIGURE 7.5 TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 3 WATER TABLE



Source: GRE, 2026

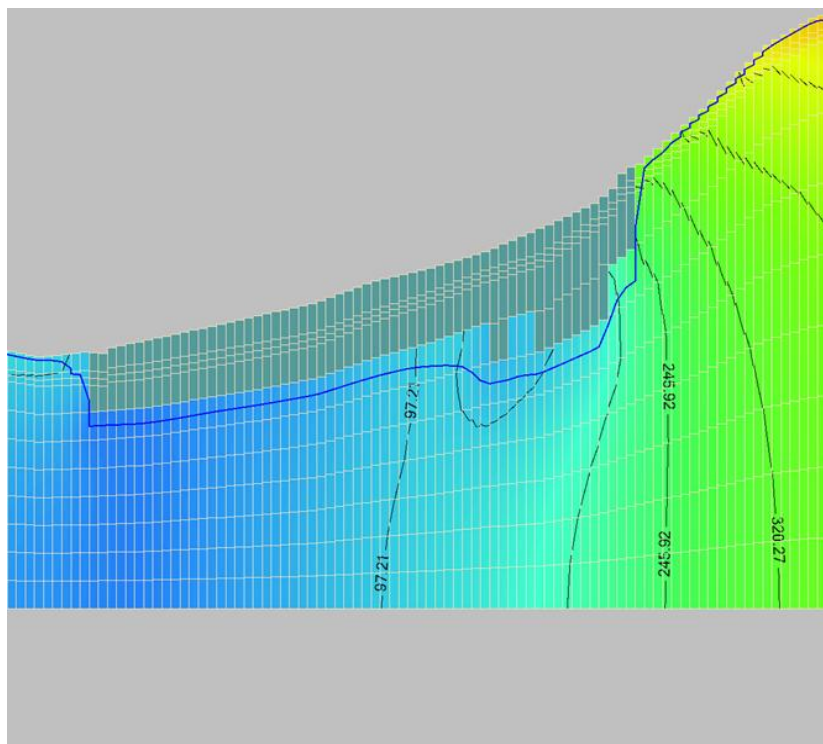
FIGURE 7.6 TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 7 WATER TABLE



Source: GRE, 2026



FIGURE 7.7 TRANSIENT MINING GROUNDWATER MODEL PITS YEAR 15 WATER TABLE



Source: GRE, 2026

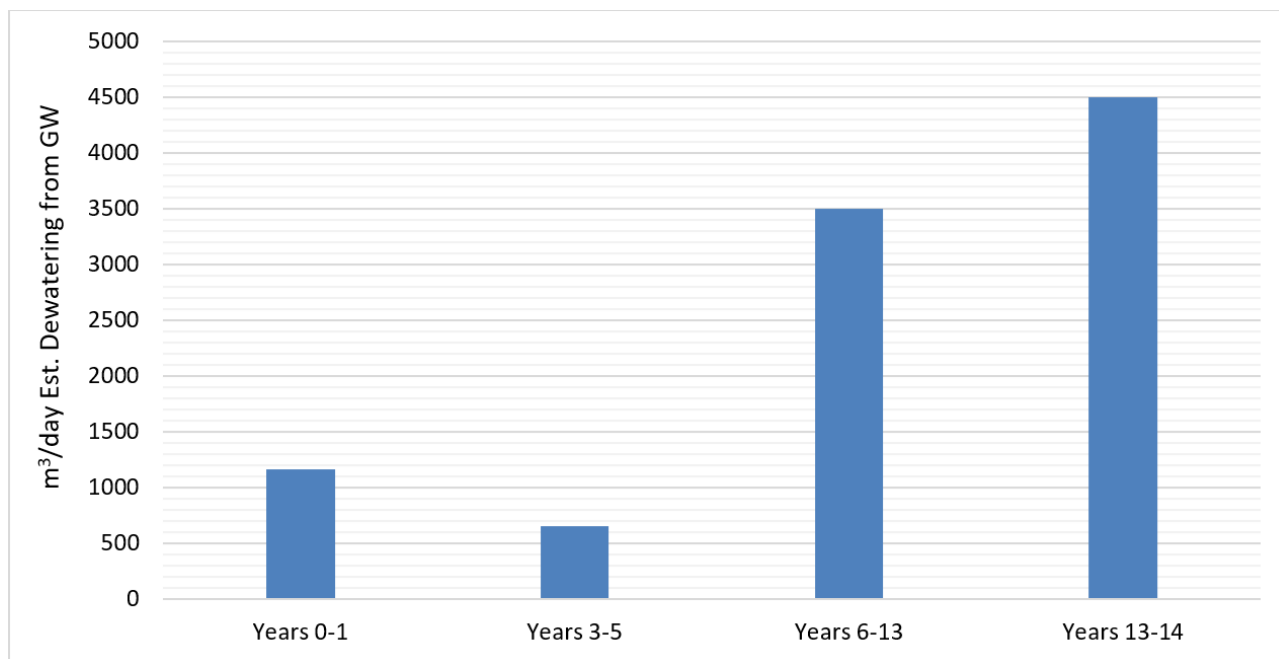
### Pit Dewatering

The primary purpose of the groundwater model is to estimate pit dewatering requirements and evaluate their effects on the groundwater system. To support this objective, GRE assigned Zone Budgets to the DRN boundary conditions surrounding the pits and along the river extents.

The Zone Budget tool in Visual MODFLOW Flex functions similarly to other zone assignments, but zones designated for budgeting are specifically used to quantify the volume of water entering or leaving a defined area. By comparing inflows and outflows within these zones, the model predicts pit dewatering rates for each pit and assesses associated changes in groundwater discharge to surface waters within the Mahdia and Minnehaha basins.

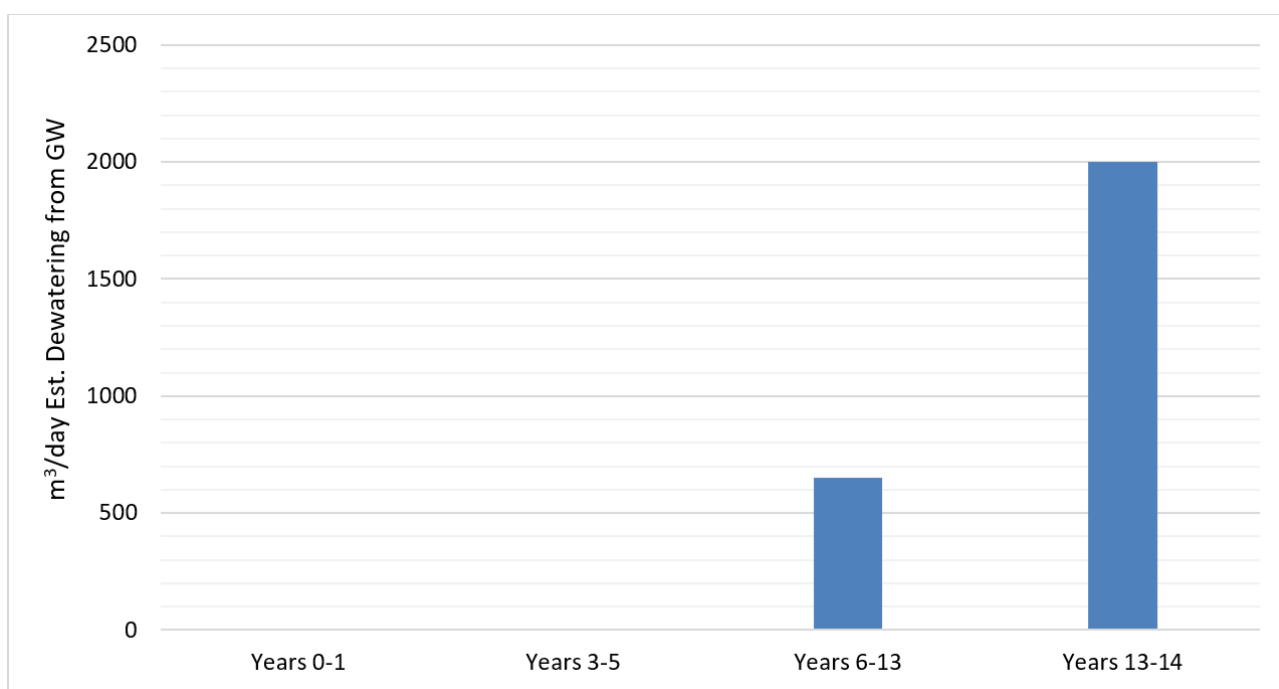
The estimated dewater rates are presented through Figure 7.8 through Figure 7.12. Pit dewatering predictions indicate higher groundwater inflows during the initial opening of each pit phase, reflecting model time discretisation rather than continuous pit development. Accordingly, stabilised inflows at each pit phase were used to estimate dewatering requirements. Dewatering rates generally increase with pit size and depth over mine life, with Salbora and Toucan showing higher inflows in later years, while Powis stabilises after early development. Eagle Mountain exhibits lower dewatering per unit area due to reduced alluvial and colluvial material, with inflows stabilising once the pit reaches its maximum extent. Maximum project-wide pit dewatering is estimated at approximately 140 L/s late in mine life.

FIGURE 7.8 ESTIMATED SALBORA PIT DEWATERING RATES



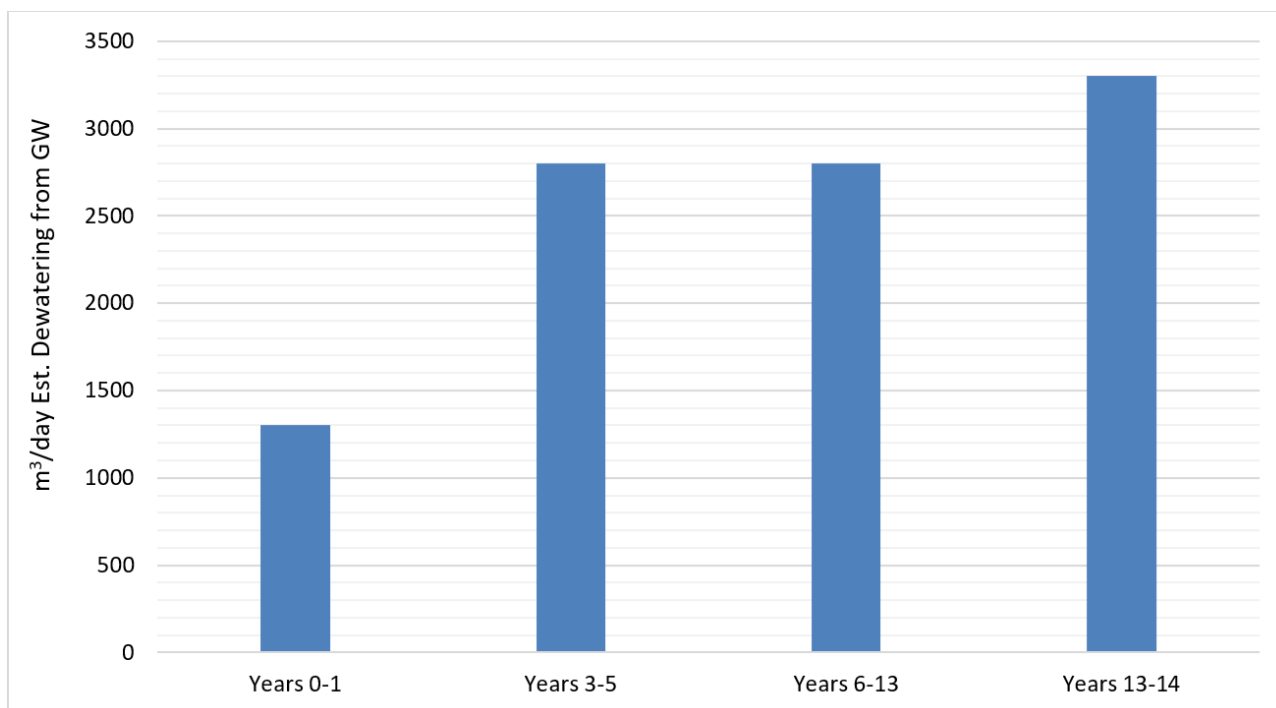
Source: GRE, 2026

FIGURE 7.9 ESTIMATED TOUCAN PIT DEWATERING RATES



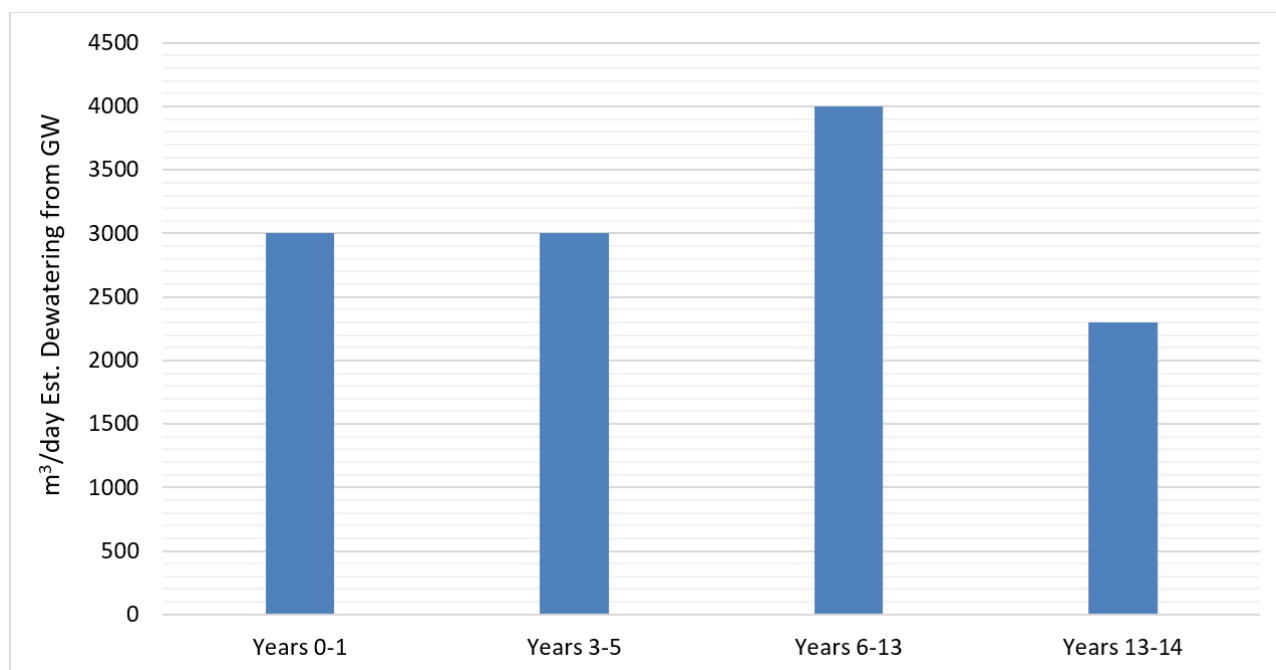
Source: GRE, 2026

FIGURE 7.10 ESTIMATED POWIS PIT DEWATERING RATES



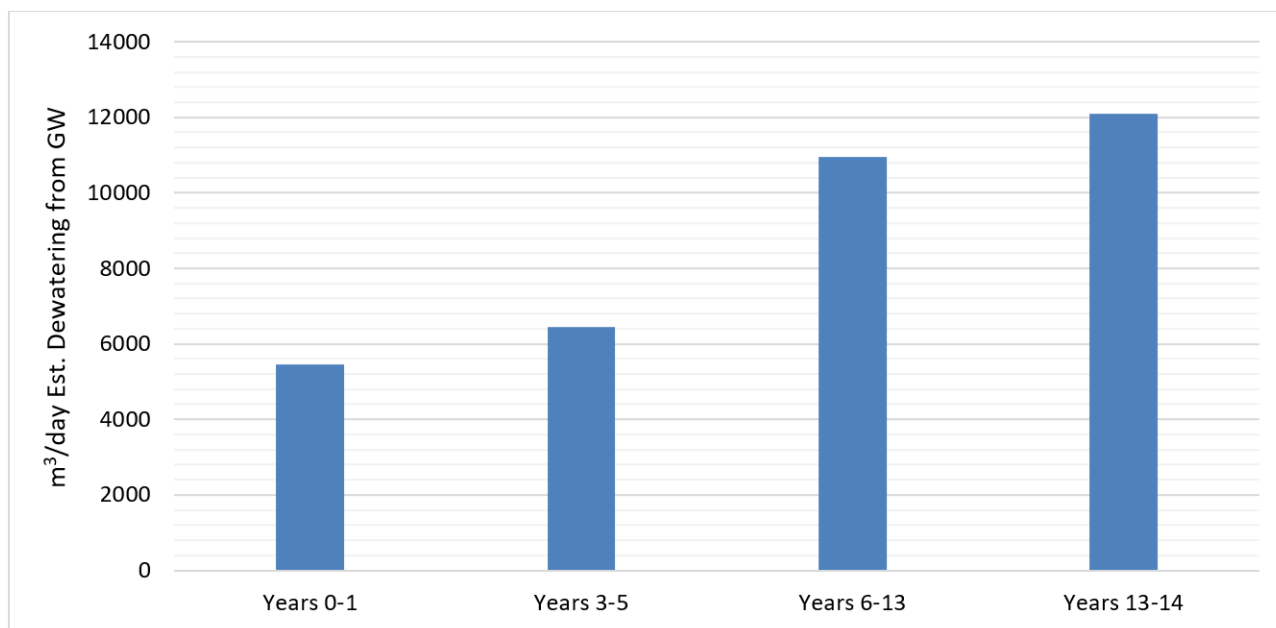
Source: GRE, 2026

FIGURE 7.11 ESTIMATED EAGLE PIT DEWATERING RATES



Source: GRE, 2026

FIGURE 7.12 ESTIMATED PROJECT-WIDE DEWATERING RATES



### Groundwater Inflows to Pits Compared to Direct Precipitation

The Eagle Mountain pit footprint is planned to be 2,488,079 m<sup>2</sup> at end-of-life. Total average annual precipitation for the last five years is expected to be ~ 4000 mm/year. This averages to ~27,500 m<sup>3</sup>/day of dewatering from direct precipitation. The maximum dewatering from the EM pit is ~4000 m<sup>3</sup>/day. This makes groundwater roughly 15% of the total annual dewatering requirement. It also makes it clear that the pit dewatering system must be sized based on rainfall and groundwater inflows, with rainfall always being the larger share.

### Estimated Drawdown

Pit dewatering and the landform changes within the pit footprint is expected to influence the local hydrogeological system. The groundwater model is capable of predicting water-level changes (drawdown) associated with pit dewatering, as well as simulating how these changes affect the volume of groundwater that would naturally discharge to nearby streams.

Drawdown due to the influence of pit dewatering throughout the selected mine years are shown in Figure 7.13 through Figure 7.16. At the end of mine life, drawdown effects are expected to be localised, while no significant drawdown is observed across the wider Mahdia drainage basin. The localised nature of the drawdown reflects several contributing factors:

- This is a high recharge environment. Drawdown is limited by infiltration from precipitation.
- Not much water is contained in the low-conductivity saprolite, transition, and hard rock zones. Most water in the project area is surface water.
- Low conductivity hard rock prevents the propagation of drawdown impacts.
- Dolerite dykes represent very low conductivity across the project. These dykes compartmentalise groundwater impacts by creating natural barriers between the pit and parallel drainage basins to the north (like the Mahdia water supply catchment).

The end-of-mine life (maximum) drawdown contours are constrained to the south side of the dolerite dykes and do not substantially extend beneath the Mahdia Water Supply catchment. Furthermore, they do not extend off the Project mine concession and do not impact any existing (or future) community groundwater well (GRE, 2026).

**FIGURE 7.13 END OF YEAR 1 WATER TABLE CONTOURS**

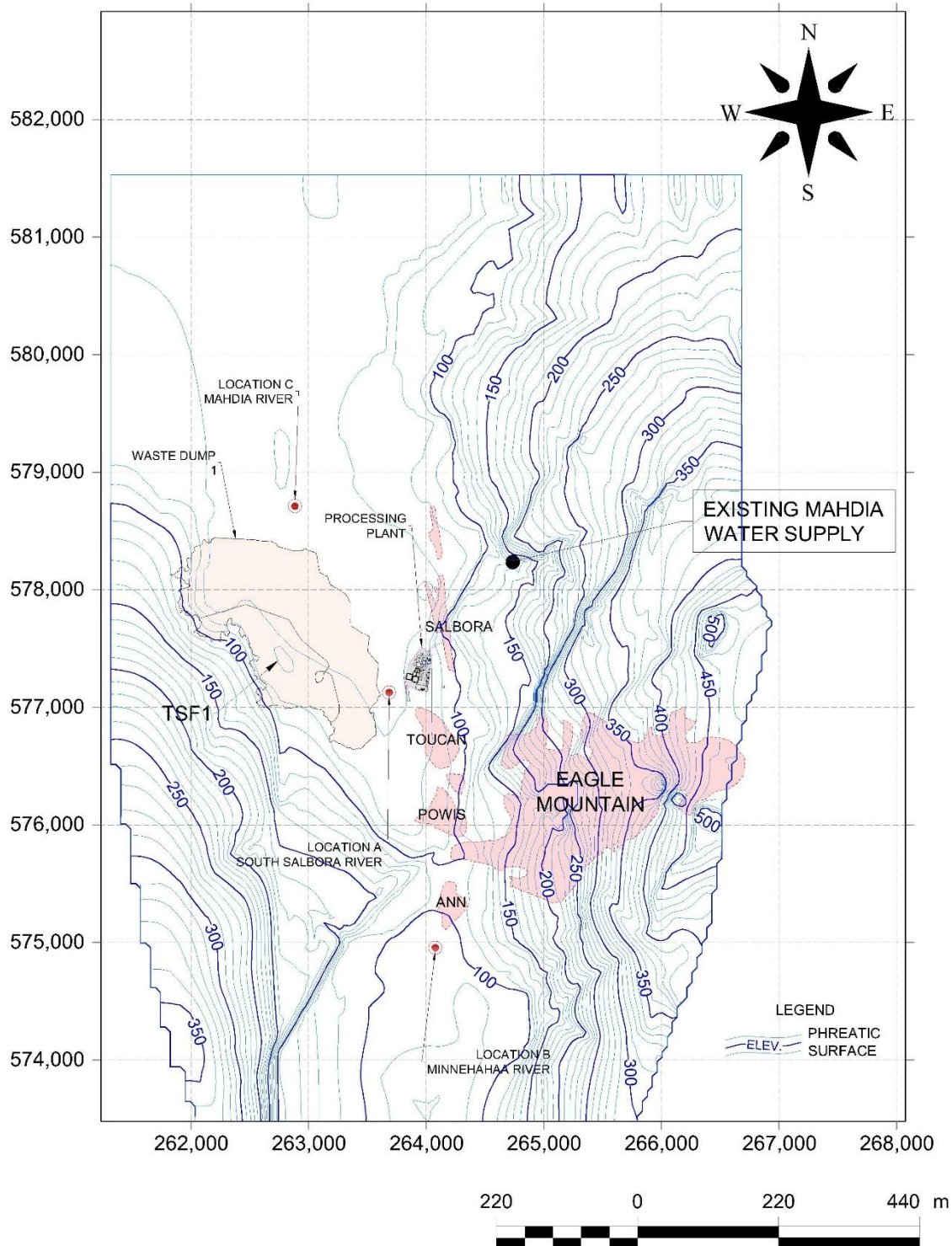




FIGURE 7.14 END OF YEAR 5 WATER TABLE CONTOURS

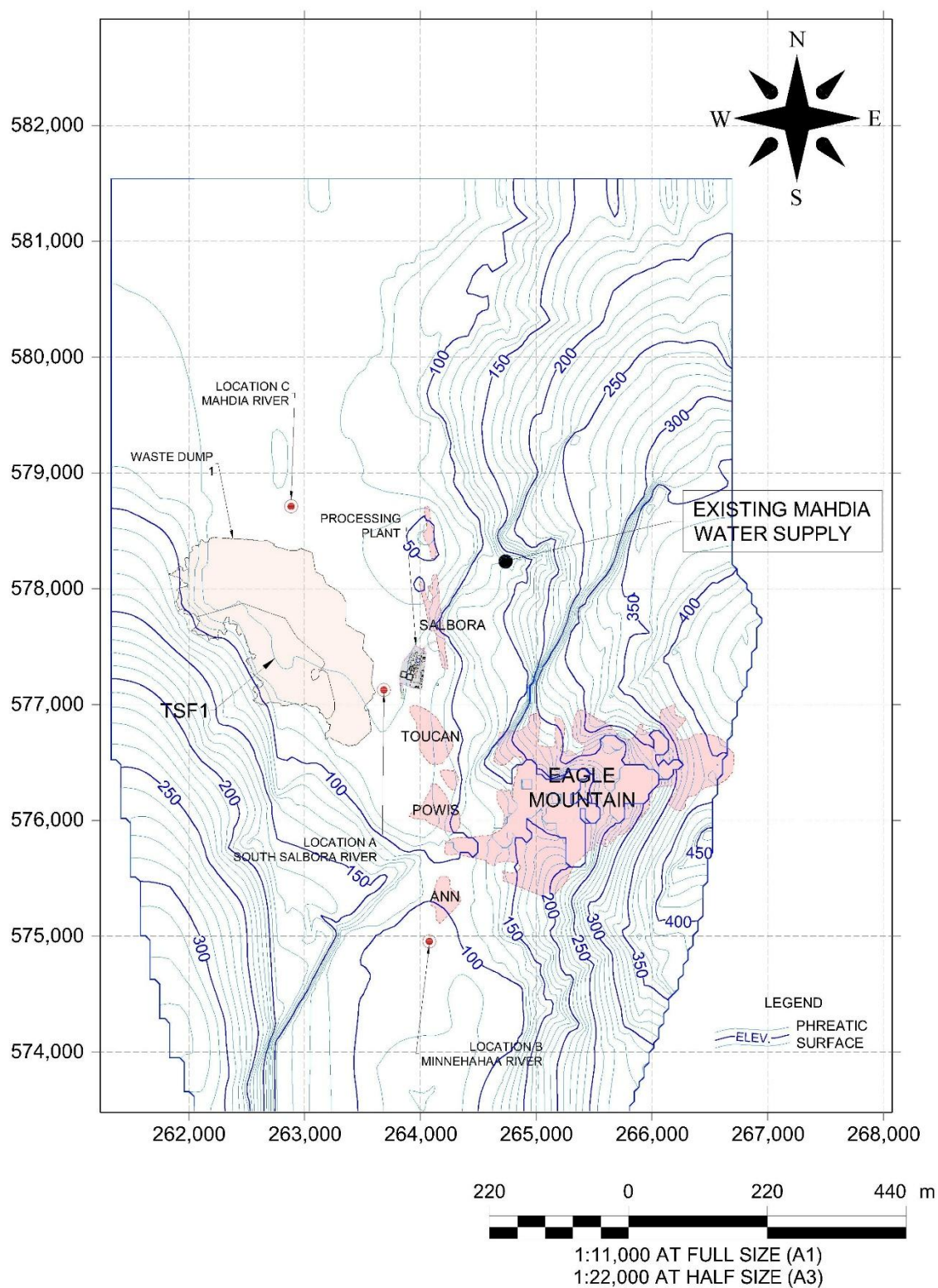




FIGURE 7.15 END OF YEAR 12 WATER TABLE CONTOURS

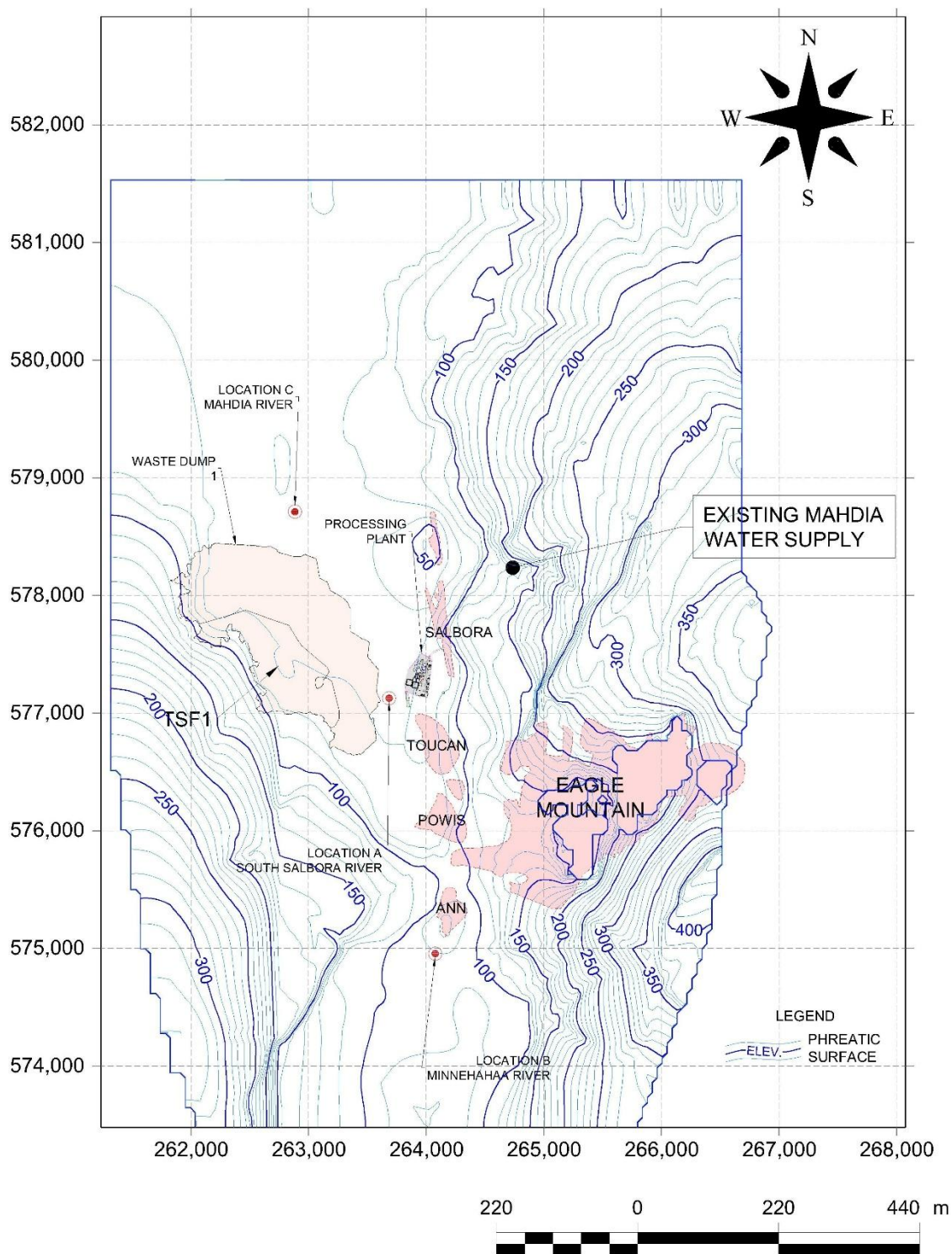
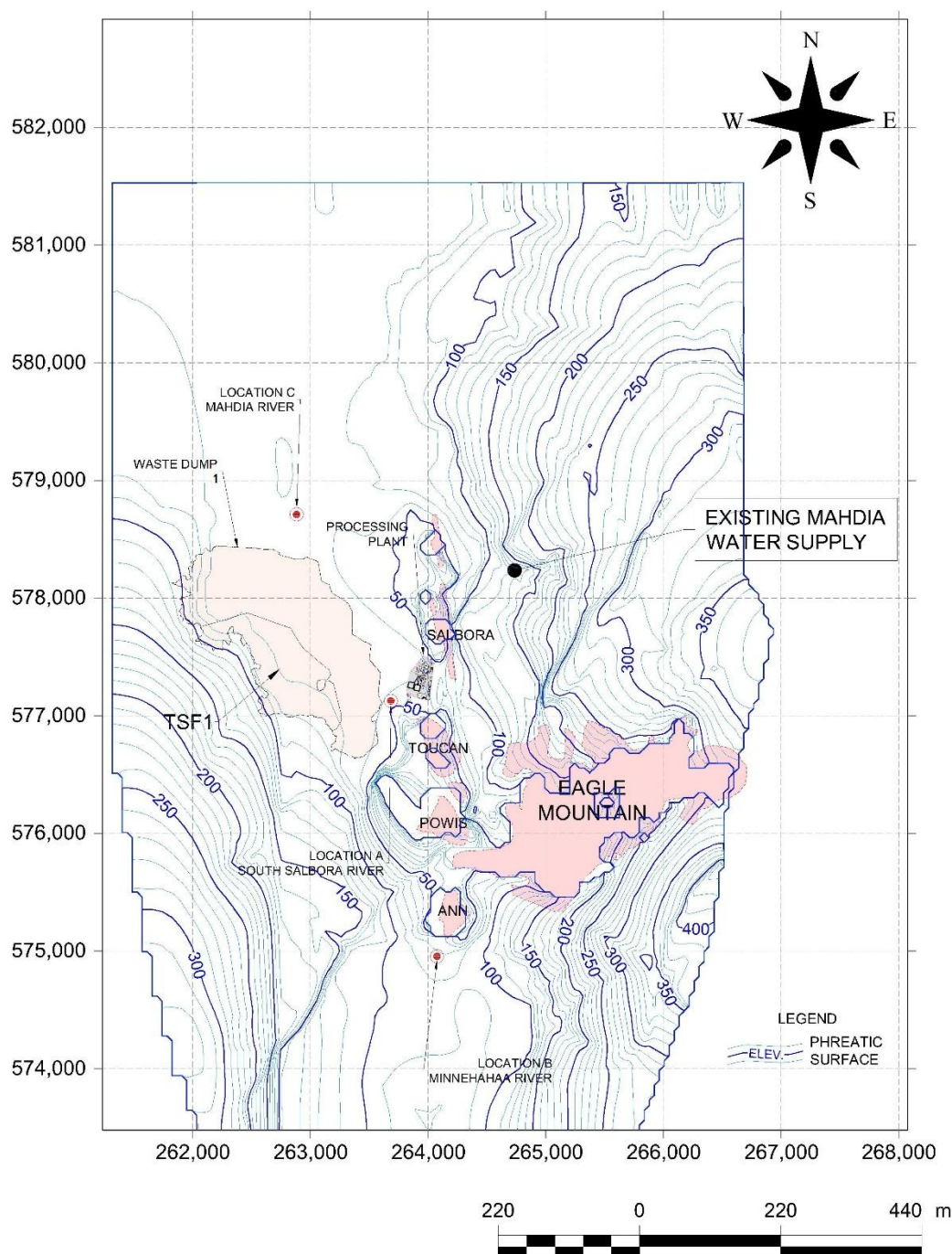


FIGURE 7.16 END OF MINE LIFE WATER TABLE CONTOURS



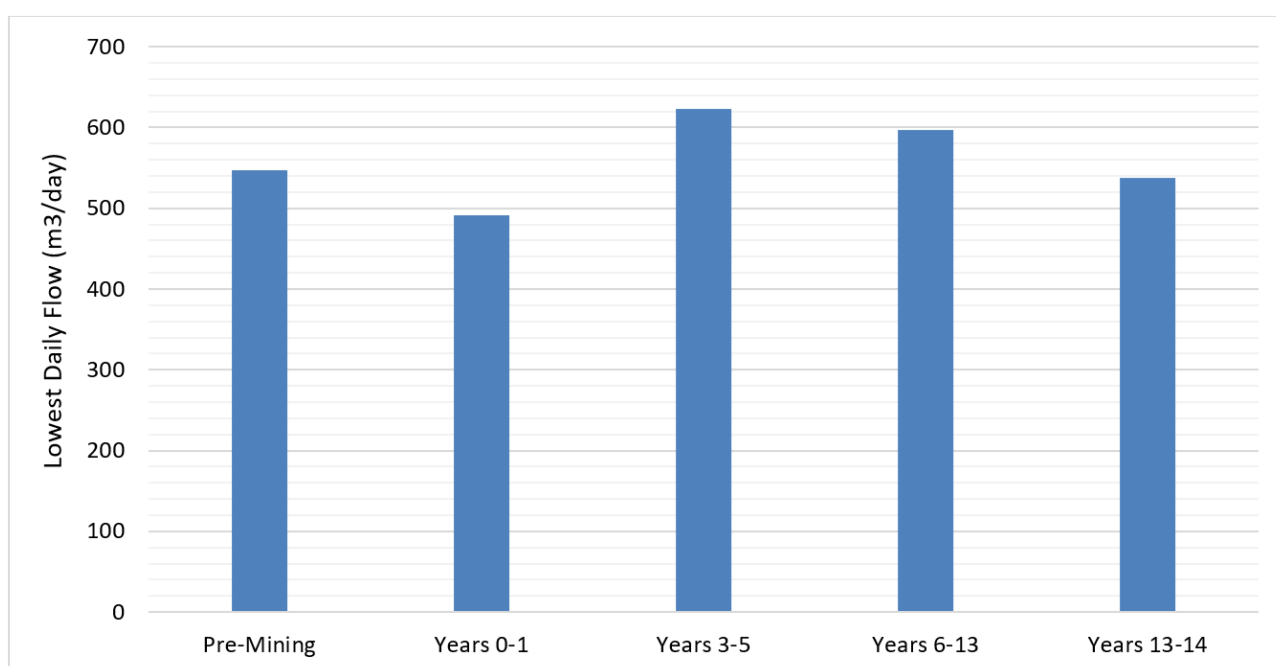
### Impacts on Mahdia Water Supply

As seen in prior figures, the Mahdia Water supply river drainage is northern, sub-parallel surface water drainage basin with no mining infrastructure (neither pits nor facilities). For the Eagle Mountain pit to have an impact on the Mahdia water supply, it must have drawdown propagate through a ridge which is partially defined by a dolerite dyke. The groundwater model contains two “zone budget” zones designed to determine any cross-basin impacts – one zone to see if the Salbora drawdown is impacting upstream, and one to see if the Eagle Mountain pit is impacting across the ridge and the dyke.

Zone budget results throughout the mine life show that nearly zero cross-basin exchange exists. Less than 5 m<sup>3</sup>/day (0.06 L/s). The deepening of the EM pit has no significant impact on the flux through a plane drawn along the southern ridge of the Mahdia water supply drainage basin

The impact downstream is equally insignificant. The zone between the Salbora pit and water supply tracks the changes in east-west water flow downgradient. Throughout mine life, flow across this boundary varies from 20 m<sup>3</sup>/day to 70 m<sup>3</sup>/day (0.2 L/s to 0.8 L/s) this change is well within the error range of the PFS-level groundwater flow model and shows no significant impacts. As for the Mahdia water supply itself, assessing impacts is best done by looking at the minimum flows – the lowest flow of the calendar year. Figure 7.17 compares the pre-mining steady state benchmark to the minimum result from each of the “boxcar” models.

**FIGURE 7.17 MINIMUM FLOW (BASEFLOW) COMPARISON AT THE MAHDIA WATER SUPPLY**



### 7.3.1.3 MODEL LIMITATIONS

The groundwater model is based on PFS-level data. GRE (2026) states that this data, by nature, is limited because the Project is in an early stage of development. Additional water level data, and hydrogeologic testing is required to better-characterise the aquifer conditions and to better assess the groundwater system. Furthermore, the project will have a different mine plan after it has been optimised during more-rigorous study phases.

### 7.3.2 EXISTING CONTROLS / DESIGN MITIGATION

A groundwater monitoring program has been established in the Project area. Currently, a total of 8 monitoring wells have been installed. The details of the monitoring wells are presented in the groundwater baseline chapter of this EIA report (Chapter 8).

The monitoring program entails:

- Groundwater level measurements,

- Quarterly collection of groundwater samples for chemical analysis.

Groundwater monitoring is done following international best practice guidelines including equipment handling and decontamination, taking of field measurements, low flow sampling procedures, as well as QAQC practices such as collecting field blanks, equipment blanks, and duplicate samples. The collected samples are submitted to an accredited laboratory for analysis. The suite of analyses includes general chemistry (pH, EC, TDS, etc.), cation and anions, metals, and others.

The results from the quarterly monitoring are analysed and interpreted. Time series trends are identified and sources of impacts on the groundwater levels and qualities are identified.

The monitoring program should be dynamic, with changes made (additional wells installed, chemical analysis suite of parameters changed) as required to adapt to the evolving mining operations. Changes that may require changes in the monitoring program could include changes to the surface layout such as additional stockpiles or surface facilities requiring installation of additional monitoring wells.

#### 7.3.2.1 WASTE STORAGE FACILITY (WSF)

The waste storage facility (WSF) is not expected to be lined at the base due to its size and chemical composition, although an impermeable base and walls can be formed from the clay rich saprolite to contain any potentially acid forming (PAF) rock identified, internal of the main landform. This will reduce the impact of poor-quality leachate seeping from the WSF into the underling soils and eventually joining the saturated zone.

The WSF benches may vary in height to facilitate drainage toward the working crest while avoiding ponding water on top of the WSF. The WSF will be started at higher ground elevations to avoid the pooling of runoff or seepage at the toe of the facilities. These measures will reduce the impact on the groundwater quality.

#### 7.3.2.2 TAILINGS STORAGE FACILITY (TSF)

In the unlikely event that seepage is measured as to contaminate the groundwater, mitigation measures will be established to prevent seepage from reaching the receiving environment. Mitigation measures include collection and treatment of the tailings effluent to reduce concentrations of constituents of concern, enhancement of natural degradation of cyanide in the tailings pond, cut-off walls within or adjacent to the containment dams and dikes, sand drains for the interception and collection of seepage should it occur, and pumping wells for the return of seepage that is collected. The effectiveness of these mitigation measures will be tracked by monitoring wells located downstream of the TSF.

#### 7.3.2.3 FUEL STORAGE, OIL AND GAS TRAPS

Following measures will be applied for storing and handling for fuels, oil and gas:

- Hydrocarbon storage tanks shall be designed and constructed above ground (i.e. not buried).
- Hydrocarbon storage facilities (tanks and piping) shall have a system to detect leaks and recover products (e.g. visual inspections, active leak detection system, annual integrity testing).



- Secondary containment shall have a typical water permeability equivalent to untreated concrete.
- Hydrocarbon use, transfer, distribution, and storage facilities will be designed to control meteoric water, including drainage within and around containment areas.
- The hydrocarbon management system will reduce the risk to, and the potential impact on, the groundwater resource quality.
- Efficient oil and grease traps or sumps will be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas, and spill kits will be available with emergency response plans. Water quality in open storage systems (e.g. leachate areas, solution ponds, and tailings ponds or impoundments) will be based on the results of a site-specific risk assessment with appropriate control measures put in place to mitigate the risk or meet the IFC EHS's effluent guideline values.

### 7.3.3 SIGNIFICANCE OF IMPACTS

#### 7.3.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

##### **Reduction in groundwater volumes and flow patterns and impacts on surrounding groundwater users**

The reduction in groundwater volumes and alteration of natural flow patterns arises from dewatering the open pits during operation. Dewatering lowers groundwater levels in the surrounding area and reduces the volume of groundwater available within the system. This constitutes a **negative** impact, as it represents a change in existing hydrogeological conditions and reduces the natural availability of groundwater resources.

The impact is classified as **direct** because the lowering of groundwater levels occurs as a direct consequence of active pumping from the aquifer system. Dewatering activities will continue for the duration of mining, meaning that reduced groundwater volumes and depressed water levels will persist over several years. For this reason, the duration of the impact is considered **long-term**.

Groundwater modelling indicates negligible cross-basin groundwater exchange throughout mine life. Drawdown from the Eagle Mountain and Salbora pits does not result in meaningful changes to groundwater flux toward the Mahdia water supply basin. This spatial extent remains confined to the near mine area, and therefore the impact extent is classified as **local**.

Taking these characteristics together, the impact magnitude is assessed as **small**. As the model outputs indicate negligible cross-basin groundwater exchange throughout mine life, no significant impact is expected on Mahdia Water Supply intake/weir. However, the sensitivity of receptors is considered **medium** given the local communities rely on groundwater and surface water for drinking, domestic use, and agriculture.

Combining a small impact magnitude with medium receptor sensitivity results in the impact being rated as **minor** in significance.

##### **Impacts on stream flow volumes (baseflow)**

Potential impacts of pit dewatering on stream flow rates (baseflow) have been assessed in Surface Waters Impact Assessment in Chapter 6.

### Impacts on groundwater quality due to potential seepages from Waste Storage Facility (WSF) and Tailings Storage Facility (TSF)

Potential impacts arising from seepage from major surface stockpiles such as the WSF and TSF, if they were to occur, would be **negative**. These impacts are considered **direct**, as contaminated water from these sources may enter surface-watercourses without intermediate processes once mobilised.

While the Eagle Mountain lithologies do not indicate a significant potential for ARD or metal leaching under current assessment conditions, proactive planning remains essential. The impact, if any, would be **long term** while the influence is expected to remain **local**, due to low hydraulic conductivity values of the saprolite with **small** impact scale.

Geochemical static testing indicates a low overall risk of ARD formation, with only one of 50 waste-rock samples classified as potentially acid-generating and generally low metal enrichment. Although kinetic testing highlights a localised metal-leaching concern, it is associated with the transition material from Salbora, which is a rare rock type on site. The frequency of the impact is therefore not expected to be continuous. Considering this geochemical profile and the potential for sediment or metal mobilisation, the impact magnitude is assessed as **small**.

While the Mahdia Water Supply intake/weir is located upgradient of the Salbora Pit and physically separated from the WSF-2 and TSF drainage catchments, local groundwater remains sensitive. Consequently, receptor sensitivity is assessed as **medium**.

Overall, the combination of small magnitude and medium sensitivity results in a **minor** impact significance prior to mitigation.

### 7.3.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Following key measures will be employed to minimise / prevent potential impacts on groundwater during the operation phase of the Project.

- Implement phased and optimised pumping schedules to minimise unnecessary drawdown.
- Continuous monitoring of groundwater levels, pit discharge rates, and water quality will be carried out through open pit monitoring wells, village springs, and community water depots/fountains. Monitoring of mine water use for operational activities will also be performed to maintain an up-to-date mine water balance.
- Identify any additional nearby groundwater users (if any) and monitor their water sources (e.g. wells, natural springs, etc.) regularly.
- Where a dewatering related reduction in water availability at community water supply source locations is identified, appropriate alternative water supply options will be developed in consultation with affected communities, taking into account their water demand.
- Maintain communication with affected communities and share monitoring results transparently.
- Monitor stream baseflow and correlate with groundwater drawdown data.
- Consider controlled discharge of treated pit water to maintain ecological flow in critical streams during dry periods.



- Ensure the TSF is constructed on a low-permeability, compacted saprolite foundation to minimise seepage.
- Install interception trenches or pumping wells to capture and treat seepages and contact waters before it reaches groundwater.
- Maintain strict protocols for handling fuels and chemicals, including secondary containment and emergency spill kits.
- To effectively manage groundwater-related impacts during the operation phase, a comprehensive Water Resources Management Plan will be implemented. This plan will guide all water-related activities, ensuring sustainable use and protection of groundwater resources.
- A detailed technical study (i.e. updated and improved numerical modelling) will be completed to determine the number of dewatering wells and the optimal dewatering strategy. The findings of the numerical groundwater flow model will be compared with actual hydrogeological conditions observed during operations. The model will be calibrated using real inflow rates obtained during pit dewatering to ensure accurate water management and effective control of drawdown impacts.
- All required drainage and construction procedures will be applied to minimise impacts on soil hydrology and enhance infiltration. Interception channels will be constructed around the open pit, waste rock dump (WRD), tailings storage facility (TSF), and processing plant to divert runoff waters and prevent erosion. These measures will reduce the risk of seepage and protect groundwater quality.
- Seepage collection systems and diversion ditches will be installed for WSF and TSF to prevent contamination. Spill prevention protocols, secondary containment for fuel and chemical storage, and emergency response plans will remain in place throughout the operational phase.

### 7.3.5 RESIDUAL IMPACT SIGNIFICANCE

After implementing additional mitigations including water management measures and contamination prevention controls, the residual impact magnitude is **negligible** to **small**, resulting in an overall residual impact significance of **negligible** to **minor**. Impact assessments are provided in Table 7.4 to Table 7.5.

**TABLE 7.4 IMPACTS ON GROUNDWATER DURING OPERATION – IMPACTS ON GROUNDWATER VOLUME (FLOW PATTERN) AND SURROUNDING GROUNDWATER USERS**

Significance of Impact			
<b>Impact</b>	Reduction in groundwater volume and flow pattern due to mine dewatering.		
<b>Impact Nature</b>	<b>Negative</b>	Positive	Neutral
	The expected drawdown in the groundwater levels, and the reduction of the groundwater volumes available in the aquifers, are negative.		
<b>Impact Type</b>	<b>Direct</b>	Indirect	Induced

Significance of Impact					
	The reduction in groundwater volumes, and the associated lowering of the groundwater levels, in the surrounding aquifers is a direct impact due to dewatering of the aquifers.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Reduction in the groundwater volume will continue as long as mine dewatering takes place and is therefore classified as long-term.				
Impact Extent	Local	Regional	International		
	The spatial extent of drawdown remains confined to the near mine area, and therefore the impact extent is classified as <b>local</b> .				
Impact Scale	Impact scale is considered to be small.				
Frequency	Once the groundwater level is breached and dewatering starts, the impact will be continuous until post-closure.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is classified as small.				
Receptor Sensitivity	Low	Medium	High		
	No significant impact is expected on Mahdia Water Supply intake/weir. However, the sensitivity of receptors is considered medium given the local communities reliance on groundwater and surface water.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact magnitude is assessed as small while the sensitivity of the aquifers to dewatering is characterised as a medium. Based on this, the significance of the impact is rated as minor.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Groundwater drawdown as a result of dewatering is expected to continue throughout the operation phase. However, modelling indicates that impacts will remain confined to the near-mine area. Accordingly, the residual impact significance is assessed as minor.				

**TABLE 7.5 IMPACTS ON GROUNDWATER DURING OPERATION – IMPACTS ON GROUNDWATER QUALITY DUE TO POTENTIAL SEEPAGES FROM WRD AND TSF**

Significance of Impact					
Impact	Negative impacts on groundwater quality due to potential seepages from surface stockpiles such as the WSF, TSF as well as the pit and accidental hydrocarbon and chemical spills.				
Impact Nature	Negative	Positive		Neutral	
	Any impact on the groundwater quality will be negative.				
Impact Type	Direct	Indirect		Induced	
	Seepage from the surface stockpiles, as well as contamination from spills will cause a direct impact on the groundwater quality.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Once contamination reaches natural streams, water-quality effects may persist until the source is stabilised or controlled, especially for constituents associated with ARD/ML or metal mobilisation.				
Impact Extent	Local	Regional		International	
	The extent of the contaminant plume cannot yet be defined, as a transport model is required to characterise its migration. Given the relatively low hydraulic conductivity of the saprolite layer, any plume development is expected to remain confined to the immediate vicinity of the project units. On this basis, the impact is assessed as local.				
Impact Scale	Negligible	Small	Medium	Large	
	The potential for persistence seepage from large stockpiles is assessed as a small scale rating.				
Frequency	Once the groundwater is contaminated, the impact will be continuous.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Geochemical assessments indicate low ARD potential and generally low metal enrichment. Therefore, the magnitude is considered small.				
Receptor Sensitivity	Low	Medium		High	
	The receptor sensitivity is assessed as medium as groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Based on the low risk of ARD and moderate risk of metal leaching, and the existing controls in mine waste management, the impact magnitude is considered as small. Given groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area, receptor sensitivity is assessed as medium and the impact significance is rated as minor.				

Significance of Impact					
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	With the implementation of additional mitigation measures, the residual impact magnitude is expected to reduce to a negligible level, resulting in a negligible residual impact significance.				

## 7.4 IMPACTS FROM CLOSURE / POST-CLOSURE PHASE

During the closure phase of the Project, mining activities will cease, and the site will undergo rehabilitation to restore stability and minimise residual risks. Based on the Conceptual Closure Plan (GRE, 2026), open pits will be typically allowed to fill with water, forming pit lakes, while waste storage facilities (WSFs) and tailings storage facilities (TSFs) will be capped or covered to reduce exposure to oxygen and water.

### 7.4.1 POTENTIAL IMPACTS

- **Recovery of Groundwater Levels and Pit Lake Formation:** As pits fill with water post-closure, pit lakes can become sources of contamination if water interacts with exposed mineralised surfaces or residual processing chemicals. Over time, contaminants may migrate from the pit lake into surrounding groundwater systems, depending on hydraulic gradients and connectivity.
- **Seepages from Waste Storage Facility (WSF) and Tailings Storage Facility (TSF):** After active operations cease, WSFs and TSFs remain potential sources of contamination. Residual sulphide-bearing materials can generate acid rock drainage (ARD) when exposed to oxygen and water, mobilising metals such as arsenic, selenium, and others. Seepage from these facilities can infiltrate groundwater, especially if containment measures degrade over time. Long-term management strategies, such as cover systems, seepage collection, and water treatment, are essential to minimise these risks.

Following closure, the open pits will gradually fill with water, forming pit lakes. Based on the geochemical characterisation outlined in Volume 2: Chapter 9, these lakes are not expected to present water quality issues (GRE, 2026). Over time, the pit lakes will integrate into the regional hydrogeologic system, receiving seepage from upgradient sources and contributing to downgradient flows. GRE (2026) indicates that while local rivers are anticipated to maintain similar flow dynamics as before mining, the presence of pit lakes may help stabilise seasonal variations, resulting in higher baseflow conditions during dry periods.

It is important to note that this assessment has been prepared based on the technical study conducted by GRE (2026). At this stage, no estimations have been completed regarding the timeline for pit lake formation following mine closure or the potential water quality characteristics of the pit lakes post closure. Consequently, this report does not include predictions or modelling related to these aspects. Future studies will be required to evaluate

the rate of pit lake formation, hydrogeochemical evolution, and any associated environmental considerations. Until such analyses are undertaken, the information presented herein should be interpreted as preliminary and focused on currently available data.

### 7.4.2 EXISTING CONTROLS / DESIGN MITIGATION

Following controls and actions will be employed to minimise / prevent potential impacts on groundwater during closure / post-closure phase of the Project.

- Groundwater monitoring wells around pit lakes and other Project units will be conducted on a regular basis to track water levels and quality over time.
- WSF and TSF will be capped by a closure cover to minimise their exposure to atmospheric conditions.
- Surface water diversion channels will be constructed to minimise runoff entering WSFs and TSFs, therefore minimising infiltration.

### 7.4.3 SIGNIFICANCE OF IMPACTS

#### 7.4.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

##### Recovery of Groundwater Levels and Pit Lake Formation

The cessation of mine dewatering during closure will lead to the recovery of groundwater levels, which is considered a **positive** impact. As pumping stops, aquifers will gradually return to their natural state, improving groundwater availability for surrounding ecosystems and potential future uses. This recovery represents a direct consequence of stopping dewatering activities, making it a **direct** impact without intermediate processes.

The recovery of groundwater volumes will be a permanent impact, as aquifers stabilise and maintain pre-development conditions over the long term. This spatial extent remains confined to the near mine area, and therefore the impact extent is classified as **local**. While localised, the improvement is significant, and the impact scale is assessed as **medium**.

Groundwater recovery will occur **continuously** until equilibrium is achieved, after which water levels will stabilise near pre-mining conditions. Based on these characteristics, the impact magnitude is rated as **medium**, reflecting the improvement in groundwater conditions. The receptor sensitivity is considered **medium**, given that groundwater and surface water resources are the primary sources for domestic, drinking, and agricultural use in the area.

Overall, the impact significance is classified as **moderate**, as the recovery of groundwater levels and volumes represents an improvement toward pre-mining conditions.

Potential Seepages from Waste Storage Facility (WSF) and Tailings Storage Facility (TSF) During the closure and post-closure phase, any seepage from surface stockpiles such as the waste storage facility (WSF) and tailings storage facility (TSF), as well as open pits will negatively affect groundwater quality. If occurs, this would be a **negative** impact, as contamination from these sources can degrade water quality and pose risks to surrounding ecosystems and water users.

While the Eagle Mountain lithologies do not indicate a significant potential for ARD or metal leaching under current assessment conditions, proactive planning remains essential. The

impact, if any, would be **long term** while the influence is expected to remain **local**, confined to channels downstream of the WSF and TSF footprints with **small** impact scale.

Geochemical static testing indicates a low overall risk of ARD formation, with only one of 50 waste-rock samples classified as potentially acid-generating and generally low metal enrichment. Although kinetic testing highlights a localised metal-leaching concern, it is associated with the transition material from Salbora, which is a rare rock type on site. The frequency of the impact is therefore not expected to be continuous. Considering this geochemical profile and the potential for sediment or metal mobilisation, the impact magnitude is assessed as **small**.

While the Mahdia Water Supply intake/weir is located upgradient of the Salbora Pit and physically separated from the WSF-2 and TSF drainage catchments, surface-water resources remain sensitive due to their domestic and agricultural use. Consequently, receptor sensitivity is assessed as **medium**.

Overall, the combination of small magnitude and medium sensitivity results in a **minor** impact significance prior to mitigation.

#### 7.4.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Following key measures will be employed to minimise / prevent potential impacts on groundwater during the closure / post-closure phase of the Project.

- Periodically refine the groundwater flow model using operational monitoring data to simulate pit lake formation processes.
- Develop a water balance to understand pit lake hydrology and seasonal variations.
- Use groundwater quality monitoring data collected during operations to predict pit lake water quality during closure and update water management measures accordingly.
- Use the refined numerical groundwater flow model to simulate contaminant transport from the base of WRDs, TSFs, and pit lakes during closure, informing adaptive management strategies.
- Continue groundwater and surface water monitoring programs to detect any changes in water quality and respond promptly.

#### 7.4.5 RESIDUAL IMPACT SIGNIFICANCE

After implementing additional mitigations and improve the understanding on pit lake formation processes, the residual impact magnitude is **positive to negligible**, resulting in an overall residual impact significance of **negligible**. Impact assessments are provided in Table 7.6 to Table 7.7.

**TABLE 7.6 IMPACTS ON GROUNDWATER DURING CLOSURE / POST-CLOSURE – RECOVERY OF GROUNDWATER LEVELS AND PIT LAKE FORMATION**

Significance of Impact			
<b>Impact</b>	Recovery of the groundwater due to mine dewatering being stopped.		
	Negative	<b>Positive</b>	Neutral



Significance of Impact					
Impact Nature	The groundwater levels will continue to recover, which is considered to be a positive impact.				
Impact Type	Direct	Indirect		Induced	
	The increase in groundwater volumes, and the associated recovery of the groundwater levels, in the surrounding aquifers is a direct impact.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Recovery of the groundwater volume will be a permanent impact.				
Impact Extent	Local	Regional		International	
	This spatial extent remains confined to the near mine area, and therefore this positive impact is local in extent.				
Impact Scale	Impact scale is considered to be medium.				
Frequency	Recovery of the groundwater levels will be continuous until seasonal equilibrium is achieved, and the water levels stabilise near pre-development levels.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be medium.				
Receptor Sensitivity	Low	Medium		High	
	The groundwater and surface water resources are the main sources of water for domestic, drinking, and agricultural use.				
Impact Significance	Negligible	Minor	Moderate		Major
	The groundwater levels and volumes in the aquifers will recover over time to near pre-mining conditions and is classified as a medium impact. The sensitivity of the aquifers to rewatering is characterised as a medium level. Based on this, the significance of the impact is rated as moderate.				
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate		Major
	Recovery of the groundwater levels is a positive impact. Unless surface runoff is diverted out of the pit (not currently planned), the rate of recovery will be dependent on natural conditions.				

**TABLE 7.7 IMPACTS ON GROUNDWATER DURING CLOSURE / POST-CLOSURE – POTENTIAL SEEPAGES FROM WRD AND TSF**

Significance of Impact					
Impact	Impacts on groundwater quality due to potential seepages from surface stockpiles such as the WSF, TSF as well as the open pits.				
Impact Nature	Negative	Positive	Neutral		
	Any impact on the groundwater quality will be negative.				
Impact Type	Direct	Indirect	Induced		
	Seepage from the surface stockpiles, as well as contamination from spills will cause a direct impact on the groundwater qualities.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Once contamination reaches natural streams, water-quality effects may persist until the source is stabilised or controlled, especially for constituents associated with ARD/ML or metal mobilisation.				
Impact Extent	Local	Regional	International		
	The extent of the contaminant plume cannot yet be defined, as a transport model is required to characterise its migration. Given the relatively low hydraulic conductivity of the saprolite layer, any plume development is expected to remain confined to the immediate vicinity of the project units. On this basis, the impact is assessed as local.				
Impact Scale	Impact scale is considered to be small.				
Frequency	Once the groundwater is contaminated, the impact will be continuous.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Geochemical assessments indicate low ARD potential and generally low metal enrichment. Therefore, the magnitude is considered small.				
Receptor Sensitivity	Low	Medium	High		
	The Mahdia Water Supply intake/weir is located upgradient of the Salbora Pit and positioned on the eastern side of the Mahdia River, whereas the WSF-1 and TSF are situated on the western hand side of the Mahdia River, and WSF-2 is situated downgradient of the Mahdia Water Supply intake/weir. The receptor sensitivity is assessed as medium as groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Based on the low risk of ARD and moderate risk of metal leaching, and the existing controls in mine waste management, the impact magnitude is considered as small. Given groundwater and surface water being the only sources for domestic, drinking, and agricultural use in the area, receptor sensitivity is assessed as medium and the impact significance is rated as minor.				

Significance of Impact					
Residual Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	With the implementation of additional mitigation measures, the residual impact magnitude is expected to reduce to a negligible level, resulting in a negligible residual impact significance.				

## 7.5 RECOMMENDATIONS FOR FURTHER WORK

Based on the review of the available hydrogeological studies and numerical groundwater modelling, several additional studies are recommended to improve the understanding of groundwater behaviour and to support future predictions and impact assessments.

- Review of the model layouts indicates that part of the eastern section of the Eagle Pit lies within an inactive zone, for which no numerical simulations have been undertaken. This area effectively acts as a no-flow boundary, limiting the model's ability to estimate groundwater drawdown and the radius of influence in this part of the Project area. It is therefore recommended that the model domain be refined and extended to ensure that the open pits are located at a sufficient distance from model boundaries, allowing more representative simulation of groundwater flow and drawdown.
- The existing groundwater model does not simulate pit lake formation processes, and consequently the recovery of groundwater levels during the post-closure period remains uncertain. ERM recommends incorporating pit lake formation into the numerical model and undertaking a dedicated water balance assessment for the pits. This would provide improved understanding of long-term groundwater recovery, pit lake water levels, and post-closure hydraulic conditions.
- Transport modelling is recommended to assess potential contaminant pathways, estimate travel times, and evaluate risks to downgradient receptors under both operational and post-closure scenarios.
- Based on GRE's geochemical characterisation and kinetic testing results, the mining lithologies associated with the project do not currently indicate a risk for ARD generation or significant metal leaching. The results suggest that potential water quality risks are primarily associated with the discharge of excess mine water and are considered manageable under appropriate operational controls. In addition, no degraded pit lake water quality is anticipated based on the geochemical evidence available at this stage of the project.

## 8. BIOLOGICAL RESOURCES IMPACT ASSESSMENT

### 8.1 INTRODUCTION

This Chapter presents the Biological Resources impact assessment for the Eagle Mountain Gold Mine Project.

### 8.2 DEFINING AREA OF INFLUENCE

The Project Area of Influence (AoI) encompasses the Eagle Mountain Prospecting License (EMPL), including the Project facilities and associated infrastructure, including the mining pits and the existing Potaro-Konawaruk access road.

### 8.3 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

Potential impacts to biological resources were identified by assessing how the Project activities may interact with the flora, fauna, and habitats observed during the in-field surveys conducted between 2013 and 2021 by Environmental Management Consultants Inc. (EMC). Potential impacts on biological resources were informed by:

- Input from technical subject matter experts;
- Stakeholder consultations;
- Comprehensive site surveys; and
- Extensive literature reviews and research.

Resource-specific definitions and designations were assigned for the purposes of assessing impacts on biological resources and are detailed in Table 8.1.

**TABLE 8.1 IMPACT CHARACTERISTIC TERMINOLOGY FOR BIOLOGICAL RESOURCES**

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact on the Project (in terms of cause and effect)	Direct Indirect Induced
Duration	The period over which a biological resource is affected	Temporary Short-term Long-term Permanent
Extent	The “reach” of the impact (e.g., confined to a small area around the Project footprint, extending for several kilometres)	Local Regional National
Scale	The size of the impact (e.g., the fraction of biological resources that are lost or affected)	No fixed designations; can be a numerical value if appropriate
Frequency	A measure of the constancy or periodicity of the impact	Episodic Continuous
Magnitude	Determined by assessing the impact’s duration, extent, scale, frequency, and likelihood, magnitude indicates the degree of change imposed on a biological resource/receptor.	Positive Negligible Small Medium Large

Characteristic	Definition	Designations
Receptor Sensitivity	The sensitivity of a biological resource considers its ecological role, sensitivity to environmental changes, and significance at various levels. Legal protections, conservation status, stakeholder perspectives, and economic value are also considered.	Low Medium High
Impact Significance	Determined using a matrix that combines the sensitivity of the biological resource and the magnitude of the impact. The matrix ensures that impact significance ratings reflect both the level of impact and the sensitivity of the resource, with definitions provided to guide the interpretation of each rating (refer to Table 8.2).	Negligible Minor Moderate Major

The impact significance criteria for biological resources are set out in Table 8.2.

**TABLE 8.2 IMPACT SIGNIFICANCE CRITERIA FOR BIOLOGICAL RESOURCES**

Magnitude of impact	Definition	Designations
Negligible	An impact of negligible significance is one where a resource will essentially not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.	Minimal and indistinct
Small	An impact of small significance is one where a resource will experience a noticeable impact, but the impact magnitude is sufficiently small (with or without mitigation) and/or the resource has low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.	Noticeable but minor
Medium	An impact of medium significance has an impact magnitude within applicable standards but falls somewhere in the range from a threshold below which the impact is minor, up to a level approaching but not breaching a legal limit. The emphasis for moderate impacts is, therefore, on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable. This does not necessarily mean that impacts of moderate significance must be reduced to minor but that moderate impacts are being managed effectively and efficiently.	Moderate and well-managed
Large	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of impact assessment is to get to a position where the Project does not have any major residual impacts, certainly not ones that will endure into the long term or extend over a large area. However, there may be major residual impacts after all practicable mitigation options have been exhausted (i.e., as low as reasonably practicable has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project	Major and far-reaching

## 8.4 IMPACTS FROM PRE-CONSTRUCTION PHASE

### 8.4.1 TERRESTRIAL RESOURCES

#### 8.4.1.1 POTENTIAL IMPACTS

##### Loss and Degradation of Vegetation and Wildlife Habitat

Within the Project Area, the vegetation is classed as mixed tropical forest, with sub-classes determined largely by position on slopes from hilltops and ridges to valley bottoms and gullies (EMC, 2021). The Project will result in direct and indirect impacts on vegetation communities and wildlife disturbance, due to land clearing and grading will remove vegetation, while adjacent areas will experience altered drainage, and reduced humidity, which may contribute to disease, soil erosion, and habitat loss. It is estimated that approximately 4.14 km<sup>2</sup> (approximately 1,023 acres) of vegetation will be directly impacted by construction of Project facilities and access roads. Table 8.3 summarises the estimated direct impacts by mapped vegetation community.

TABLE 8.3 ESTIMATED HABITAT LOSS

Vegetation Community	Impacts	Approx. Area Impacted (acres)	Approx. Area Impacted (km <sup>2</sup> )
Intact Mixed Forest – upper slopes	Permanent clearing of intact mixed tropical forest for mine infrastructure and roads reduces interior forest area and creates new edges.	505	2.04
Riparian / Valley Mixed Forest	Removal and disturbance of trees such as crabwood–trysil forest along small waterways and valleys will reduce riparian cover and narrowing corridor width.	150	0.61
Secondary Mixed Forest – low-elevation areas	Clearing of already disturbed secondary forest in lower-elevation areas can cause loss of regenerating habitat.	305	1.23
Other disturbed / previously cleared areas	Expansion of existing clearings and highly modified areas, with limited additional loss of natural vegetation but some increase in forest edge.	63	0.26
<b>Total</b>		<b>1,023</b>	<b>4.14</b>

The Project will not only remove vegetation but also increase habitat fragmentation at the site scale. Placement of infrastructure in already disturbed and secondary forest at lower elevations reduces fragmentation of intact Mixed Forest on the slopes but will not eliminate it. Linear features such as access roads and corridors will create new edges and further separate intact upper-slope Mixed Forest from riparian/valley forest and secondary low-elevation forest, increasing edge-to-interior ratios and altering microclimate conditions along these edges.

Forest fragmentation as a result of vegetation clearing in some areas such as the TSF, could degrade habitat quality and possibly isolate wildlife populations within the Project Area by restricting movement, mating opportunities, and genetic diversity for less mobile species.



Species exhibit varying tolerance to fragmentation, for example, although jaguars tolerate moderate habitat alteration (Zanin et al., 2015; Horn et al., 2020), many species can face genetic bottlenecks as a result of isolation, increasing the risk of population decline and local extirpation (Rodrigues et al., 2024). Research also indicates that fragmentation from mining and other activities resulting in large scale habitat loss disproportionately affects larger species, such as the white-lipped peccary and lowland tapir, which are highly vulnerable to habitat loss and reduced connectivity (Ewers and Didham, 2006; Gaston and Blackburn, 1996; Lino et al., 2019). Fragmentation may also cause tree mortality in some species, particularly within the first 100 m of forest edge (Laurance et al., 1997; Numata et al., 2011). Edge effects may also further expose wildlife to human disturbance and predation.

### **Vegetative Metabolic Distress**

Dust from site preparation, clearing vegetation, and vehicle movement will settle on plants in and around the Project Area. This dust (particularly in the dry season) can block the tiny openings (stomata) on leaves, making it harder for plants to absorb light and moisture, which are needed for photosynthesis, respiration, and transpiration. Some plants, like lichens, mosses, young saplings, broad-leaved species, and ferns, are particularly sensitive to dust (Farmer 1993). Dust also changes the nutrients and other materials that collect on plant surfaces, such as the thin layer of organic compounds, minerals, and atmospheric deposits on leaves (Van Langenhove et al. 2020). Studies from mining areas in Madhya Pradesh show that dust can harm plant growth and change the structure of plant communities (Kumar 2020). Increases of dust can also block pollen from sticking to flowers, hide visual signals and change scents, making it harder for pollinators to find them and reducing plant reproduction (Waser et al. 2017).

### **Sensory Disturbance of Wildlife**

Noise and light emissions during clearing and pre-construction equipment use, can cause behavioural impacts to terrestrial wildlife within and surrounding the Project Area, including several sensitive species, such as the spectacled owl (*Pulsatrix perspicillata*), Jaguar (*Panthera onca*) and the white lipped peccary (*Tayassu pecari*) which may temporarily avoid the affected area due to light and noise disturbance. At this early project stage, these disturbances are expected to be short-term and localised, and many mobile species are likely to move away from active work areas in response to vegetation clearing and human presence but may return once noise and light levels decrease and suitable habitat remains or is restored post-construction activities. Noise and light pollution can potentially disrupt natural habitats, wildlife communication, and breeding patterns, and even lead to habitat abandonment while potentially causing wildlife injury, hearing loss, and altered foraging, breeding, and resting behaviours, which may affect population dynamics and ecosystem health if disturbances are prolonged or repeated (Ruscher et al. 2021; Barber et al. 2010). The impact of noise varies by species, depending on their hearing sensitivity, distance from the source, and the noise characteristics.

Medium and large mammals, such as red howler monkeys and jaguars, exhibit aversive behaviours to increased noise and light levels, altering their activity patterns and avoiding areas of high human disturbance during active land preparation (Barber et al. 2011; Tobler et al. 2010). Ungulates like the red brocket deer may be vulnerable to artificial light, which can disorient them and increase the risk of vehicle collisions, while bats, relying on echolocation for

navigation, can experience disrupted foraging and mating behaviours under elevated noise and light pollution (Rich and Longcore 2006; Jones et al. 2009; Rowse et al. 2016). Birds, including those reliant on vocalisations for communication and territorial defence, are disrupted by anthropogenic noise and artificial light at night, impacting mating and foraging behaviours (Barber et al. 2010; Nordt and Klenke 2013).

### **Injury and Mortality of Wildlife**

Species that are less mobile or move slowly such as certain amphibians, reptiles, and small mammals are vulnerable to injury or mortality from interactions with construction equipment, vehicles, and felled trees, as they may not be able to escape the path of machinery or falling trees, resulting in injury and death. Additionally, these activities increase the risk of wildlife becoming trapped, particularly those drawn to the area by food or water. Small mammals and amphibians are at particular risk of entrapment in newly created structures, which can result in death by drowning or exhaustion.

Within the Project Area, mammals such as the red howler monkey, capybara, jaguar, and giant anteater face greater risks of mortality due to vegetation clearing, vehicle collisions, and entrapment during pre-construction relative to baseline conditions where no industrial development occurs. Species of conservation concern including the Guianan weeper capuchin, certain deer, and peccary species, are threatened by habitat loss, which may lead to population declines and local extirpations (Altrichter et al. 2012, CITES 2024). Bird species observed in surveys from 2013, 2021, and 2025, especially those listed on the International Union for Conservation of Nature (IUCN) Red List, may be injured during vegetation clearing. Herpetofauna such as caimans, frogs, skinks, and snakes are limited by their physical characteristics, making it difficult for them to escape disturbances caused by pre-construction activities (Campbell et al. 2013, Pianka and Vitt 2003, Duellman and Trueb 1994).

#### **8.4.1.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION**

- Survey and protect sensitive species: Conduct pre-construction surveys to avoid special-status species and transplant special status plant species' seedlings as needed;
- Minimise cleared width of roads and work areas, adhere to the most direct routes and avoid areas of high vegetation and faunal diversity;
- Paced, sequential clearing and conduct clearing in stages to allow mobile wildlife to move away from work zones;
- Apply dust control measures during construction in the dry season. Ensure noise level specifications are met, use well-maintained equipment with noise mufflers, and enforce speed limits on Project roads;
- Implement a wildlife awareness training program for workers;
- Wildlife will be removed from construction sites, and transplanted when necessary and plausible; and
- A Vegetative Clearance Procedure will be developed to guide preconstruction clearances.

#### **8.4.1.3 SIGNIFICANCE OF IMPACTS**

The following sections detail the magnitude, receptor sensitivity, and overall impact significance ratings for each potential impact to terrestrial biological resources during the pre-construction phase. The impacts addressed include:

- the loss and degradation of vegetation and wildlife habitat;
- vegetative metabolic distress from dust deposition;
- sensory disturbances to wildlife from noise and light; and
- injury and mortality of wildlife.

### **Receptor Sensitivity**

The ecological integrity and conservation value of much of the habitat in the Project Area is limited, as a result of historical artisanal mining activities within the EMPL, and current artisanal mining in the surrounding areas and select locations of the EMPL. The sensitivity to further habitat loss and/or degradation is, therefore, considered Medium. Although dust deposition has the potential to affect flora and fauna, any accumulation in dust will be periodically removed by the frequent rainfall that occurs at the location, and as a result, the sensitivity of vegetation to the metabolic distress from dust deposition is considered Medium. The Project Area has several flora, fauna, and wildlife species that are considered Near Threatened or Endangered by the IUCN, protected under CITES, and/or endemic to the Guiana Shield. At a population level these species will, by definition, be more sensitive to Project-related impacts than non-special status species. However, wildlife can adapt to some degree of sensory disturbance by moving to unaffected or less affected areas for the duration of the activity that is causing the disturbance. As a result, the sensitivity of the wildlife community as a whole to sensory disturbance and to injury and mortality is considered Medium.

### **Impact Magnitude**

As a result of the long-term duration of the effect and the scale of habitat changes that will occur within the AoI, the magnitude of impact from loss and degradation of vegetation and wildlife habitat is considered Medium. Dust accumulation and anthropogenic noise and/or light effects are anticipated to occur over a relatively small area and will primarily be contained to the Project Area and the surrounding land. In addition, activities associated with dust, noise and light will be episodic. Given the scale and episodic nature, the magnitude of vegetative stress from dust accumulation and sensory disturbance is assessed as Small. The magnitude of impacts from injury and mortality is considered to be Medium because of the long-term nature of the impact balanced by the limited spatial extent over which it will occur.

### **Impact Significance**

The effects of the loss and degradation of vegetation and wildlife habitats will be long term, and as a result, the impact significance is considered to be Moderate. The sources of dust, noise and light are anthropogenic, and as a result, the magnitude of these impacts, are anticipated to reduce with distance from the Project Area and will be Minor. Similarly, the impact significance for the injury and mortality of wildlife is assessed as Minor and will be concentrated to the Project Area.

#### **8.4.1.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES**

The mitigation and monitoring measures outlined in this Environmental Impact Assessment (EIA) are designed to manage impacts to all species present within and surrounding the Project Area, and as a result, no targeting mitigation measures for species are considered to be necessary.

## Biodiversity Management Plan

A Biodiversity Management Plan (BMP) will be prepared and implemented to avoid and minimise potential impacts, specifically on IUCN and endemic species. The BMP will include targeted strategies such as habitat preservation, species monitoring, and other adaptive management approaches to ensure minimal disruption to flora, fauna, and wildlife of conservation concern. The detailed BMP will be developed closer to the start of construction following completion of the Project design and feasibility studies.

## Monitoring Programme

In addition to the existing controls and mitigation measures set out in Section 8.4.1.1, biological monitoring, for example tracking population dynamics, will be used to assess potential impacts on wildlife within the AoI over time. By tracking population dynamics, vulnerable species can be identified, enabling targeted conservation efforts. Biological monitoring can additionally detect broader ecological shifts, which is essential for evaluating the cumulative impacts of mining activities on biodiversity and ecosystem function. Ultimately, integrating biological monitoring demonstrates a commitment to responsible environmental stewardship, allowing for adaptive practices that reduce negative impacts and promote long-term conservation.

### 8.4.1.5 RESIDUAL IMPACT SIGNIFICANCE

There are no additional mitigation measures identified relating to the loss and degradation of vegetation and wildlife habitat, dust deposition or sensory disturbances to wildlife from noise and light. As a result, the significance of residual impacts for the loss and degradation of vegetation and wildlife will remain as Moderate, and the significance of residual impacts for dust deposition and sensory disturbances to wildlife from noise and light will be Minor. Enforcing speed limits on Project roads would reduce the likelihood of injury and mortality, however, the significance of residual impacts would continue to be assessed as **Minor**. The impact significance on terrestrial biological resources during the pre-construction phase is detailed in Table 8.4.

**TABLE 8.4 SUMMARY OF TERRESTRIAL IMPACTS DURING THE PRE-CONSTRUCTION PHASE OF THE PROJECT**

Significance of Pre-Construction Impacts				
Impact	Loss and Degradation of Vegetation and Wildlife Habitat			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.			
Impact Type	Direct	Indirect		Induced
	Impacts to the loss and degradation of vegetation and wildlife habitats as a result of pre-construction activities (e.g., clearance) would be direct.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The construction phase of the Project is anticipated to take 24 months, however, the altered habitat conditions as a result of vegetation removal will be permanent.			
	Local	Regional		International

Significance of Pre-Construction Impacts					
Impact Extent	The impact will only be localised within the Project AoI.				
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads. This is considered a Small impact.				
Frequency	Impacts to biological resources is considered long-term during the pre-construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be Medium.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of terrestrial biological resources to the direct loss of vegetation and habitat during the pre-construction phase is rated as Medium as a result of the presence of numerous plant and animal species of conservation concern (IUCN Red List, CITES, and Guiana Shield Endemics) identified in the Project Area.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Medium receptor sensitivity and Medium impact magnitude will result in a Moderate impact significance.				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	There are no additional mitigation measures available to reduce, residual impact significance of loss and degradation of vegetation/wildlife habitat, and therefore, the residual impact is considered Moderate.				
Impact	Vegetative Metabolic Distress from Dust Deposition				
Impact Nature	Negative		Positive		Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.				
Impact Type	Direct		Indirect		Induced
	Impacts to biological resources would be indirect with dust deposition occurring near any pre-construction work areas and access roads.				
Impact Duration	Temporary	Short-term		Long-term	Permanent
	Dust will be produced continuously throughout all phases of the Project, however, dust will be periodically removed by rainfall, and as a result, impacts to biological resources will be Temporary.				
Impact Extent	Local		Regional		International
	The impact will only be localised within the Project AoI.				
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads. This is considered a small impact.				
Frequency	Impacts of dust deposition is expected to be continuous throughout the lifetime of the Project.				
	Positive	Negligible	Small	Medium	Large

Significance of Pre-Construction Impacts				
Impact Magnitude	Based on the characteristic above, the impact is likely to be Small.			
Receptor Sensitivity	Low	Medium	High	
	The sensitivity of vegetation to dust deposition in the Project Area is rated as 'Medium' due to the presence of plant species of conservation concern identified in the Project Area (IUCN Red List and Guiana Shield Endemics).			
Impact Significance	Negligible	Minor	Moderate	Major
	Dust generated during pre-construction activities will have a Minor impact, reducing with distance from work areas.			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance will be Minor.			
Impact	Sensory Disturbance of Wildlife from Noise and Light			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.			
Impact Type	Direct	Indirect		Induced
	Impacts to biological resources are expected to directly affect wildlife behaviour.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Noise and light will be produced continuously throughout all phases of the Project, indicating that the impacts to biological resources will be long-term.			
Impact Extent	Local	Regional		International
	The impact will only be localised within the Project AoI.			
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads. This is considered a Small impact.			
Frequency	Impacts of noise and light to is expected to be continuous throughout the pre-construction phase.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the characteristic above, the impact is likely to be Small.			
Receptor Sensitivity	Low	Medium	High	
	The sensitivity of wildlife to noise and light in the Project Area is rated as 'Medium' due to the presence of special status species that are of conservation concern identified in the Project Area (IUCN Red List and Guiana Shield Endemics) that are highly responsive to noise and light (i.e., owls and large mammals).			
Impact Significance	Negligible	Minor	Moderate	Major
	Noise and light generated during pre-construction activities, such as clearance works and vehicle movements, are anticipated to have a Minor impact, diminishing with distance from the Project Area.			



Significance of Pre-Construction Impacts					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Upon considering mitigation measures, the residual impact is assessed to be Minor.				
Impact	Injury and Mortality of Wildlife				
Impact Nature	Negative		Positive	Neutral	
	Potential impacts to terrestrial biological resources would be considered Negative.				
Impact Type	Direct		Indirect	Induced	
	Impacts to biological resources would be direct.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Injury and mortality impacts to biological resources will be Long-term as they will continue throughout all Project phases.				
Impact Extent	Local		Regional	International	
	The extent of the impacts from terrestrial wildlife is Regional. Some bird species migrate, while several large mammals identified in the Project Area have large home ranges.				
Impact Scale	The impact scale would be anywhere where there is equipment in use or active clearing and/or construction occurring during the pre-construction phase.				
Frequency	Impacts of noise and light to is expected to be continuous throughout the pre-construction phase of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Medium.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of wildlife to injury and mortality in the Project Area is rated as 'Medium' due to the presence of wildlife, such as species of amphibians, reptiles, insects, small mammals, and some birds will not be able to move from the Project Area prior to the commencement of pre-construction activities. Several of these species are also of conservation concern (IUCN Red List, CITES listed, and Guiana Shield Endemics), with populations potentially being impacted if injury/mortality do occur.				
Impact Significance	Negligible	Minor		Moderate	Major
	The impact significance rating of the Project on the mortality of terrestrial wildlife is Moderate throughout the pre-construction phase.				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	The impact is Minor given the proposed controls and mitigation identified.				

## 8.4.2 AQUATIC RESOURCES

### 8.4.2.1 POTENTIAL IMPACTS

#### **Loss of Aquatic Habitat**

For the purposes of this assessment, loss of aquatic habitat is defined as complete removal of a surface water feature from the landscape. Conversion of an existing aquatic habitat to another condition or status is considered degradation and is discussed separately.

Aquatic habitat loss during the pre-construction phase will be limited, and any aquatic habitat losses are expected to be mostly in small headwater streams and ephemeral aquatic habitats.

#### **Degradation of Aquatic Habitat**

For the purposes of this assessment, degradation of aquatic habitat is defined broadly, and encompasses the range of physical disturbances that is expected to occur to aquatic habitats as a result of the Project. The most prominent mechanisms of habitat degradation that are expected to occur during pre-construction are altered water quality / downstream sedimentation and loss of stream connectivity. Any sources of aquatic habitat degradation as a result of pre-construction will most likely persist during the construction and operation of the Project, and may even be permanent (e.g. the fragmentation of a stream channel that is bisected by a road which will remain in service after the mine is closed) Other mechanisms of aquatic habitat degradation that will occur to a lesser extent during pre-construction, but become more important during the construction phase, include changes in flow regimes and stream morphology. These are discussed further in Section 8.5.

Clearing, grubbing, stripping, earth moving, and grading during the pre-construction phase will increase runoff and erosion, which will increase turbidity and affect water quality and sediment dynamics in nearby streams that receive runoff from disturbed areas. Elevated turbidity can impede the respiration of fish and macroinvertebrates and lead to metabolic stress, or in extreme cases mortality (Ryan 1991). Increased turbidity can also reduce visibility for fish and certain macroinvertebrates impacted species that rely on sight to detect and avoid predators (Dunlop et al. 2005), or to feed. As the particulates that cause turbidity settle out of the water column, they cause sedimentation. Sedimentation clogs streambed substrates altering the channel morphology and reducing habitat availability for macroinvertebrates and (Wood and Armitage 1997). Once introduced to a riverine system, turbidity and sedimentation are gradually distributed downstream by streamflow, which spreads the negative effects beyond the immediate vicinity of the activity that caused the impact.

Although the effects of turbidity and sedimentation from the Project have the potential to extend throughout affected headwater watersheds, streams in the AoI and the biota they support are not particularly sensitive to such impacts. As documented in the biodiversity baseline surveys, there are several waterways within the AoI, including the Mahdia River and Minnehaha Creek. These waterways have been heavily disturbed as a result of historical artisanal mining activities. Water quality has noticeably improved between the 2013 and 2021 surveys, but legacy effects remain. As a result, potential impacts from the Project are likely to represent an incremental additional stressor rather than cause significant changes to existing aquatic biodiversity in the AoI. In addition to turbidity and sedimentation, decomposition of organic matter from cleared vegetation can affected water quality by increasing nutrient loads, affecting pH levels and raising biochemical oxygen demand, which can lead to low-oxygen

conditions and potentially cause injury or mortality to aquatic fauna (Campbell and Doeg 1989). Nutrient-rich runoff from cleared vegetation can also lead to eutrophication and algal blooms, further depleting oxygen levels and stressing or killing fish and macroinvertebrates that depend on stable conditions to survive (Bashir et al. 2020).

Another aspect of pre-construction activities with the potential to degrade aquatic habitat is fragmentation and /or isolation of formerly contiguous stream habitats. Longitudinal fragmentation occurs when natural downstream flows are interrupted, isolating headwaters from downstream habitats, whilst lateral fragmentation occurs when a stream is isolated from its floodplain. In mine settings, the creation of dams, berms, roads, and other crossings (including culverts if they are not installed at grade and therefore create a vertical drop) are the main mechanisms of longitudinal fragmentation. In comparison, channelisation is the main mechanism of lateral fragmentation in mine environments. Both types of fragmentation have the potential to negatively impact aquatic biota, particularly fish, as many freshwater tropical fish are migratory and do not have the ability to cross artificial barriers. In contrast, macroinvertebrates are not typically migratory, and many adult macroinvertebrates can fly. As a result, the impacts of fragmentation are typically more significant for fish than for macroinvertebrates. However, no migratory fish were recorded during the biodiversity baseline studies.

### **Aquatic Species Injury and Mortality**

Activities associated with the pre-construction phase, for example clearing and earthworks, could result in the injury or mortality of freshwater organisms. However, injury and mortality of fish and macroinvertebrates will be limited to the footprint of activities that occur in waterbodies within the Project Area, and would not affect areas upstream or downstream habitats within or outside the Project.

Several species of fish identified during the 2013 and 2021 surveys are endemic to Guyana, including the *equidens potaroensis*, *Crenicichla wallacii*, *Anablepsoides (Rivulus) holmiae*, and *Anablepsoides (Rivulus) waimacui*. No fish or macroinvertebrates species detected within the survey efforts are listed as Endangered or Threatened on the IUCN Red List.

#### **8.4.2.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION**

- Pre-construction activities will take place in the dry season where possible to avoid periods when the volume of surface runoff is lowest and hydrological connections between disturbed areas and adjacent streams will be limited;
- Ditches, culverts, and bridges will prevent runoff from directly entering the watershed and will convey runoff to suitable outflow locations;
- A phased approach to land clearing will be used to minimise the amount of disturbed land at one time; and
- An erosion and sediment control management plan and a site water management plan will be implemented to mitigate environmental impacts.

#### **8.4.2.3 SIGNIFICANCE OF IMPACTS**

The following sections detail the magnitude, receptor sensitivity, and overall impact significance ratings for each potential impact to aquatic biological resources during the pre-construction phase. The impacts addressed include:

- turbidity and sedimentation;
- aquatic habitat loss;
- aquatic habitat degradation;
- alterations in stream hydrology;
- changes in downstream water chemistry; and
- aquatic species injury and mortality.

### Receptor Sensitivity

There are no fish or macroinvertebrates species listed as Endangered or Threatened or on the IUCN Red List within the AoI, and many of the waterways have been directly or indirectly affected by historical artisanal mining activities. As a result, the receptor sensitivity of aquatic habitat loss and degradation is assessed as **Medium**. The injury and mortality of aquatic species will be local and limited to the Project Area, and there are no special status aquatic species known to occur within the Project AoI, so the sensitivity of the aquatic community to injury and mortality of individual fish and macroinvertebrates during the pre-construction phase is considered to be **Low**.

### Impact Magnitude

Aquatic habitat loss will be limited to the Project Area but in areas where natural habitats are lost, their loss will be perceptible and measurable as compared to existing conditions. Therefore; the magnitude of impacts from habitat loss is considered **Small**. Focusing land-disturbing activities during the dry season will limit the potential for water quality-related habitat disturbance, so turbidity and sedimentation is not expected to lead to a widespread transformation of aquatic habitat conditions, but the geographic extent of habitat degradation is anticipated to be larger than that of habitat loss depending on how far, and to what extent, turbidity and sedimentation is transported. As a result, the magnitude of impact is considered to be **Medium**. The extent of injury and mortality impacts of aquatic organisms is expected to be more confined, so the magnitude of impacts from injury and mortality is considered **Small**, primarily due to the limited footprint of the pre-construction worksites.

### Impact Significance

During the pre-construction phase, impacts from aquatic habitat loss will cause **Minor** impacts, and degradation of aquatic habitat will result in **Moderate** impacts. The significance of injury and mortality of aquatic species are assessed as **Negligible** as a result of the localised, short-term impacts, and the status of the species in the Project Area.

#### 8.4.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

- Create and maintain construction crossings at perennial streams, ideally using stone in the stream bed that allows water to pass rather than timber mats, dams or culverts. If bridges are required, natural flow characteristics will be maximised;
- Locate crossings and conduct other activities that disturb streams away from deep, permanent pools that function as dry season refugia for aquatic species;
- A Biodiversity Management and Monitoring Plan will be prepared for the Project.

- Regularly monitor water quality to detect and address any pollution issues during construction, ensuring adherence to environmental regulations and minimising impacts on aquatic life;
- Establish and maintain buffer zones around affected waterways, where possible, to safeguard aquatic habitats from construction-related disturbances;
- Maintain vegetated buffers between active construction sites (construction) and operating infrastructure (operations) and surface water features;
- Retain large woody debris in stream channels to increase instream habitat diversity and prevent drainage from cleared vegetation stockpiles from reaching streams to avoid excessive nutrients in runoff; and
- To the extent possible, retain seasonally inundated habitats and the connections between these habitats and perennial stream channels.

#### 8.4.2.5 RESIDUAL IMPACT SIGNIFICANCE

Following the implementation of the mitigation, management and monitoring measures outlined in Sections 8.4.2.2 and 8.4.2.4, the residual impact significance for aquatic habitat loss and degradation is anticipated to be **Minor**. Aquatic species injury and mortality is expected to be **Negligible** as a result of the limited area within which these impacts will occur and the conservation status of the affected species. The impact significance is summarised in Table 8.5.

**TABLE 8.5 SUMMARY OF IMPACTS ON AQUATIC BIODIVERSITY DURING THE PRE-CONSTRUCTION PHASE OF THE PROJECT**

Significance of Pre-Construction Impacts					
Impact	Aquatic Habitat Loss				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to biological resources during the pre-construction phase would be direct.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Some aspects of habitat loss and conversion will be long-term but reversible, while others will be permanent. The implementation of erosion and sediment control and site water management plans will help reduce total habitat loss within the AoI.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the AoI of the Project.				
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads.				
Frequency	Loss of aquatic habitat will be continuous.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Small.				
	Low		Medium	High	

Significance of Pre-Construction Impacts				
<b>Receptor Sensitivity</b>	Aquatic habitat within the AoI has been degraded and historical disturbance has promoted dominance of the biological community by species that are relatively disturbance tolerant; however, some natural aquatic ecological functions remain which will be further degraded by the Project. As a result, the receptor sensitivity is assessed as Medium.			
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major
	Loss of aquatic habitat will be confined to the Project Area. Pre-construction worksites and habitats have already been degraded by ASM, but further disturbance of these areas will exacerbate historical impacts within the Project Area. The significance of these losses will be Minor.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Residual Impact Significance</b>	Negligible	Minor	Moderate	Major
	Mitigation measures will reduce the extent of aquatic habitat loss, but losses within the footprints of permanent mine infrastructure (e.g. TSF, WSF) will be measurable following application of all available mitigation measures, so the residual impact is assessed to be Minor.			
<b>Impact</b>	<b>Aquatic Habitat Degradation</b>			
<b>Impact Nature</b>	Negative	Positive	Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.			
<b>Impact Type</b>	Direct	Indirect	Induced	
	Impacts to aquatic biological resources would be direct. Degradation of habitat will directly impact the fish and macroinvertebrates within the Project Area and would have the potential to impact the migrating fish outside of the area.			
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
	Habitats have the potential be altered in the pre-construction phase and if so, they will remain permanently altered.			
<b>Impact Extent</b>	Local	Regional	International	
	The impact will only be localised within the AoI of the Project.			
<b>Impact Scale</b>	Localised to the immediate Project Area or a few kilometres downstream.			
<b>Frequency</b>	Impacts of turbidity and sedimentation are expected to be continuous once sediment is introduced to waterbodies, but the intensity will fluctuate episodically, with maximum intensity primarily during storm or flooding events. Habitat fragmentation will be continuous.			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
	Fish and macroinvertebrates living within and downstream of the Project Area will be impacted by turbidity and sedimentation. However, turbidity and sedimentation is not expected to lead to a widespread transformation of aquatic habitat conditions			
<b>Receptor Sensitivity</b>	Low	Medium	High	
	Aquatic habitat within the AoI has been degraded and historical disturbance has promoted dominance of the biological community by species that are relatively disturbance tolerant; however, some natural aquatic ecological functions remain which will be further degraded by the Project. As a result, the receptor sensitivity is assessed as Medium.			



Significance of Pre-Construction Impacts				
<b>Impact Significance</b>	Negligible	Minor	<b>Moderate</b>	Major
	Permanent degradation of aquatic habitat could affect reproduction, growth, behaviour, and migration of aquatic species permanently. The intensity of these effects will be highest in close proximity to the Project footprint, but they are expected to extend over a larger area than habitat loss due to downstream effects, resulting in a Moderate significance rating.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	<b>Small</b>	Medium
<b>Residual Impact Significance</b>	Negligible	<b>Minor</b>	Moderate	Major
	The implementation of mitigation, monitoring and management measures is expected to reduce the impact significance to <b>Minor</b> .			
<b>Impact</b>	<b>Aquatic Species Injury and Mortality</b>			
<b>Impact Nature</b>	<b>Negative</b>	Positive	Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.			
<b>Impact Type</b>	<b>Direct</b>	Indirect	Induced	
	Injury and mortality will directly impact aquatic species.			
<b>Impact Duration</b>	Temporary	Short-term	Long-term	<b>Permanent</b>
	Impacts to aquatic life will be permanent.			
<b>Impact Extent</b>	<b>Local</b>	Regional	International	
	The extent of the impacts from the aquatic species injury and mortality are expected to be local and contained to the Project Area.			
<b>Impact Scale</b>	The impact scale would be the number injured or killed.			
<b>Frequency</b>	The frequency of the impact is expected to be episodic with the majority of injuries and deaths occurring during activities such as clearing and earthworks.			
<b>Impact Magnitude</b>	Positive	Negligible	<b>Small</b>	Medium
	The magnitude of the impacts on aquatic organisms is expected to be Small primarily due to the limited footprint of the pre-construction worksites.			
<b>Receptor Sensitivity</b>	<b>Low</b>	Medium	High	
	There are no fish or macroinvertebrates species listed as Endangered or Threatened or on the IUCN Red List within the AoI. Watercourses within the AoI have already been degraded as a result of historical artisanal mining activities; thereby increasing the proportion of common species in the areas that would be affected, therefore the sensitivity of the aquatic community to injury and mortality of individual fish and macroinvertebrates is Low.			
<b>Impact Significance</b>	<b>Negligible</b>	Minor	Moderate	Major
	The impact significance of aquatic species injury and mortality are assessed as Negligible as a result of the localised, short-term impacts, and the status of the species in the Project Area.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	<b>Small</b>	Medium

Significance of Pre-Construction Impacts				
Residual Impact Significance	Negligible	Minor	Moderate	Major
	Aquatic species injury and mortality is expected to be Negligible as a result of the limited area within which these impacts will occur and the conservation status of the affected species.			

## 8.5 IMPACTS FROM CONSTRUCTION PHASE

### 8.5.1 TERRESTRIAL RESOURCES

#### 8.5.1.1 POTENTIAL IMPACTS

##### Loss and Degradation of Vegetation and Wildlife Habitat

During the construction phase, activities such as land clearing, infrastructure development, and increased human activity could lead to habitat degradation through the removal of vegetation, soil erosion and pollution. However, most of the activity will occur on land that will have been extensively modified during the pre-construction phase. As a result, the magnitude of additional habitat loss and degradation during the construction phase will be limited.

##### Vegetative Metabolic Distress

The Project will cause vegetative metabolic distress primarily through the physical deposition of dust during the construction phase. The effects of dust deposition during the construction phase are anticipated to be similar to that of pre-construction and are detailed in Section 8.4.1.1.

##### Sensory Disturbance of Wildlife from Noise and Light

The various sources of light generated by construction activities can significantly impact wildlife. The effects of sensory disturbance of wildlife from light are anticipated to be similar to that of pre-construction and are detailed in Section 8.4.1.1.

The noise levels generated from mining equipment during the construction phase can disrupt wildlife by interfering with communication, mating calls, and feeding behaviours, leading to increased stress, habitat avoidance, and potential long-term impacts on survival and reproduction (Vardhan et al. 2004). Extended exposure to noise levels ranging from 70 to 85 dB can also result in temporary or permanent hearing impairment in wildlife (O'Neill and Yurk 2017; Schwartz and Bee 2013; Zeyl and Johnston 2016). Extreme noise levels, therefore, may cause irreversible damage or even lead to mortality.

As construction progresses, activities such as opening borrow pits and performing earthworks will produce continuous noise at levels of 85-100 dB; blasting operations can generate impulsive noise exceeding 120 dB. Interim diesel generators will contribute additional continuous noise around 85-95 dB, potentially causing significant stress and disturbance over large areas. The elevated noise levels pose a heightened risk of disturbing critical behaviours for species listed on the IUCN Red List, potentially exacerbating their vulnerability and negatively impacting their long-term survival and conservation status (Pater et al., 2009; Griffiths et al., 2014).

## Injury and Mortality of Wildlife

The proposed construction may cause substantial risks of physical injury and mortality to wildlife. For example, vegetation clearance to construct Project infrastructure will lead to habitat destruction and the use of heavy machinery may result in accidental collisions. Blasting may additionally exacerbate this risk by generating shockwaves and debris. Key species such as the jaguar, and Lowland tapir, are listed on the IUCN Red List and CITES, are vulnerable to habitat destruction, blasting, and heavy machinery, which can lead to injury, mortality, and displacement. Risks include habitat fragmentation, pollution, and increased mortality from collisions and falling debris. Given the high conservation value of these species, effective mitigation strategies are essential to protect their habitats and ensure their survival.

### 8.5.1.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION

- Surveys will be conducted to determine the presence of wildlife, especially sensitive or special-status species, in the work areas;
- Wildlife will be safely removed and relocated to suitable habitats that are unaffected by construction activities to reduce the likelihood of injury and mortality;
- Any additional clearing not completed during the pre-construction phase will be paced and sequential, allowing wildlife to move away from work areas and, therefore, minimise the risk of injury and mortality;
- All clearing and activities associated with habitat disturbance will be restricted to work areas. Soil exposure will be minimised and progressively revegetated and/or stabilised as construction progresses;
- Dust control measures will be implemented to minimise impacts from construction during the dry season. Construction will occur primarily in the dry seasons to minimise the effects of soil erosion, sedimentation, and increased turbidity;
- All equipment will be well-maintained and will utilise noise mufflers to reduce noise levels and meet noise regulations. Construction activities will be restricted to daytime hours, where possible, with the exception of tasks that require nighttime work. Noise levels will be regularly monitored during construction activities;
- Haul roads for the Project will not be open to the public reducing potential impacts from poaching and/or hunting, however the old Potaro-Konawaruk road will remain open for public access, and an overpass built to allow crossings of public vehicles. There will be regular patrols alongside access roads and camera traps will be installed. Strict access controls will also be in place alongside continuous environmental monitoring and partnerships with local authorities for enforcement; and
- Environmental awareness campaigns for workers and communities, combined with a zero-tolerance policy on hunting and forest clearing will be implemented.

### 8.5.1.3 SIGNIFICANCE OF IMPACTS

#### Receptor Sensitivity

The sensitivity of terrestrial biological resources to habitat loss and degradation is rated as **Medium**, reflecting the presence of sensitive species, including those listed on the IUCN Red List, CITES, and as Guiana Shield Endemics. Although dust deposition has the potential to affect flora and fauna, particularly those listed on the IUCN Red List and as Guiana Shield

Endemics, any accumulation in dust will be periodically removed by rainfall, and as a result, the sensitivity of vegetation to the metabolic distress from dust deposition is considered **Medium**. The Sensitivity of the wildlife community as a whole to sensory disturbance is considered **Low**. This rating is lower than during pre-construction because the extensive clearing and human activity that will occur during pre-construction will have caused wildlife populations to re-distribute across the landscape according to each species relative sensitivity to human activity. By the time construction activities begin, the wildlife communities that are closest to potential sources of disturbance will likely be less sensitive to such impacts than during initial pre-construction activities. Similarly to the pre-construction phase, sensitivity to injury and mortality is considered **Medium**.

### Impact Magnitude

During the mining construction phase, the impact magnitude rating for the loss and degradation of vegetation and wildlife habitat is classified as **Small**. Development of Project infrastructure will result in lasting changes to terrestrial ecosystems, but these changes will occur almost exclusively on land that will have previously undergone extensive modification (and consequent loss of ecological integrity and / or conservation value). The magnitude of vegetative metabolic distress due to dust deposition is considered **Small**. This rating is based on the localised and short-term nature of the impacts, where dust generated from construction activities and access roads will only affect vegetation in the immediate vicinity of the Project Area. The magnitude of impacts from sensory disturbance of wildlife and injury and mortality is considered **Medium**, respectively, reflecting the similarities between pre-construction and construction phases in terms of exposure to these impacts.

#### 8.5.1.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

There are no additional measures recommended to manage impacts on terrestrial biological resources from impact during construction.

#### 8.5.1.5 RESIDUAL IMPACT SIGNIFICANCE

The residual impact significance for the loss and degradation of vegetation and wildlife habitat will remain as **Minor** as a result of the ongoing activities associated with degradation and the permanence of habitat alteration. Following the implementation of the existing controls and embedded mitigation measures, the residual impact significance for vegetative metabolic distress is reduced to **Minor**. Both sensory disturbances of wildlife and injury and mortality of wildlife have a residual impact significance of **Minor** as a result of the existing controls and embedded mitigation measures outlined in Section 8.5.1.2. The residual impact significance for each impact is summarised in Table 8.6.

**TABLE 8.6 SUMMARY OF TERRESTRIAL IMPACTS DURING THE CONSTRUCTION PHASE OF THE PROJECT**

Significance of Construction Impacts			
Impact	Loss and Degradation of Vegetation and Wildlife Habitat		
Impact Nature	Negative	Positive	Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.		
Impact Type	Direct	Indirect	Induced

Significance of Construction Impacts					
Impact Duration	Temporary	Short-term		Long-term	Permanent
	Once the construction sites have been cleared and graded, the altered habitat conditions for terrestrial flora and fauna are expected to be permanent. Continued facility development during the construction phase will further degrade any remaining habitat.				
Impact Extent	Local		Regional		International
	The impact will only be localised within the AoI of the Project.				
Impact Scale	Impact scale is localised to the Project Area and surrounding access roads and is considered small.				
Frequency	Impacts to biological resources is considered long-term during the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be Small.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of terrestrial biological resources to ongoing vegetation and habitat loss during the construction phase is assessed as Medium. It is anticipated that some species will be absent by the time construction begins as a result of pre-construction activities. This 'Medium' sensitivity rating reflects the presence of plant and animal species of conservation concern, including those listed on the IUCN Red List, CITES, and Guiana Shield Endemics, within the Project Area.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in a Minor impact significance.				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	There are no additional mitigation measures recommended to manage Project effects during construction; therefore, residual impact significance for loss and degradation of vegetation and wildlife habitat is considered Minor.				
Impact	Vegetative Metabolic Distress				
Impact Nature	Negative		Positive		Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.				
Impact Type	Direct		Indirect		Induced
	Impacts to biological resources during the construction phase would be indirect. Dust deposition will occur near any mining construction and access roads.				
Impact Duration	Temporary	Short-term		Long-term	Permanent
	Dust will be produced continuously throughout all phases of the Project, indicating that the impacts to biological resources will be Long-term.				
Impact Extent	Local		Regional		International
	The impact will only be localised within the Area of Influence of the Project.				

Significance of Construction Impacts						
Impact Scale	Impact scale is localised to the Project Area and surrounding access roads and is considered small.					
Frequency	Impacts of dust deposition to is expected to be continuous throughout the Project lifetime.					
Impact Magnitude	Positive	Negligible	Small	Medium	Large	
	Based on the characteristic above, the impact is likely to be Medium.					
Receptor Sensitivity	Low		Medium		High	
	The sensitivity of vegetation to dust deposition in the Project Area is rated as Medium because of the presence of plant species of conservation concern identified in the Project Area, including IUCN Red List, CITES and Guiana Shield Endemics species.					
Impact Significance	Negligible	Minor		Moderate	Major	
	Dust generated during construction activities will have a Minor impact.					
Residual Impact Magnitude	Positive	Negligible		Small		Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major	
	Following the implementation of the existing controls and embedded mitigation measures, the residual impact significance for vegetative metabolic distress is reduced to Minor.					
Impact	Sensory Disturbance of Wildlife					
Impact Nature	Negative		Positive		Neutral	
	Potential impacts to terrestrial biological resources would be considered Negative.					
Impact Type	Direct		Indirect		Induced	
	Sensory impacts including noise and light are expected to directly affect wildlife behaviour.					
Impact Duration	Temporary	Short-term		Long-term	Permanent	
	Noise and light will be produced intermittently throughout the construction phase, indicating that impacts will be short-term.					
Impact Extent	Local		Regional		International	
	The impact will only be localised within the Area of Influence of the Project.					
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads.					
Frequency	Noise and light will be produced intermittently throughout the construction phase, indicating that impacts will be short-term.					
Impact Magnitude	Positive	Negligible	Small	Medium	Large	
	Based on the characteristic above, and with the expected increase of light and sound from construction equipment, the impact is likely to be Medium.					
	Low		Medium		High	



Significance of Construction Impacts				
<b>Receptor Sensitivity</b>	The sensitivity of wildlife to noise and light in the Project Area is rated as Low because the extensive clearing and human activity that will occur during pre-construction will have caused wildlife populations to re-distribute across the landscape according to each species relative sensitivity to human activity.			
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major
	Noise and light generated during construction activities will have a Minor impact.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Residual Impact Significance</b>	Negligible	Minor	Moderate	Major
	There is no additional mitigation measures recommended, therefore, the residual impact significance for disturbance of wildlife is considered Minor.			
<b>Impact</b>	<b>Injury and Mortality of Wildlife</b>			
<b>Impact Nature</b>	Negative	Positive	Neutral	
	Potential impacts to terrestrial biological resources would be considered Negative.			
<b>Impact Type</b>	Direct	Indirect	Induced	
	Impacts to terrestrial biological resources would be direct.			
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
	Injury and mortality are expected to occur throughout construction, and impacts have the potential to be permanent (e.g., mortality).			
<b>Impact Extent</b>	Local	Regional	International	
	The extent of the impacts from terrestrial wildlife is Local given the limited spatial extent over which injury and mortality could occur.			
<b>Impact Scale</b>	Impact scale would be contained to the Project Area and surrounding access roads.			
<b>Frequency</b>	Potential wildlife injury and mortality is expected to be occur during the construction phase.			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
	Based on the characteristic above, the impact is likely to be Medium.			
<b>Receptor Sensitivity</b>	Low	Medium	High	
	The sensitivity of wildlife to injury and mortality in the Project Area is rated as 'Medium' as a result of the presence of species of conservation concern. (e.g., IUCN Red List, CITES, and Guiana Shield Endemics).			
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major
	The impact significance rating of the Project on the injury and mortality of wildlife is considered to be Moderate.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Residual Impact Significance</b>	Negligible	Minor	Moderate	Major
	The residual impact significance for wildlife injury and / or mortality is considered Minor.			

## 8.5.2 AQUATIC RESOURCES

### 8.5.2.1 POTENTIAL IMPACTS

#### **Loss of Aquatic Habitat**

Aquatic habitat loss during the construction phase will be limited as the Project has been designed to avoid stream crossings and other aquatic impacts where possible, and a significant proportion of the Project's overall impact on aquatic habitat will occur during the pre-construction phase. Infrastructure has been moved away from the drainage basin of the reservoir that feeds the Salbora water supply. Any aquatic habitat losses during the construction phase are expected to be mostly in small headwater streams and ephemeral aquatic habitats. Amphibians included on the IUCN Red List and are endemic to Guyana were identified within the Project Area and will be especially vulnerable to impacts associated with the construction phase. Habitats for these endemic species such as the Kaie Rocket Frog, Woodley's Stefania, Evan's Stefania, and *Allobates amissibilis* are also potentially vulnerable as a result of construction.

#### **Degradation of Aquatic Habitat**

The same mechanisms of aquatic habitat degradation will occur during construction as during pre-construction, although the spatial extent of these impacts will be significantly larger during construction. Completion of the sediment dams to enclose the tailings storage and waste storage facilities will contain most of the sediment, turbidity, and any runoff, however, until their completion, aquatic habitat will experience degradation.

Although increased turbidity and sedimentation will remain factors in how stream conditions change during the construction phase, hydrological changes will become more relevant to the degradation of aquatic habitat as construction progresses. Construction activities associated with soil disturbance will alter flow patterns, impacting fish and macroinvertebrates. The Project design also includes sediment ponds downstream of works areas, however, until these have been constructed, it is likely that flows downstream will increase, at least temporarily. Overall, altered stream flows may lead to the degradation of aquatic habitat, impacting aquatic organisms and their access to resources and lifecycles.

Aquatic habitats will be permanently altered where streams will be filled in and / or diverted to allow for the construction of Project infrastructure. Water will be routed through an artificial conveyance (e.g. a pipe, culvert, ditch, etc.), which will discharge the diverted water into the existing stream downstream of the diversion. As a result, the construction of the Project will impact aquatic habitat upstream and downstream. The artificial conveyance could result in habitat fragmentation as culverts can create barriers, preventing movement and impacting seasonal foraging and rearing habitat. As a result, populations of fish species may decline. The fragmentation of stream habitat can also reduce gene flow between populations of macroinvertebrates leading to decreased genetic diversity. Loss of habitat connectivity can limit the availability of resources and suitable breeding sites for macroinvertebrates, further exacerbating population declines and reducing overall biodiversity (Hering et al. 2009).

Ammonium nitrate is a salt that is one of the primary ingredients of mining explosives. Ammonium nitrate is also a common fertiliser and to the extent that it could be released to surface waters in the AoI, it could potentially lead to eutrophication and algal blooms.

### Aquatic Species Injury and Mortality

Activities associated with the construction phase are anticipated to have similar effects on the injury and mortality of aquatic species as of the pre-construction phase (see Section 8.4.2.1). However, the injury and mortality of fish and macroinvertebrates will be limited to the Project Area.

#### 8.5.2.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION

- Aquatic habitats will be avoided where possible, and any bridges, culverts and / or ditches will prevent runoff from directly entering the watershed.

#### 8.5.2.3 SIGNIFICANCE OF IMPACTS

##### Receptor Sensitivity

Impacts on aquatic biodiversity during construction will be largely similar to impacts during pre-construction. The sensitivity of aquatic habitat to loss and/or degradation is therefore considered to be **Medium** and the sensitivity of aquatic biota to injury and mortality is considered to be **Low**.

##### Impact Magnitude

Construction activities will be similar to pre-construction activities in terms of their impacts on aquatic habitat, so the magnitude of impacts from loss of aquatic habitat are assessed as **Small** and the magnitude of impacts from habitat degradation are considered **Medium**. The magnitude of the impacts on aquatic organisms is expected to be **Small** as impacts will be limited to the Project Area.

##### Impact Significance

The type of impacts occurring during the construction phase are anticipated to be similar to that of pre-construction. During the construction phase, impacts on aquatic habitat loss are expected to be **Minor**, and impacts from habitat degradation are expected to be **Moderate**. The impact significance of injury and mortality of aquatic organisms is anticipated to be **Negligible** during construction.

#### 8.5.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

- Monitor water quality downstream of active construction work areas to identify the source of any pollution, ensuring compliance with environmental regulations and reducing impacts to aquatic species;
- Establish and maintain buffer zones around watersheds, and implement fish rescue and relocation efforts, to protect aquatic habitats from disturbances associated with construction activities;
- Create and maintain construction crossings at perennial streams, ideally using stone in the stream bed that allows water to pass rather than timber mats, dams or culverts. If bridges are required, span will be maximised for optimal natural flow characteristics;
- Maintain vegetated buffers between active work areas, operating infrastructure and surface water features; and
- To the extent possible, retain seasonally inundated habitats and the connections between these habitats and perennial stream channels.

### 8.5.2.5 RESIDUAL IMPACT SIGNIFICANCE

During the construction phase, the Project will have varying impacts on aquatic species and habitats. Following the implementation of the embedded and additional mitigation measures, the residual impact significance of aquatic habitat loss and degradation during construction is expected to be **Minor**. With the additional mitigation, management and monitoring measures associated the residual impact of injury and mortality is anticipated to remain **Negligible**. The impact significance is summarised in Table 8.7.

**TABLE 8.7 SUMMARY OF AQUATIC IMPACTS DURING THE CONSTRUCTION PHASE OF THE PROJECT**

Significance of Construction Impacts						
Impact	Loss of Aquatic Habitat					
Impact Nature	Negative	Positive		Neutral		
	Potential impacts to aquatic biological resources would be considered Negative.					
Impact Type	Direct	Indirect		Induced		
	Impacts to biological resources from habitat loss would be direct.					
Impact Duration	Temporary	Short-term	Long-term	Permanent		
	Some aspects of habitat loss and conversion will be long-term but reversible, while others will be permanent. The implementation of erosion and sediment control and site water management plans will help reduce total habitat loss within the AoI.					
Impact Extent	Local	Regional		International		
	The impact will only be localised within the AoI of the Project.					
Impact Scale	Impact scale is considered to be local to the Project AoI.					
Frequency	Impacts of habitat loss will occur throughout the construction phase.					
Impact Magnitude	Positive	Negligible	Small	Medium	Large	
	Based on the characteristic discussed above, the magnitude of the impact is likely to be Small.					
Receptor Sensitivity	Low		Medium		High	
	Aquatic habitat within the AoI has been degraded and historical disturbance has promoted dominance of the biological community by species that are relatively disturbance tolerant; however, some natural aquatic ecological functions remain which will be further degraded by the Project. As a result, the receptor sensitivity is assessed as Medium.					
Impact Significance	Negligible	Minor		Moderate	Major	
	Loss of aquatic habitat will be confined to the Project Area. Construction worksites and habitats have already been degraded by artisanal mining, but further disturbance of these areas will exacerbate historical impacts within the Project Area. The significance of these losses.					
Residual Impact Magnitude	Positive	Negligible		Small		Medium
	Negligible	Minor		Moderate		Major

Significance of Construction Impacts					
Residual Impact Significance	Mitigation measures will reduce the extent of aquatic habitat loss, but losses within the footprints of permanent mine infrastructure will be measurable following application of all available mitigation measures, so the residual impact is assessed to be Minor.				
Impact	Aquatic Habitat Degradation				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to aquatic biological resources would be both direct and indirect. The loss and degradation of aquatic habitat during construction will directly impact the fish and macroinvertebrates within the Project Area and indirectly impact aquatic habitats downstream from active construction work areas.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Aquatic habitats could be permanently altered.				
Impact Extent	Local	Regional		International	
	The impact will be localised to the AoI.				
Impact Scale	The impact scale is anticipated to be local.				
Frequency	Impacts of habitat degradation to is expected to be continuous during the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic discussed above, the magnitude of the impact is likely to be Medium.				
Receptor Sensitivity	Low	Medium		High	
	Aquatic habitat within the AoI has been degraded and historical disturbance has promoted dominance of the biological community by species that are relatively disturbance tolerant; however, some natural aquatic ecological functions remain which will be further degraded by the Project. As a result, the receptor sensitivity is assessed as Medium.				
Impact Significance	Negligible	Minor	Moderate		Major
	Permanent degradation of aquatic habitat could affect reproduction, growth, behaviour, and migration of aquatic species permanently. The intensity of these effects will be highest in close proximity to the Project footprint, but they are expected to extend over a larger area than habitat loss due to downstream effects, resulting in a Moderate significance rating.				
Residual Impact Magnitude	Positive	Negligible	Small		Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	The implementation of embedded and additional mitigation measures will reduce the impact significance to Minor.				
Impact	Aquatic Species Injury and Mortality				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources are considered Negative.				

Significance of Construction Impacts				
Impact Type	Direct		Indirect	Induced
	Individual aquatic organisms will be directly impacted by injury and mortality.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The impacts will be permanent.			
Impact Extent	Local		Regional	International
	The extent of the impacts from aquatic species injury and mortality are expected to be contained to the Project Area.			
Impact Scale	The impact scale would be small.			
Frequency	The impact is expected to occur episodically, with most injuries and mortalities likely to happen during activities such as clearing and earthworks.			
Impact Magnitude	Positive	Negligible	Small	Medium
	The magnitude of the impacts on aquatic organisms is expected to be Small primarily due to the limited footprint of the pre-construction worksites			
Receptor Sensitivity	Low		Medium	High
	There are no fish or macroinvertebrates species listed as Endangered or Threatened or on the IUCN Red List within the AoI. Watercourses within the AoI have already been degraded as a result of historical artisanal mining activities; thereby increasing the proportion of common species in the areas that would be affected, therefore the sensitivity of the aquatic community to injury and mortality of individual fish and macroinvertebrates is Low.			
Impact Significance	Negligible	Minor	Moderate	Major
	The impact significance of aquatic species injury and mortality are assessed as Negligible as a result of the localised, short-term impacts, and no known special status species in the Project Area.			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	Despite the mitigation, monitoring and management measures identified, the residual impact significance will remain as Negligible.			

## 8.6 IMPACTS FROM OPERATION PHASE

### 8.6.1 TERRESTRIAL RESOURCES

#### 8.6.1.1 POTENTIAL IMPACTS

##### **Vegetative Metabolic Distress**

The primary source of vegetative metabolic distress during operation will be dust deposition. However, dust deposition during operation is expected to be lower compared to the pre-construction and construction phases as a result of the reduction in activities associated with soil disturbance. Activities associated with dust deposition during the operation phase include vehicle movement and the general operation of mining pits.



### **Sensory Disturbance of Wildlife from Noise and Light**

As with the pre-construction and construction phases, the sensory disturbance of wildlife from noise and light is expected to occur during operation. However, in comparison to pre-construction and construction, sensory disturbance is expected to be lower during the operational phase. During operation, the work areas will be smaller, and as a result, the amount of light required will decrease. In addition, during the operation phase, noise will be less diffused throughout the Project Area and more concentrated to key operating areas, such as the mine pits. It is also likely that noise-sensitive species will have migrated during the pre-construction and construction phases, and will therefore, be less impacted by the noise generated throughout the operation of the Project.

### **Injury and Mortality of Wildlife**

The risk of injury and mortality to wildlife will persist during the operational phase. Vehicle movement is one of the primary hazards associated with wildlife injury and mortality of wildlife during operation. Wildlife could also become trapped in Project infrastructure, leading to injury and / or mortality if they are unable to escape or receive relocation assistance. Species of conservation concern, especially those listed on the IUCN Red List and CITES and Guiana Shield Endemics, are particularly at vulnerable to the risk of injury and mortality; the loss or harm to these species would not only threaten their populations but could also disrupt local ecological balance, affecting predator-prey dynamics and overall biodiversity. As a result, the implementation of mitigation measures relating to wildlife injury and mortality during operation will be critical.

#### **8.6.1.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION**

- Conduct ongoing surveys within and around operational areas to monitor the presence of special status species;
- Wildlife will be removed and relocated to suitable and safe habitats;
- Ensure noise level specifications are met, use well-maintained equipment with noise mufflers, and enforce speed limits on Project roads;
- Restrict any new disturbance to designated work areas, minimise bare soil exposure and progressively revegetate and / or stabilise disturbed soil to manage erosion and mitigate habitat disruption;
- Regularly water dusty surfaces, particularly on heavily trafficked roads to control dust generation;
- A full Biodiversity Management Plan (BMP) will be prepared and implemented and will detail mitigation, management and monitoring measures relating the operation of the Project.
- Implement a wildlife awareness training program for workers and run environmental awareness campaigns for workers and communities; and
- Implement a zero-tolerance policy on hunting and forest clearing.

### 8.6.1.3 SIGNIFICANCE OF IMPACTS

#### Receptor Sensitivity and Impact Magnitude

The sensitivity of terrestrial biological resources to vegetative metabolic stress is considered **Medium**. The sensitivity of the wildlife community as a whole to sensory disturbance is considered **Low**. Similarly to the pre-construction and construction phases, sensitivity to injury and mortality is considered **Medium**.

The magnitude of impact for both vegetative metabolic stress from dust deposition and sensory disturbance from noise and light are assessed as **Small**. The impact magnitude for injury and mortality during operation will be **Medium** as a result of the permanent nature of this impact.

#### Impact Significance

Following the completion of construction, the impact of vegetative metabolic distress will be reduced as the occurrence and frequency of activities associated with dust generation will decrease. The impact significance of vegetative metabolic distress during operation is, therefore, assessed as **Minor**. Following the implementation of embedded mitigation measures, sensory disturbances from noise and light are anticipated to be **Negligible** during operation. The risk of injury and mortality of wildlife during operation is expected to be similar to that of pre-construction and construction, and as a result, the impact significance is considered to be **Moderate**.

### 8.6.1.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

There are no additional measures recommended to manage impacts on terrestrial biological resources from impact during operation.

### 8.6.1.5 RESIDUAL IMPACT SIGNIFICANCE

The residual impact significance of all potential impacts will remain the same as there are no additional mitigation, management and monitoring measures. The significance of impact during operation is summarised in Table 8.8.

**TABLE 8.8 SUMMARY OF TERRESTRIAL IMPACTS DURING THE OPERATIONAL PHASE OF THE PROJECT**

Significance of Impact During Operation				
Impact	Vegetative Metabolic Distress			
Impact Nature	Negative	Positive	Neutral	
	Potential impacts to terrestrial biological resources would be considered Negative.			
Impact Type	Direct	Indirect	Induced	
	Impacts to biological resources during operation would be indirect.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Dust will be produced continuously throughout the operation of the Project, and as a result, the impact duration would be Long-term.			
	Local	Regional	International	

Significance of Impact During Operation					
Impact Extent	The impact will only be localised within the AoI of the Project.				
Impact Scale	Impact scale is considered localised to the Project Area and the surrounding access roads. This is considered a Small impact.				
Frequency	Impacts of dust deposition to is expected to be continuous throughout the operational lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Small.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of vegetation to dust deposition in the Project Area is rated as Medium because of the presence of plant species of conservation concern identified in the Project Area, including IUCN Red List, CITES and Guiana Shield Endemics species.				
Impact Significance	Negligible	Minor		Moderate	Major
	Dust generated during operation will have a Minor impact.				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	The residual impact is assessed as Minor.				
Impact	Sensory Disturbance of Wildlife				
Impact Nature	Negative		Positive		Neutral
	Potential impacts to terrestrial biological resources would be considered Negative.				
Impact Type	Direct		Indirect		Induced
	Sensory impacts including noise and light are expected to directly affect wildlife behaviour.				
Impact Duration	Temporary	Short-term		Long-term	Permanent
	Noise and light will be produced continuously throughout the operation of the Project, and are therefore, considered to be Long-term.				
Impact Extent	Local		Regional		International
	The impact will only be localised within the AoI of the Project.				
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads. This is considered a Small impact.				
Frequency	Impacts of noise and light to terrestrial biological resources is expected to be continuous throughout the operational lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, and with the expected decrease of sensory disturbance from noise and light, the impact is likely to be Small.				
	Low		Medium		High

Significance of Impact During Operation					
Receptor Sensitivity	The sensitivity of wildlife to noise and light in the Project Area is considered to be Low				
Impact Significance	Negligible	Minor	Moderate	Major	
	Following the implementation of embedded mitigation measures, sensory disturbances from noise and light are anticipated to be Negligible during operation.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The residual impact is assessed to be Negligible.				
Impact	Injury and Mortality of Wildlife				
Impact Nature	Negative		Positive	Neutral	
	Potential impacts to terrestrial biological resources would be considered Negative.				
Impact Type	Direct		Indirect	Induced	
	Impacts to terrestrial biological resources would be direct.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Injury and mortality are expected to occur during the operational phase of the Project, and given the nature of this impact, the duration is expected to be Permanent.				
Impact Extent	Local		Regional	International	
	The extent of the impacts from terrestrial wildlife is Local given the limited spatial extent over which injury and mortality could occur.				
Impact Scale	Impact scale would be the Project Area and surrounding access roads.				
Frequency	Potential wildlife injury and mortality is expected to be continuous throughout the operational lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Medium.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of wildlife to injury and mortality in the Project Area is rated as Medium as a result of the presence of species of conservation concern. (e.g., IUCN Red List, CITES, and Guiana Shield Endemics).				
Impact Significance	Negligible	Minor	Moderate		Major
	The impact significance of injury and mortality of wildlife during the operational phase of the Project is considered to be Moderate.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate		Major
	The residual impact of wildlife injury and mortality during operation is Moderate.				

## 8.6.2 AQUATIC RESOURCES

### 8.6.2.1 POTENTIAL IMPACTS

#### **Degradation of Aquatic Habitat**

During the operation phase, pit dewatering and excavation will alter sediment dynamics in and around the Project Area. These activities can increase sedimentation in aquatic environments, which can smother habitats, disrupt aquatic plant growth, and clog the gills of fish and macroinvertebrates, resulting in reduced oxygen availability, and impaired feeding and respiration (Ryan 1991; Dunlop et al. 2005). Pit excavation may also generate large quantities of sediment that can create turbid conditions in surrounding water courses, reducing light penetration and photosynthesis in aquatic plants, and interfering with respiratory and feeding processes impacting the health of fish and invertebrates. Sediment ponds will be used to mitigate potential downstream impacts, however their efficiency in retaining sediment (averaging 98.2%) can decline during intense or prolonged rainfall events, as observed at María José mine in the Alto Tajo National Park (Zapico et al. 2021). Despite effectively reducing sediment yield by 98.4% compared to similar mines without ponds (Reed et al. 1985), significant rainfall events may still elevate suspended sediment concentrations, impacting downstream water quality and ecological integrity. Hydrological changes, as a result of ore extraction and tailings management activities, can lead to alteration in streamflow patterns and water distribution, impacting natural watercourses and potentially diverting or depleting local water sources. This can lead to degradation of aquatic habitats within the Project footprint and downstream.

Mining activities during the operation phase may degrade water quality, further affecting fish and macroinvertebrates. Waste rock and tailings produced during ore extraction can release heavy metals and toxic chemicals into the water column, while leachate and wastewater effluents can have adverse impacts on downstream water quality. Current analysis of potential leachate from waste rock at the project does not indicate presence of significant heavy metals or toxic chemicals and tailings are low acid generating. Mitigation measures, such as cyanide recycling and destruction circuits, TSF seepage controls, blasting controls to limit nitrogen, and sewage treatment for domestic wastewater, will minimise the impacts on downstream aquatic habitats.

#### **Aquatic Species Injury and Mortality**

During operations, activities such as plant and road maintenance, vehicle movements, worker mobilisation, and establishment of worker accommodations and facilities may cause injury or mortality of aquatic species. Maintenance activities such as road repairs, inspections, and plant monitoring can disturb aquatic habitats when conducted near or within waterways. Vehicle crossing waterways pose risks of crushing or harming aquatic species, and increased traffic due to worker mobilisation and site development will exacerbate risks of injury and mortality of aquatic species.

### 8.6.2.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION

- A pump back system will collect and return seepage through the embankment drain, further minimising environmental impact;
- Treated water from the TSF and settling ponds will be discharged into the environment;

- Water collected from the pit dewatering infrastructure will be held in sediment settling ponds, allowing the sediment to settle out of the water before water is released to the downstream environment;
- Cyanide detoxification and destruction circuit;
- Seepage control systems on at the TSF;
- Controls on blasting to limit excess nitrogen in waste rock;
- Sewage treatment plant to treat domestic wastewater;
- Treated water will be released to the environment at controlled rates to minimise downstream impacts; and
- Stronghold Guyana have avoided the watershed of the Salbora Reservoir in the Project design and avoided diversions to watercourses. However, watercourses in the EMPL have already been diverted due to historical ASM in the Project Area.

### 8.6.2.3 SIGNIFICANCE OF IMPACTS

#### Receptor Sensitivity

Most aquatic organisms within the Project AoI are adapted to disturbed conditions but some organisms would still be expected to experience negative effects from exposure to dewatering and/or increased flows from Project discharges, so the aquatic community's sensitivity to disturbance during Project operations is considered **Medium**. Injury and mortality of aquatic species will be local and limited to the Project Area and there are no special status aquatic species known to occur within the Project AoI, so the sensitivity of the aquatic community to injury and mortality of individual fish and macroinvertebrates is considered **Low**.

#### Impact Magnitude

The magnitude of habitat degradation from turbidity, sedimentation, and water chemistry changes during Project operations is rated as **Small**, as most of the hydrological and physical habitat changes that will occur as a result of the Project will have occurred during prior phases. Similarly, most impacts on wildlife injury and mortality will have occurred during prior phases, so the magnitude of impacts from injury and mortality of aquatic species during Project operations are also considered **Small**.

#### Impact Significance

During operations, aquatic habitats will be affected by turbidity, sedimentation, hydrological changes, and changes in water chemistry. Most of these changes will effectively represent a continuation of habitat changes that began during pre-construction and construction. The aquatic community will have adjusted to a more tolerant species assemblage, however discharges from the cyanide detoxification system will be unique to this phase. Therefore, impacts from habitat degradation during Project operations will be considered **Minor**. Impacts from injury and mortality of aquatic organisms are rated **Negligible**, as direct risks from plant maintenance and vehicle movements will be less extensive than during prior Project phases.



#### 8.6.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

- Conduct frequent water quality monitoring to identify and address any pollution incidents during construction, ensuring compliance with environmental regulations and reducing impacts to aquatic species; and
- Establish and maintain buffer zones around waterways, and implement fish rescue and relocation efforts, to protect aquatic habitats from construction-related disturbances.

#### 8.6.2.5 RESIDUAL IMPACT SIGNIFICANCE

The structural management measures that are intended to address watershed-level impacts on physiochemical habitat conditions (such as the TSF and WSF) will be fully operational by the Construction phase, and the more localised measures (e.g.; buffer zones, placement of woody debris) will remain in effect, so the residual significance of habitat-related impacts during the Operations phase is considered **Negligible**. Impacts on wildlife injury and mortality are also considered **Negligible** (Table 8.9).

TABLE 8.9 SUMMARY OF AQUATIC IMPACTS DURING THE OPERATION PHASE

Significance of Impact					
Impact	Degradation of Aquatic Habitat				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to biological resources during the operational phase would be direct.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The mine is expected to be operational for approximately 15 years therefore the impact to aquatic species will be long-term.				
Impact Extent	Local	Regional		International	
	The impact will be localised within the Project AoI.				
Impact Scale	The impact scale is anticipated to be local and small.				
Frequency	Impacts to aquatic species could occur intermittently during the operational phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be Small.				
Receptor Sensitivity	Low		Medium		High
	Due to historical ASM activities, aquatic organisms present throughout the Project footprint and downstream are adapted to turbidity and sedimentation.				
Impact Significance	Negligible	Minor		Moderate	Major
	Impacts to aquatic fauna due to increased turbidity and sedimentation are expected to occur. Impact significance is considered Minor due to the absence of species of conservation concern within the Project Area and ASM activities have already resulted in increased turbidity and sedimentation of most streams in the Project footprint, therefore these species are adapted to anthropogenic disturbances.				

Significance of Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	After considering mitigation measures, the residual impact is assessed to generally be Negligible.				
Impact	Injury and Mortality of Wildlife				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered Negative.				
Impact Type	Direct	Indirect		Induced	
	The injury and mortality of wildlife would be directly impacted by operational activities.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Injury and mortality are anticipated to continue during all Project phases, therefore the effects on aquatic species will be long-term.				
Impact Extent	Local	Regional		International	
	The impact extent will be contained to the Project Area, and as a result, will be Local.				
Impact Scale	The scale of impact on aquatic species are the watercourses within the AoI and downstream as a result of water quality degradation, habitat disturbance and vehicle interaction.				
Frequency	Potential injury and mortality to aquatic species expected to be continuous throughout the lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts on wildlife injury and mortality are considered Small as impacts on wildlife injury and mortality of aquatic species will have occurred during prior phases.				
Receptor Sensitivity	Low	Medium		High	
	Sensitivity to injury and mortality are considered low, given the potential for injury and mortality will be local and limited to the Project Area and there are no known aquatic species of special status present in the Project AoI.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The impact significance is considered Negligible due to localised maintenance activities and the temporary, episodic nature of these activities.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	There are no specific management measures to address injury or death of aquatic wildlife due to mine operations and maintenance, so the residual significance of this impact will remain Negligible.				

## 8.7 IMPACTS FROM CLOSURE PHASE

### 8.7.1 TERRESTRIAL RESOURCES

#### 8.7.1.1 POTENTIAL IMPACTS

##### **Sensory Disturbance of Wildlife**

Noise and light impacts during mining decommissioning can be comparable to or even surpass those during the construction and operation phases, although these impacts are typically brief. Decommissioning is often characterised by intense, short-term activities such as dismantling and site clearance, which create significant noise and light disruption. Bright lighting, used for safety and operational purposes, may disturb nocturnal species, interfering with their natural behaviours, navigation, and reproduction. Noise generated from machinery, demolition, and transportation can also disrupt wildlife, causing alterations to their feeding, mating, and migration behaviours. Decommissioning activities, which are characteristically concentrated and intermittent, can cause more severe disturbances, especially in sensitive or previously undisturbed areas, resulting in physiological stress and the degradation of habitat quality for various species.

##### **Injury and Mortality of Wildlife.**

Decommissioning mining operations presents several risks to terrestrial wildlife, both during and after closure. Even in disturbed landscapes, wildlife populations can occupy residual habitat features surrounding the mining infrastructure. Therefore, the removal of mining equipment and infrastructure can displace local wildlife populations and increase the risk of injury, particularly through collisions with machinery and vehicles. Accidental mishandling or disposal of waste and contaminants in tailing facilities can result in environmental pollution, exposing wildlife to toxic and harmful substances or contamination of their food sources. Residual contaminants, such as heavy metals and acid mine drainage, can remain in the environment, causing long-term health issues and habitat degradation. Research indicates that metal contamination from mine tailings can induce oxidative stress and reduce activity in species like the white-footed mouse, leading to injury and potential mortality (Beyer et al., 2018). Mercury and arsenic contamination, as seen at sites like Whitewood Creek, continues to impact local bird populations, resulting in severe health consequences and ecological harm (Marr, A.E., 2023). Whitewood Creek is indicative of a 'worst-case' scenario with arsenic-rich sulphides and is in contrast to the geology of the Eagle Mountain Project which presents low heavy metal concentrations and low acid generation. Based on the Project's geochemical analysis, contamination of the soil and water, resulting in long-term damage to wildlife is expected to be limited.

Restoration activities during the decommissioning phase may alter habitat features, affecting species that have adapted to previous conditions. Physical barriers and landscape alterations can create obstacles or force wildlife to relocate after adapting to the presence of the mine, potentially leading to further ecological disruption. Primates, such as the Howler Monkey (*Alouatta macconnellii*) and Guiana Spider Monkey (*Ateles paniscus*), were detected in and around the Project Area, and were observed and heard foraging in the higher and lower elevations. Despite the habitat disturbances, these areas can still provide essential food sources like fish and other aquatic prey (Terborgh 1995). Abandoned mines in North America can provide vital shelter and resources for wildlife, serving as critical habitats for various

species, such as pumas and black bears. However, closing or restricting access to these mine sites can disrupt these essential habitats and deprive wildlife of critical resources, potentially leading to injury or mortality (Wyckoff, 1999; Furey and Racey 2016). Effective decommissioning management is crucial to mitigate these risks to terrestrial wildlife.

#### 8.7.1.2 EXISTING CONTROLS AND EMBEDDED DESIGN MITIGATION

- Control noise and light emissions: Utilise well-maintained equipment fitted with noise suppressors and continuously monitor noise levels to ensure regulatory compliance, thereby minimising noise pollution. Reduced light disturbance to wildlife communities by scheduling decommissioning activities during daylight hours whenever possible.
- Assess wildlife presence: Conduct regular wildlife surveys within and around operational areas to monitor the presence of sensitive or special-status species. This enables timely adjustments to operational practices to safeguard these species throughout the mining phase.
- Relocate wildlife: Develop and implement procedures for rescuing and relocating wildlife that may enter operational areas. This approach helps reduce injury and mortality by ensuring that displaced animals are moved to safe and suitable habitats.
- Adhere to speed limits: Enforce speed limits on facility access roads and restrict night driving to reduce the risk of vehicle-wildlife collisions and overall disturbance. This is essential for preventing wildlife injuries and maintaining site safety.
- Vegetation and habitat restoration: Develop and implement a vegetation rehabilitation and restoration plan during the decommission phase, including liana removal as required.

#### 8.7.1.3 SIGNIFICANCE OF IMPACTS

##### Receptor Sensitivity and Impact Magnitude

Wildlife sensitivity to sensory disturbance is rated as **Low**, as most if not all sensitive species will have vacated areas of intense Project activity by the decommissioning phase of the Project lifecycle. Sensitivity to injury and/or mortality of wildlife is rated as **Medium**, due to the presence of amphibians, reptiles, small mammals, and some birds within the Project Area, including conservation-concern species like those on the IUCN Red List and CITES, which may be particularly vulnerable to disturbances related to the Project.

Noise and light emissions are considered indirect impacts, as they can influence wildlife behaviour without direct contact. These disturbances will be continuous throughout the Project lifecycle, resulting in long-term environmental effects. However, the impact is localised within the Project's Area of Influence, primarily impacting the Project Area and associated access roads, and is therefore considered small in scale. During the decommissioning phase, the magnitude of sensory disturbance will be **Small** due to the short duration and localised nature of the disturbances from activities such as dismantling infrastructure. The magnitude of impacts on wildlife injury and mortality during decommissioning is rated as **Medium**.

##### Impact Significance

During the decommissioning phase, the significance of sensory disturbances to wildlife, such as noise and light impacts, will be **Negligible**. While these impacts will occur, they will be comparatively short-term and less persistent than during construction. However,

decommissioning activities will introduce new sources of disturbance and potential hazards that will maintain the risk of wildlife injury and mortality at levels comparable to prior Project stages. Activities such as dismantling infrastructure and habitat restoration can expose wildlife to temporary risks and uncertainties, resulting in a **Moderate** impact on terrestrial wildlife.

#### 8.7.1.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional monitoring after decommissioning is recommended to assess and mitigate long-term environmental impacts and ensure compliance with environmental regulations.

#### 8.7.1.5 RESIDUAL IMPACT SIGNIFICANCE

All available management measures designed to address operational impacts on terrestrial biodiversity have been factored into the initial impact ratings. As a result, residual impacts on biodiversity during the decommissioning phase will be equivalent to the initial impact ratings during this phase. Table 8.10 provides a detailed list and description of each impact's significance during decommissioning.

**TABLE 8.10 SUMMARY OF TERRESTRIAL IMPACTS DURING THE OPERATIONS PHASE OF THE PROJECT**

Significance of Operations Impacts					
Impact	Sensory Disturbance of Wildlife				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to terrestrial biological resources would be considered negative.				
Impact Type	Direct	Indirect		Induced	
	Terrestrial biological resources would be indirectly impacted. Sensory impacts like noise and light are expected to indirectly affect wildlife behaviour.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Noise and light will be generated continuously throughout all Project phases. Impacts to terrestrial biological resources will be Long-term.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the Project Area of Influence.				
Impact Scale	Impact scale is considered localised to the Project Area and surrounding access roads. This is considered a small impact.				
Frequency	Noise and light impacts to terrestrial biological resources is expected to be continuous throughout the lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Short-term, high-intensity decommissioning activities such as dismantling and site clearance produce significant disturbances, including bright lighting and loud noises, which can disrupt nocturnal species and alter wildlife behaviours, resulting in physiological stress and reduced habitat quality. However, given the limited duration and localised area of the noise levels, the impact magnitude is considered Small.				
Receptor Sensitivity	Low	Medium		High	
	The sensitivity of wildlife to noise and light in the Project Area is rated as Low due to prior Project activities' expected effect on the distribution of sensitive species within the EMPL.				

Significance of Operations Impacts					
Impact Significance	Negligible	Minor	Moderate	Major	
	During the decommissioning phase, noise and light impacts occur but are usually short-term, with intense disturbances arising from activities such as dismantling. While lighting may be less continuous than during operations, the acute disturbances during decommissioning are typically of shorter duration than those experienced during construction, which involves the highest levels of continuous noise and light.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	The residual impact during the decommissioning phase is assessed to be Negligible.				
Impact	Injury and Mortality of Wildlife				
Impact Nature	Negative		Positive	Neutral	
	Potential impacts to terrestrial biological resources would be considered negative.				
Impact Type	Direct		Indirect	Induced	
	Terrestrial biological resources would be directly impacted.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Injury and mortality are expected to occur continuously throughout all Project phases, indicating that the impacts to biological resources will be Long-term.				
Impact Extent	Local		Regional	International	
	The impact extent on terrestrial wildlife is Regional. Some bird species migrate, while several large mammals identified in the Project Area have extensive home ranges. Any injury or mortality event may cause broader regional impacts, particularly for migrating species in the Project Area.				
Impact Scale	Impact scale would encompass any location where equipment is operating, or active construction is taking place during the decommissioning phase.				
Frequency	Potential wildlife injury and mortality is expected to be continuous throughout the lifetime of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Medium.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity of wildlife to injury and mortality within the Project Area is rated as 'Medium', due to the presence of amphibians, reptiles, insects, small mammals, and some birds that may be unable to avoid the Project footprint during the decommissioning of mining infrastructure. Several of these species are of conservation concern, including those listed on the IUCN Red List, CITES, and as Guiana Shield endemics, increasing the risk of population impacts if injury or mortality occurs.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Decommissioning activities, including dismantling infrastructure and site restoration, can create disturbances and hazards that elevate the risk of wildlife injury and mortality. Habitat restoration can temporarily expose wildlife to new risks, and the transition from an operational mine to a restored environment				



Significance of Operations Impacts				
	introduces additional uncertainties and potential dangers. Consequently, the impact of injury to terrestrial wildlife is considered Moderate.			
<b>Residual Impact Magnitude</b>	Positive	Negligible	Small	<b>Medium</b>
<b>Residual Impact Significance</b>	Negligible	Minor	<b>Moderate</b>	Major
	The residual impact of wildlife injury and mortality is Moderate.			

## 8.7.2 AQUATIC RESOURCES

### 8.7.2.1 POTENTIAL IMPACTS

#### Degradation of Aquatic Habitat

During the decommissioning phase, many of the pit lakes will fill with surface water and groundwater while the WSF will be regraded and capped with topsoil, and the TSF will be graded to drain, with a pond forming over most of the TSF surface. In addition, the processing plant and supporting infrastructure and equipment will be removed. The capping of the WSF will prevent seepage and offsite transport of effluent and will require hauling of materials and earthworks, which may generate additional runoff, leading to increased turbidity and sedimentation in nearby water courses. Dismantling the processing facilities can further increase runoff and elevate erosion risks and sedimentation as infrastructure is removed and the landscape is altered. Following removal of facilities and stabilisation of the landscape, there will be less impervious surfaces, which will increase filtration and reduce some runoff impacts.

Drainage of WSF may also alter groundwater flow patterns, causing disruption to the natural movement of groundwater, and potentially impacting nearby aquatic ecosystems by changing water availability and flow rates. Changes to the stability of water conditions may impact aquatic habitats and, over time, can result in shifts in habitat quality and ecosystem dynamics, potentially harming aquatic life and reducing biodiversity. While capping helps to prevent the release of contaminants or pollutants into nearby water systems and mitigate the risks of acid mine drainage, if not managed properly, contaminants can be introduced into aquatic habitats. Capping failures or seepage can lead to heavy metal contamination and habitat degradation as aquatic species can be impacted by changes in water quality. Additionally, changes to water management systems, residual chemicals, and waste materials during facility removal leading to contamination and sedimentation may further impact water quality and aquatic ecosystems.

#### Aquatic Species Injury and Mortality

The regrading of benches at the WSF and removal of project infrastructure may pose risks of injury or mortality to aquatic species. Heavy machinery used for landscape regrading could impact aquatic species as vehicles may need to cross waterbodies and regrade stream areas. Additionally, residual chemicals and potential seepage from the WSF and TSF after decommissioning may injure fish species and impact their populations. Streams will be regraded to restore pre-construction conditions, ultimately benefiting aquatic habitats, however the process itself can result in injury and death of aquatic species over the short-term.

### 8.7.2.2 EXISTING CONTROLS AND DESIGN MITIGATION

- Regrading of benches on WSF.
- Revegetation of WSF and other disturbed areas.
- Grading of TSF to drain, forming a pond.
- Establishment of long-term water management at TSF.
- Erosion and sediment control management plan and site water management plan.

### 8.7.2.3 SIGNIFICANCE OF IMPACTS

#### Receptor Sensitivity

No unique aquatic habitats exist within the project AoI, and by the decommissioning phase, these habitats will have been shaped by over a decade of industrial mining activities associated with the operation of the Project. Habitat features most vulnerable to mining-related degradation will have already been eliminated or significantly diminished, resulting in **Low** sensitivity to further loss or degradation of aquatic habitats. Aquatic biota will continue to have a **Low** sensitivity to injury or mortality to individual fish or macroinvertebrates.

#### Impact Magnitude

While aquatic organisms will have adapted to historical mining impacts, they may still experience physiochemical habitat disturbances, however these will be comparable in nature and scale to pre-construction impacts. Consequently, the magnitude of impacts to habitat degradation during decommissioning is expected to be **Small**. Similarly, the magnitude of impacts related to injury and mortality are rated as **Small**, reflecting the similarity of type of activities between pre-construction and decommissioning phases.

#### Impact Significance

The significance of impacts from habitat degradation will be **Negligible**, largely due to the relatively small footprint and short duration of closure activities combined with the highly disturbance-adapted characteristics of the aquatic biological community that will exist within the Project AoI by this point in the Project's life cycle. Impacts from injury and mortality of aquatic biota will also be **Negligible** due to the same factors that will limit the significance of this impact during prior Project stages.

### 8.7.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional monitoring after decommissioning is suggested to assess and mitigate long-term environmental impacts and ensure compliance with environmental regulations.

### 8.7.2.5 RESIDUAL IMPACT SIGNIFICANCE

Mitigation measures during the decommissioning phase - such as regrading WSF benches, revegetating disturbed areas, implementing long-term water management at the TSF and pits - are expected to effectively manage habitat-related impacts and keep residual impacts on habitat at a **Negligible** significance. The residual significance of impacts on aquatic biota is also expected to remain **Negligible**. (Table 8.11).

TABLE 8.11 SUMMARY OF AQUATIC IMPACTS DURING THE DECOMMISSIONING PHASE

Significance of Impact					
Impact	Degradation of Aquatic Habitat				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered negative.				
Impact Type	Direct	Indirect		Induced	
	Biological resources would be directly impacted during the decommissioning phase. Turbidity and sedimentation will occur near decommissioning activities such as road use, dismantling of processing plant, and decommissioning of other supporting facilities.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Decommissioning is the final stage of the Project, so impacts incurred during this phase would be permanent.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised and small.				
Frequency	Impacts to fish and macroinvertebrates could occur intermittently during the decommissioning phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be small.				
Receptor Sensitivity	Low	Medium		High	
	Aquatic organisms present within and surrounding the Project Area are expected to be adapted to the types of disturbances that will occur during decommissioning.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Given that the overall impact magnitude is small, the absence of conservation-sensitive species, and historical ASM activities have already resulted in increased turbidity and sedimentation of most streams in the Project footprint, these species are considered to have adapted to anthropogenic disturbances. Impacts are therefore considered negligible.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	After considering mitigation measures, the residual impact is assessed to generally be Negligible.				
Impact	Aquatic Species Injury and Mortality				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to aquatic biological resources would be considered negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to aquatic biological resources would be direct.				
	Temporary	Short-term	Long-term	Permanent	

Significance of Impact				
Impact Duration	Injury and mortality are expected to occur continuously throughout all Project phases, indicating that the impacts to biological resources will be Long-term.			
Impact Extent	Local	Regional		International
	The extent of impacts to aquatic fauna is expected to be localised, primarily driven by various activities during the decommissioning phase.			
Impact Scale	The scale of impact on aquatic species extends to waterways within the AoI and downstream, primarily influenced by habitat disturbance, degradation of water quality, and interactions with vehicles.			
Frequency	Potential injury and mortality of aquatic species is expected to be continuous throughout the lifetime of the Project.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the characteristic above, the impact is likely to be Small.			
Receptor Sensitivity	Low	Medium		High
	The impacts on injury and mortality are rated as low due to the local extent which is limited to the Project Area and no known occurrence of special status aquatic species in the Project AoI.			
Impact Significance	Negligible	Minor	Moderate	Major
	The significance of impacts from injury and mortality of aquatic biota will be Negligible due to the same factors that will limit the significance of this impact during prior Project stages.			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	After considering mitigation measures, the residual impact is assessed to generally be Negligible.			

## 9. SOCIOECONOMICS AND COMMUNITY HEALTH IMPACT ASSESSMENT

### 9.1 INTRODUCTION

This chapter identifies and assesses the potential impacts on the existing socioeconomic and community health environment in the Social Area of Influence (Social AoI) due to Project-related activities. The methods used to assess socioeconomic impacts build upon the general assessment methodology outlined in Volume 1: Chapter 5. The general approach and methodology have been adapted for use in evaluating impacts on socioeconomic resources/receptors.

The assessment presented in this chapter addresses potential impacts from the Project on the following socioeconomic resources/receptors within the Social AoI:

- Socioeconomic Conditions
  - Employment and Business Activity
- Land Use
  - Land Use and Governance
  - Ecosystem Services
- Community
  - Physical and Economic Displacement
  - Community Health, Safety, and Wellbeing
  - Vulnerable/Indigenous Peoples
- Social Infrastructure
  - Transport
  - Infrastructure and Utilities

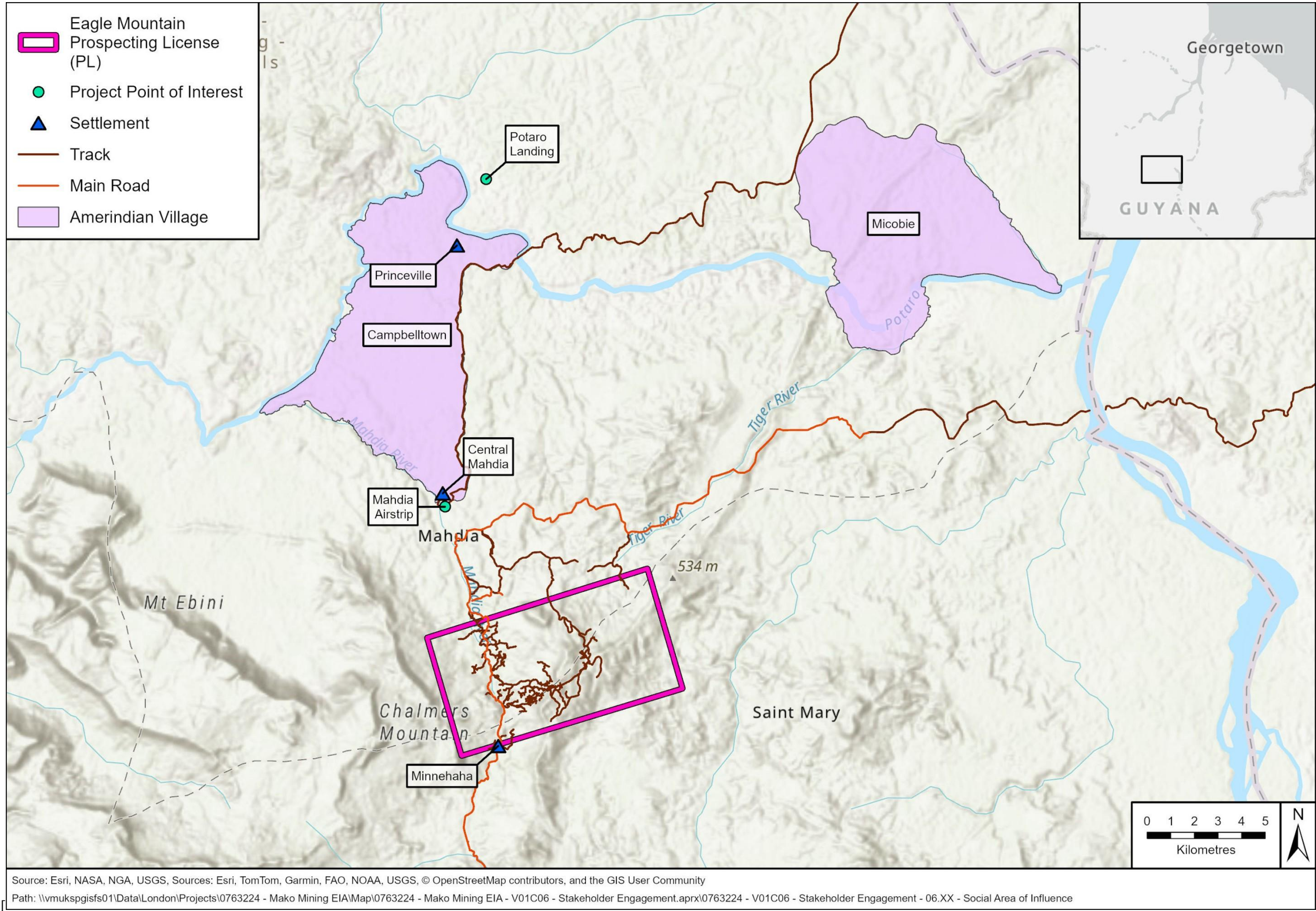
Potential impacts due to planned Project activities on these socioeconomic resources/receptors are assessed for the pre-construction and construction, operations, and closure phases of the Project.

#### 9.1.1 DEFINING THE AREA OF INFLUENCE

The Social Area of Influence (Social AoI), including the Direct AoI and Indirect AoI, are shown in Figure 9.1.



FIGURE 9.1 SOCIAL AOI



Source: ERM, 2025. Note: Rio Potaro is the Potaro River



### 9.1.2 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

For the socioeconomic impact assessment, specific criteria for designation of socioeconomic impacts (type, extent, duration, and frequency) are shown in Table 9.1.

**TABLE 9.1 DESIGNATION DEFINITION FOR SOCIOECONOMICS AND COMMUNITY HEALTH**

<b>Designations</b>	
<b>Type</b>	<b>Definition</b>
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the communities which are affected).
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., availability or accessibility of social infrastructure as a result of the Project utilising that infrastructure).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., impacts to a community from an influx of a large Project workforce).
Positive	An impact that is considered to represent an improvement on the baseline conditions or introduces a new change that may be beneficial.
<b>Extent</b>	<b>Definition</b>
Local	Impact is anticipated to be contained within the Direct AoI
Regional	Impact is anticipated to be felt within the Indirect AoI
International	Impact is anticipated to be felt at the national level and beyond
<b>Duration</b>	<b>Definition</b>
Temporary	Instantaneous to less than 1 week in aggregate
Short-term	More than 1 week to less than 1 year in aggregate
Long-term	More than 1 year in aggregate
Permanent	Permanent in nature
<b>Frequency</b>	<b>Definition</b>
Once	Occurring only one time
Episodic	Occurring occasionally and at irregular intervals
Continuous	Occurring more than occasionally or at regular intervals

Source: ERM, 2012

Criteria for the determination of magnitude for socio-economics and community health and safety are provided in Table 9.2 and Table 9.3. Criteria for sensitivity for socio-economics and community health and safety are provided in Table 9.4 and Table 9.5.

TABLE 9.2 LEVELS OF MAGNITUDE FOR SOCIOECONOMICS

Magnitude	Defining Characteristics
Negligible	Change remains within the range commonly experienced within the household or community.
Small	Perceptible difference from baseline conditions. Generally, these impacts are local, rare and affect a small proportion of households and are of a short duration.
Medium	Clear difference from baseline conditions. These impacts affect a substantial area or number of people and/or are of medium duration. Their frequency may be occasional, and impacts may be regional in scale.
Large	Change dominates over baseline conditions. They affect most of the area or population in the AoI and/or persist over many years. Impact may be experienced over a regional or national area.
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there are ample data to support a more robust characterisation. It is usually sufficient to indicate that the Project will result in a positive impact, without characterising the exact degree of positive change likely to occur.

Source: ERM, 2012

TABLE 9.3 LEVELS OF MAGNITUDE FOR COMMUNITY HEALTH, SAFETY, AND WELLBEING

Magnitude	Defining Characteristics
Negligible	No discernible change in health status of the population. Anticipated incidence of a health-related risk at an individual level is "very rare."
Small	Changes to health status or access to medical care occur in some individuals and households, but changes are minor, temporary, and reversible even without medical or public health intervention. Anticipated incidence of a health-related risk at an individual level is "rare."
Medium	Changes to health status or access to medical care occur at the population level but are reversible over time or with medical or public health intervention. Anticipated incidence of a health-related risk at an individual level is "occasional."
Large	Profound and measurable changes to health status or access to medical care are evident at the population level. Some health impacts may be severe or permanently debilitating, requiring medical or public health intervention or other forms of assistance for treatment and recovery. Anticipated incidence of a health-related risk at an individual level is "frequent."

Source: ERM, 2012

TABLE 9.4 LEVELS OF SENSITIVITY FOR SOCIOECONOMICS

Sensitivity	Defining Characteristics
Low	Minimal vulnerability; impacted people consequently have a high ability to adapt to changes brought by the Project and opportunities associated with it.
Medium	Some but few areas of vulnerability; impacted people still retain an ability to adapt at least in part to change brought by the Project and opportunities associated with it.

Sensitivity	Defining Characteristics
High	Profound or multiple levels of vulnerability that undermine impacted people's ability to adapt to changes brought by the Project and opportunities associated with it.

Source: ERM, 2012

**TABLE 9.5 LEVELS OF SENSITIVITY FOR COMMUNITY HEALTH, SAFETY, AND WELLBEING**

Sensitivity	Defining Characteristics
Low	The population does not have many areas of health vulnerability. Individuals and households have the personal resources and capacity to protect and promote health. The community is well equipped with resources and infrastructure to provide routine medical and health care and address medical and health emergencies.
Medium	The population has multiple areas of health vulnerability, due either to environmental or social factors. Portions of the population face socioeconomic challenges that act as barriers to health protection and promotion. There are shortfalls in local medical and health resources and infrastructure that compromise ability to provide timely and appropriate medical and health care in some situations.
High	The population has many areas of health vulnerability due to environmental and social factors. A large proportion of the population is disadvantaged, which acts as a barrier to protecting and promoting health. Adequate medical health resources and infrastructure are lacking, often not allowing for timely and appropriate medical and health care.

Source: ERM, 2012

## 9.2 IMPACTS FROM PRE-CONSTRUCTION / CONSTRUCTION PHASE

Activities that may impact the socioeconomic and community health environments during this phase include:

- Presence and transportation of the workforce, with a peak estimated workforce of 350;
- Construction of the workers camp with potential for a portion of the workforce to be housed in Mahdia;
- Upgrade of main access road;
- Construction of haul roads between Project facilities and pits; and
- Construction of the processing plant and supporting infrastructure.

Pre-construction and construction are estimated to take around 2 years.

### 9.2.1 POTENTIAL IMPACTS

#### 9.2.1.1 IMPACTS TO EMPLOYMENT AND BUSINESS ACTIVITY

Key potential impacts to socioeconomic conditions identified for the pre-construction / construction phase of the Project include:

- Increased employment and direct hiring of Guyanese nationals;
- Increased capacity and skills of local workers and subcontractors; and
- Increased local business activity and growth.

Each of these potential impacts is discussed in the following sections.

The Project will advance employment and skills development by prioritising local recruitment and subcontracting, sourcing goods and services within the Area of Influence (AoI), and supporting community investment. At peak construction, approximately 350 workers will be employed across a range of roles, from entry-level to managerial positions. Strong emphasis will be placed on hiring local Guyanese, particularly from Region 8. Local hiring initiatives will be supported through periodic job fairs at major AoI centres and ongoing community grants, particularly targeting Amerindian communities.

Job creation and income generation are expected to contribute to broader economic activity, including increased household spending, income tax contributions, and potential growth in sales for local businesses. The Project will evaluate opportunities to use suppliers and contractors from the area, especially Mahdia and Campbelltown, for goods such as food supplies and drinking water for the camp.

The Project may also generate additional economic benefits in the area, with local businesses likely to benefit from Project-related purchases. Workers may spend a portion of their earnings within the nearby communities, which could contribute to higher local spending over the Project's duration. However, the extent of the economic benefits will depend on how much of this spending remains within the formal local economy.

There are significant gaps in income in Guyana due to ongoing issues like poor infrastructure, unequal education, and uneven growth. Areas further from the coast usually have fewer job opportunities and a lower quality of life, with remote and Indigenous communities experiencing the most pronounced socioeconomic disadvantages. The Project may lead to some negative effects on local economies, such as increased competition for skilled workers and support services. This could harm other businesses that cannot match the Project's salaries in Region 8, potentially worsening income inequality. Individuals and households within the AoI who lack the necessary qualifications, certifications, and work experience may face difficulties in accessing employment opportunities associated with the Project, as local workers would require targeted skills development to meet the Project's standards. While the Project intends to facilitate or support training programs for locals to meet required standards, the scope and nature of the support may depend on collaboration with government agencies, institutions and other partners.

While this may cause short-term challenges, the long-term effects may result in a positive outlook for the local community. Guyana is also known for having a high level of "brain drain," whereby a large percentage of the tertiary-educated population emigrates from the country, mostly to Organisation for Economic Co-operation and Development nations (Guyana Standard 2023). Employment opportunities available throughout all Project phases can help attenuate this phenomenon. In addition, capacity-building and training initiatives supported by the Eagle Mountain Project may contribute to a more qualified workforce and to enhance the capacity of local suppliers to serve a larger and more diverse clientele, rather than focusing only on the immediate needs of a single mine.

#### 9.2.1.2 IMPACTS TO LAND USE

Key potential impacts to land use identified for this phase of the Project include the following.

- Changes in Land Use and Governance:

- Conversion of land from one use to another (i.e., artisanal mining to commercial mining or ecosystem services); and
- Change in management and ownership type (i.e., change between public, private, and Amerindian ownership).

There are no large-scale significant mineral properties adjacent to the Eagle Mountain Prospect License (EMPL); however, there are several individual medium-and-small-scale tenements around the Property, held primarily by small-scale miners, and other areas that are used informally (and in some cases illegally) by porkknockers and artisanal miners. Stronghold Guyana has acquired the licenses for the Kilroy medium-scale permits within the EMPL, while some small-scale claims and informal workings in the surrounding area remain independently controlled.

To the Northeast of the EMPL, there are the settlements of Mahdia (township) and Campbelltown (titled village), and the south, east and north are predominantly areas that were historically and in some cases are currently mined as well as the community of Minnehaha (Figure 9.1).

Expected changes in land use include conversion of lands in the EMPL from current exploration camp and associated activities to a fully expanded mine site, including all associated infrastructure and facilities. The potential impacts of pre-construction / construction activities on Land Use and Governance are negative. Although porkknocker activities within the EMPL are not legally permitted, save and except several legal small-scale claims, the conversion of the EMPL for commercial mining limits further artisanal mining activities. Areas outside of the EMPL utilised by porkknockers will not be affected by the Project.

#### 9.2.1.3 IMPACTS TO COMMUNITY HEALTH, SAFETY, AND WELLBEING

Key potential impacts to the community identified for the pre-construction / construction phase of the Project include:

- Impacts to Community Health, Safety, and Wellbeing, including:
  - Potential overburdening of healthcare and medical services within the Social AoI, specifically the Mahdia Regional Hospital and/or hospitals in Georgetown (in the case of emergency); Increased risk of communicable disease transmission;
    - Impacts to public safety; and
    - Increased strain on the health and wellbeing of community members in the Social AoI.
- Impacts to Vulnerable/Indigenous Peoples.

Access to medical care in Region 8 and the Social AoI is challenging due to limited resources and the isolated or remote location of many communities. Patients in need of emergency care must travel to either Mahdia or even Georgetown, depending on the type of care needed. This poses challenges in access to healthcare, particularly for workers and community members in remote areas, including those working in mining in the interior. Refer to Table 9.6 for the existing medical services available in the Social AoI. During construction and operations phases there will be an on-site medic stationed at the Eagle Mountain Camp, however, currently there is no medic on site.

**TABLE 9.6 HEALTHCARE AND MEDICAL SERVICES IN THE SOCIAL AOI**

<b>Healthcare Service</b>	<b>Location in the Social AoI</b>
Regional Hospital	Mahdia District Hospital
Health Centre	Campbelltown
Health Posts	Micobie, Princeville

Source: ERM Fieldwork, 2025

The Mahdia District Hospital, located approximately 7 km from the Project site, is one of two hospitals in Region 8. This hospital provides comprehensive medical services to the region's population, including remote, hinterland, and mining communities within Region 8, Sub District 1. The facility plays a critical role in delivering primary, secondary, and emergency healthcare, and also functions as the regional distribution centre for essential medications and supplies. Project workers who require emergency medical services beyond Eagle Mountains' on-site medical services would be transported to the Mahdia District Hospital for care. For more involved cases of emergency, workers may need to be transported to a hospital further away in Georgetown. This impact assessment considers the potential additional strain the Project may cause the Mahdia District Hospital should Project workers need emergency medical services.

The Mahdia District Hospital averages around 10 patients per day. The hospital has a total of 41 beds, distributed across several specialised departments: male and female wards each containing seven beds; the isolation unit accommodates up to ten patients; the paediatric ward has five beds; and the maternity ward is equipped with three beds. This configuration generally aligns with the hospital's typical daily demand, which averages about ten patient visits per day. However, during surgical outreach events - conducted every two to three months and lasting two to three days - there is often temporary pressure on bed availability due to a surge in admissions.

The facility is equipped with three ambulances (one bus and two land cruisers), which limits the ability to reach remote areas. Although a surgical theatre has been built, it is not yet operational. Plans are in place to expand the hospital, with a particular focus on the relatively new emergency department. There is also budget allocation for commissioning the operating theatre and constructing a surgical recovery room designed to accommodate five male and five female patients. However, further physical expansion is restricted by limited yard space and terrain that does not support vertical construction.

The Mahdia District Hospital provides a comprehensive range of healthcare services to the community, including accident and emergency care, dental surgery, laboratory, ultrasound, X-ray, physiotherapy, speech therapy, optometric and audiology services, as well as rehabilitation, maternal and child health, pharmacy, and environmental health services. Emergency Medical Technician (EMT) support is available, and specialist services such as obstetrics and gynaecology are occasionally provided by visiting professionals from Georgetown. It has also been noted during field interviews that the staffing capacity is adequate to manage the typical volume of daily patient visits. Based on this assessment, the hospital is expected to be able to accommodate a small increase in patient volume associated with the Project, if such cases arise.



The Project is anticipated to employ a peak workforce of 350 workers during the pre-construction / construction phase. Local workers will reside at home while out-of-town workers will stay at the Eagle Mountain camp with overflow staying at existing lodgings in Mahdia. The camp will have on-site medical personnel who would attend to minor or less severe health issues among workers; however, in the event of a serious medical emergency, affected workers would need to be transported to the Mahdia Regional Hospital, or potentially, to a hospital in Georgetown, depending on the severity of the emergency.

Given that there are anticipated to be a maximum of 350 workers, and that most medical issues would be dealt with on site, the potential Project impact to overburdening the healthcare and medical services in the Social AoI is **indirect, regional** (likely concentrated to Mahdia but potentially impacting hospitals in Georgetown), and **long-term** in nature. The magnitude of the impact is likely **medium**, while the sensitivity of the community health in the Social AoI is **high**, given multiple levels of vulnerability exist (such as difficulty accessing health resources and high levels of prevalence of disease such as malaria). While the workforce presence is continuous, the frequency of an emergency is unpredictable, and therefore **episodic**.

The Project workforce may strain healthcare services and heighten the risk of communicable disease transmission in areas like Mahdia due to the influx of non-resident workers, increased population mobility between the Project site and Town, and increased interaction between the workers and local community. Workers arriving from regions with higher disease prevalence could alter local transmission patterns, particularly for TB and STIs. Congregated living arrangements and rotational schedules may further elevate risks of respiratory and vector-borne disease spread. The increased demand for routine and emergency care may also place pressure on staff, diagnostic services, and medical supplies, especially considering Mahdia's remote location and constrained referral capacity. While the influx is not expected to significantly raise local crime rates, concerns about safety and security may arise from a large, predominantly young male workforce being integrated into the local community. Worker-community interactions may raise gender-sensitive concerns or risks of exploitative relationships if not carefully managed.

### **Vulnerable/Indigenous Peoples**

Amerindians populations constitute a considerable portion of the population in Interior Regions. The Indigenous communities of Campbelltown, Princeville, and Micobie within Region 8 are considered part of the indirect Social AoI. No known Amerindian communities are found in or around the EMPL; however, the Amerindian communities could be indirectly impacted as they will utilise medical facilities in Mahdia.

The Amerindian communities within the indirect Social AoI also exhibit vulnerabilities, such as limited livelihood opportunities, high levels of substance abuse, barriers to accessing medical care, uncertainty regarding land ownership, and potential for discrimination. As such, Amerindian communities may exhibit a lower ability to adapt to changes due to the Project and may experience impacts disproportionately compared to other communities in the Social AoI.

#### **9.2.1.4 IMPACTS TO SOCIAL INFRASTRUCTURE**

Key potential impacts to social infrastructure identified for the pre-construction / construction phase of the Project include:

- Impacts to terrestrial transportation networks, including:
  - Increased transportation resulting in potential traffic congestion on roadways; and movements to transport workers, materials, equipment, and supplies.
- Impacts to infrastructure and utilities, including:
  - Potential strain on infrastructure and utilities in the Direct and Indirect AoI as a result of Project activities.

Each of these potential impacts is discussed in detail in the sections below.

### **Traffic and Transport**

The use of road-based transportation is expected to peak during construction to accommodate the frequent movement of workers, supplies, materials, equipment, and fuel to the worksite. Most of the Project's supplies will be imported to Guyana or sourced from suppliers in Georgetown/Mahdia. The access road within the EMPL is currently utilised by an average of between three to six cars per hour and around 90 cars per day, including Stronghold Guyana vehicles. Construction activities will introduce additional vehicles along the access road with impacts to local traffic and transportation. During construction, the Project will add nine articulated dump trucks (ADT) with a 36-tonne capacity per day to local traffic.

Access to the Project site will continue to rely on road and air transport. The main route from Georgetown to Mahdia spans approximately 310 km and typically takes six to eight hours, depending on conditions, following the Linden–Soesdyke Highway and the Linden–Lethem Road, sections of which have recently been upgraded to improve all-weather accessibility. Within the surrounding communities, Mahdia and Campbelltown have established road networks, while Micobie and Princeville rely on laterite roads that can become more challenging during adverse weather. Air transport remains important in Region 8 for the movement of goods and services, with operational airstrips in Mahdia, Kato, and Paramakatoi. The Mahdia airstrip links to Georgetown, offering a quicker alternative to road travel, though road transport remains crucial for cost-effective movement of goods and personnel. These existing transport conditions influence the Project's logistics, including the capacity and reliability of routes used to move people and materials, and help to contextualise the expected increases in Project-related traffic and associated pressures on road infrastructure and local road users.

### **Infrastructure and Utilities**

Currently, the Project worksite is centred at the Eagle Mountain Camp, utilising its own utilities and infrastructure with minimal dependence on public utilities and infrastructure. During the pre-construction / construction phase, however, there is potential for increased strain on infrastructure within the Project's Direct AoI. This phase includes activities such as:

- Installation and operation of diesel-fuelled generators at mine site;
- Import of major pieces of equipment such as grinding mills, excavators, mine trucks, batch plants/crushers;
- Commissioning and start-up of the processing plant;
- Construction of the power plant, upgrading access roads within the EMPL, and operations phase camp; and
- Outside the EMPL, the upgrading of access road.

The Project will rely entirely on power supplied by the power plant, which will be constructed at the mine site to supply power to the Project. Mahdia has a power plant managed by the government of Guyana. Mahdia Power and Light Inc. (MPL Inc.) are responsible for the generation and distribution of electricity in Mahdia and Campbelltown. Although Princeville is close to Mahdia, the community is not on the electricity grid, therefore has no power supply from MPL. Residents of Princeville and Micobie rely on individually owned generators to supply power. The schools, health posts, and ICT Hubs in both communities are equipped with solar panels for power generation, which was provided through the Government of Guyana. As a result, no significant impact on electricity within these communities is anticipated.

In Mahdia, the regional capital, housing are generally of a higher standard when compared to the rest of the region, however, less developed than typical urban centres in Guyana. There is a mixture of commercial buildings like hotels, apartments, and other businesses, as well as residential structures, though the Project workforce will not depend on these facilities. Instead, a permanent campsite will be constructed within the EMPL to accommodate the workforce, however there is potential for a portion of the workforce to be housed in Mahdia which will potentially cause issues with resource use and strain on local utilities.

## 9.2.2 EXISTING CONTROLS/DESIGN MITIGATION

### 9.2.2.1 SOCIOECONOMIC CONDITIONS

#### **Employment and Business Activity**

Existing embedded controls to mitigate potential Project impacts from Employment and Business Activity include:

- Employing Guyanese citizens with appropriate skills and qualifications where possible;
- During construction, Stronghold Guyana will target hiring local Guyanese workers, particularly from Region 8;
- Partnering with select local institutions to support workforce development programs targeted to in-demand skillsets and provide Guyanese candidates with appropriate training;
- Proactively messaging and communicating about Project-related employment opportunities throughout all Project phases, beginning with pre-construction / construction (e.g., job fairs); and
- Procure goods and services locally (within the Social AoI) when available and feasible throughout all Project phases.

### 9.2.2.2 LAND USE

#### **Land Use and Governance**

There are no known embedded controls to mitigate potential Project impacts from Land Use and Governance. Land within the EMPL that is required for the Project has been leased to Stronghold Guyana via mining permits received from GGMC.

### 9.2.2.3 COMMUNITY

#### Community Health, Safety, and Wellbeing

Embedded controls for Community Health, Safety, and Wellbeing include:

- The Project's Community Health and Safety Plan, including emergency procedures, on-site medical facilities, and grievance mechanism procedures; and
- The Project will provide on-site medical services (access to the Camp medic) to employees and residents in and around the EMPL to attend to minor or less severe health issues.

#### Vulnerable/Indigenous Peoples

The Project has included vulnerable and Indigenous peoples in the Stakeholder Engagement Plan and Public Consultations.

### 9.2.2.4 SOCIAL INFRASTRUCTURE

#### Traffic and Transport

Embedded controls for terrestrial and river-based transportation include:

- The Project's commitment to maintenance and upgrades along access roads used within the Direct AoI in collaboration with the Guyana Ministry of Public Works.
- There are 13 wooden/timber bridges from Mabura (east bank of Mango Landing – ferry crossing) to the security gate at the base of the camp road. All 13 bridges will be upgraded and widened.

#### Infrastructure and Utilities

Embedded controls for infrastructure and utilities include:

- Utilising the Project's own infrastructure and utilities (accommodation, power, water supply - drawn from creeks and groundwater wells, avoiding the Salbora water supply which provides water to Mahdia).

## 9.2.3 SIGNIFICANCE OF IMPACTS

### 9.2.3.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

Potential impacts from Project activities on socioeconomic conditions during the pre-construction/construction phase are anticipated to be primarily **direct, regional, long-term**, and **continuous** in nature. The magnitude of potential impacts is likely **positive** (Table 9.7).

**TABLE 9.7 POTENTIAL PROJECT IMPACTS TO SOCIOECONOMIC CONDITIONS (PRE-CONSTRUCTION / CONSTRUCTION)**

Significance of Impact			
Impact	Socioeconomic Conditions		
Impact Nature	Negative	<b>Positive</b>	Neutral
	Potential impacts to Socioeconomic Conditions would be <b>Positive</b> for: <ul style="list-style-type: none"> <li>• Employment and Business Activity</li> </ul>		
Impact Type	<b>Direct</b>	Indirect	Induced

Significance of Impact					
	• Impacts to Employment and Business Activity are <b>direct</b> .				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The pre-construction / construction phase of the Project is expected to be completed in 24 months, which would be considered <b>long-term</b> for Employment and Business Activity.				
Impact Extent	Local	Regional	International		
	• Impacts to Employment and Business Activity are <b>regional</b> .				
Frequency	• Impacts to Employment and Business Activity are <b>continuous</b> .				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts to Employment and Business Activity are <b>positive</b> .				
Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity to Employment and Business Activity is <b>medium</b> .				

#### 9.2.3.2 IMPACTS TO LAND USE

Potential impacts from Project activities on Land Use and Governance during the pre-construction phase are anticipated to be primarily **direct, regional, long-term**, and occurring **once**. The magnitude of potential impacts is likely **negative** (Table 9.8).

TABLE 9.8 POTENTIAL PROJECT IMPACTS TO LAND USE (PRE-CONSTRUCTION / CONSTRUCTION)

Significance of Impact					
Impact	Impacts to Land Use				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to Land Use during the pre-construction / construction phase would be <b>negative</b> for Land Use and Governance.				
Impact Type	Direct	Indirect		Induced	
	Impacts to Land Use and Governance are considered <b>direct</b> .				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The pre-construction / construction phase of the Project is expected to be completed in 24 months, which would be considered <b>long-term</b> for Land Use and Governance.				
Impact Extent	Local	Regional		International	
	Impacts to Land Use and Governance are considered <b>regional</b> , with understanding that the greatest impact will be on the communities in closest proximity to the EMPL (such as Minnehaha) and artisanal miners in the EMPL				
Frequency	Impacts to Land Use and Governance are expected to occur <b>once</b> .				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts to Land Use and Governance are <b>medium</b> .				

Significance of Impact				
Receptor Sensitivity	Low		Medium	High
	Sensitivity for Land Use and Governance receptors is <b>medium</b> .			
Impact Significance	Negligible	Minor	Moderate	Major
	Impact significance for Land Use and Governance is <b>moderate</b> .			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	With the application of mitigation measures, residual impact significance for Land Use and Governance is <b>Minor</b> .			

### 9.2.3.3 IMPACTS TO COMMUNITY

Given potential impacts to increased risk of spread of communicable disease, potential for increased crime or decreased security with a large, male workforce, and potential for increased strain on community health and wellbeing, impacts to community health, safety and wellbeing are considered **indirect, regional, long-term**, and **continuous** (due to the continuous presence of the workforce during pre-construction). The magnitude of the impact is **medium** at peak workforce given the current population in Region 8, and the sensitivity of community health is **high** (Table 9.9).

Potential impacts from Project activities on Amerindian communities during the pre-construction / construction phase are anticipated to be **induced, regional, long-term**, and **episodic** in nature. The magnitude of potential impacts is likely **small** due to the Amerindian communities being in the Indirect AoI, and sensitivity of the Amerindian communities is **high** (Table 9.9).

**TABLE 9.9 POTENTIAL PROJECT IMPACTS TO COMMUNITY (PRE-CONSTRUCTION / CONSTRUCTION)**

Significance of Impact				
Impact	Impacts to Community			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to Community during pre-construction / construction would be <b>Negative</b> for: <ul style="list-style-type: none"><li>Community Health, Safety, and Wellbeing</li><li>Vulnerable/Indigenous Peoples</li></ul>			
Impact Type	Direct	Indirect		Induced
	Impacts to Community Health, Safety, and Wellbeing are <b>indirect</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>induced</b> .			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The pre-construction / construction phase of the Project is expected to last over 15 months, which would be considered <b>long-term</b> for Community Health, Safety, and Wellbeing, and Vulnerable/Indigenous Peoples.			



Significance of Impact					
Impact Extent	Local		Regional		International
	Impacts to Community Health, Safety, and Wellbeing are <b>regional</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>local</b> .				
Frequency	Impacts to Community Health, Safety, and Wellbeing are <b>episodic</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>episodic</b> .				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts to Community Health, Safety, and Wellbeing are <b>medium</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>small</b> .				
Receptor Sensitivity	Low		Medium		High
	Sensitivity for all receptors under Community is <b>high</b> .				
Impact Significance	Negligible	Minor		Moderate	Major
	Impact significance for Community Health, Safety, and Wellbeing is <b>Major</b> . Impact significance for Vulnerable/Indigenous Peoples is <b>Moderate</b> .				
Residual Impact Magnitude	Positive	Negligible		Small	Medium
Residual Impact Significance	Negligible	Minor		Moderate	Major
	With the application of mitigation measures, residual impact significance for Community Health, Safety, and Wellbeing is <b>Moderate</b> . With the application of mitigation measures, residual impact significance for Vulnerable/Indigenous Peoples is <b>Minor</b> .				

#### 9.2.3.4 IMPACTS TO SOCIAL INFRASTRUCTURE

The Project will result in increased movements of people, goods, and vehicles within the Social AoI. The impacts on land-based transportation are considered **direct** and the extent of the impacts **regional** as transportation routes include publicly used access roads. The duration of impacts is considered **long-term** with the expectation of the pre-construction / construction phase continuing for over one year and frequency is **continuous** with the rotation of workers and regular transportation of materials. The magnitude of the impacts is **large** given the Project transportation routes will impact public roads in the EMPL, including some areas that do not experience heavy traffic (such as the Amerindian communities within or proximate to the transportation routes). The impact sensitivity is **high**, given some areas along the anticipated transportation routes exhibit vulnerabilities (the Amerindian communities along the transportation routes and landings surrounding the EMPL) and the inability to adapt to changes (the limited alternative options).

Impacts to utilities and infrastructure are considered **indirect**. The impact duration is **long-term**, and the nature/extent of impact is considered **regional** given the focus on the Indirect AoI. The frequency of the Project's use of infrastructure and utilities during pre-construction / construction will be **continuous**. Impact magnitude is **small** as the Project anticipates sourcing most utilities independently and will rely on Eagle Mountain Camp for workforce accommodations. Sensitivity is **medium** considering the vulnerabilities exhibited in the Social AoI, including high levels of inequality overall, limited telecommunications infrastructure,

limited electrical infrastructure and/or access, limited waste management services, and dependence on primarily unpaved laterite roads.

**TABLE 9.10 POTENTIAL PROJECT IMPACTS TO SOCIAL INFRASTRUCTURE (PRE-CONSTRUCTION / CONSTRUCTION)**

Significance of Impact					
Impact	Impacts to Social Infrastructure				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to Social Infrastructure during the pre-construction / construction phase would be <b>negative</b> for: <ul style="list-style-type: none"><li>Land and river-based transportation</li><li>Infrastructure and utilities</li></ul>				
Impact Type	Direct	Indirect		Induced	
	Impacts to land and river-based transportation are considered <b>indirect</b> . Impacts to infrastructure and utilities are considered <b>indirect</b> .				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The pre-construction / construction phase of the Project is expected to last 15 months, which would be considered <b>long-term</b> .				
Impact Extent	Local	Regional		International	
	Impacts to land and river-based transportation are considered <b>regional</b> . Impacts to infrastructure and utilities are considered <b>regional</b> .				
Frequency	Impacts to land and river-based transportation are considered <b>continuous</b> . Impacts to infrastructure and utilities are considered <b>continuous</b> .				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts to land and river-based transportation are considered <b>medium</b> . Impacts to infrastructure and utilities are considered <b>small</b> .				
Receptor Sensitivity	Low	Medium		High	
	Sensitivity for land and river-based transportation are considered <b>High</b> . Sensitivity for infrastructure and utilities are considered <b>Medium</b> .				
Impact Significance	Negligible	Minor	Moderate	Major	
	Impact significance for land transportation is considered <b>Major</b> . Impact significance for infrastructure and utilities is considered <b>Minor</b> .				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Impact significance on land transportation is considered <b>Moderate</b> . Impact significance on access to utilities and services is considered <b>Negligible</b> .				

## 9.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

### 9.2.4.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

#### **Employment and Business Activity:**

- Develop Local Development Plan outlining a plan for local hiring and procurement with Key Performance Indicators (KPIs) for all Project phases that include focus on workforce diversity and plan for hiring Guyanese nationals and Region 8 residents, including Indigenous and vulnerable peoples, and support to obtain formal identification documents required for all paid positions;
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding employment and business activities.
- Monitor percentage of workforce made up of Guyanese nationals and Region 8 workforce throughout all Project phases.
- Monitor percentage of Project goods and services procured locally throughout all Project phases.
- Report on progress against employment and procurement targets annually throughout all Project phases.

### 9.2.4.2 IMPACTS TO LAND USE

#### **Land Use and Governance:**

- Develop and update a Stakeholder Engagement Plan to structure engagement with stakeholders in the Social AoI, including land use and land ownership/management topics.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding employment and business activities.

### 9.2.4.3 IMPACTS TO COMMUNITY

#### **Community Health, Safety, and Wellbeing:**

- Development of a Community Health and Safety Management Plan.
- Require Project workers to adhere to a Worker Code of Conduct, which would consider workforce off-duty behaviour to mitigate impacts to community safety and security.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding community health, safety, and security.
- Development of a Traffic Management Plan to anticipate Project impacts to road networks in the Social AoI and implement safety measures for Project vehicles.

#### **Vulnerable/Indigenous Peoples:**

- Continue inclusion of vulnerable and Indigenous (Amerindian) peoples in the Stakeholder Engagement Plan (SEP). Update the SEP as needed throughout the Project lifecycle to adapt to the needs of those in Amerindian communities in the Social AoI.

- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Amerindian communities in the Social AoI. Monitor grievances registered by those in the Amerindian communities by theme and topic; take actions to adapt the Project, as practicable, to the needs of Amerindian peoples.
- Develop a Local Employment Plan, whereby those in Amerindian communities in the Social AoI are prioritised for Project employment, as applicable.

#### 9.2.4.4 IMPACTS TO SOCIAL INFRASTRUCTURE

##### **Traffic and Transportation**

- The Project is proposing the construction of an overpass or bridge for public vehicles along the main access road to reduce the exposure of public vehicles to mine traffic, such as the haul trucks that are transporting material to the waste dump on the west side of the access road. The selection of the public road to pass 'over' the haulage road and tailings pipeline was made to reduce the impact on the public road at this crossing due to heavy rains known to occur seasonally in the area and public travel will be on the higher and well-draining road, rather than through the underpass, where accumulation or buildup could occur. Rainfall will be diverted due to the slight increase in elevation at the crossing, for the public road. Approaches from north or south and on each side of the road will include diversions and water control to reduce potential washout of either travel way.
- There will be guard rails to prevent any public vehicles from damage or rollover if there should be any occurrence or deviation off the roadway.
- All design of the public road realignment and the underpass/overpass will be made with consultation with the proper Guyana national and regional road/highway agencies.
- Ensure warning for cars is provided with early notification of any planned disruptions to the EMPL Access Road and any planned road closures.
- Develop a comprehensive Traffic Management Plan that includes mitigation measures for both land and river-based transportation, including coordinating transport of workforce/materials/supplies to minimise disruption in local communities.
- Develop a Project Grievance Mechanism available to those in the Social AoI and track any feedback received regarding the Project's generation of traffic. Adjust Project activities, as appropriate and feasible, based on stakeholder feedback received.

##### **Infrastructure and Utilities:**

- Development of a Waste and Wastewater Management Plan.
- Development of a Hazardous Waste Management Plan.
- Develop a Project Grievance Mechanism available to those in the Social AoI and track any feedback received regarding the Project's impacts on social infrastructure and utilities. Adjust Project activities, as appropriate and feasible, based on stakeholder feedback received.

## 9.2.5 RESIDUAL IMPACT SIGNIFICANCE

### 9.2.5.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

With the application of recommended mitigation measures, and given the magnitude of impacts is **positive**, residual significance of impacts to Employment and Business Activity during the pre-construction / construction phase is **Negligible**.

### 9.2.5.2 IMPACTS TO LAND USE

With the application of recommended mitigation measures, the residual significance of impacts to Land Use and Governance during the pre-construction / construction phase is **Minor**.

### 9.2.5.3 IMPACTS TO COMMUNITY

With the application of recommended mitigation measures, residual significance of impacts to Community during the pre-construction / construction phase are as follows:

- Residual impact significance for Physical and Economic Displacement is **Small** (no known embedded controls nor mitigation measures).
- Residual impact significance for Community Health, Safety, and Wellbeing is **Moderate**.
- Residual impact significance for Vulnerable/Indigenous Peoples is **Negligible**.

### 9.2.5.4 IMPACTS TO SOCIAL INFRASTRUCTURE

With the application of recommended mitigation measures, residual significance of impacts to Social Infrastructure during the pre-construction / construction phase are as follows:

- Residual impact significance for traffic transportation is **Moderate**.
- Residual impact significance for infrastructure and utilities is **Negligible**.

## 9.3 IMPACTS FROM OPERATIONS PHASE

Following the Project Description as described in Volume 1: Chapter 2 of this EIA, operations are considered to begin when the processing plant is operating at 60 percent of the nameplate capacity. Operations phase activities will include:

- Open-pit mining;
- Tailings management;
- Waste rock management;
- Ore processing;
- Operation of accommodations, including sourcing, treatment, and delivery of potable water, sourced from groundwater wells and nearby creeks and avoiding the Salbora water supply providing water to Mahdia, and domestic waste management;
- Transport of supplies into the facility and gold out of the facility;
- Transport of mine employees between the Project site, Mahdia, Campbelltown, Linden, and Georgetown or other nearby towns;
- Solid waste management; and
- Power generation.

### 9.3.1 POTENTIAL IMPACTS

As per the EIA Cumulative Impact Assessment (Volume 3: Chapter 12 of the EIA Report), potentially displaced or economically disrupted communities in the Project area are landing areas / temporary or informal settlements that are already experiencing frequent population shifts (particularly depopulation) as new artisanal mining opportunities arise in other areas. During fieldwork, ERM observed the landings closest to the EMPL were declining in population, with artisanal miners seeking opportunities in other landings, and therefore does not anticipate displacement as a result of the proposed Project.

#### 9.3.1.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

Key potential impacts to socioeconomic conditions identified for the operations phase of the Project include:

- Employment and direct hiring of Guyanese nationals;
- Increased capacity and skills of local workers and subcontractors; and
- Increased local business activity and growth;

#### **Employment and Business Activity**

Socioeconomic impacts during operations mirror those in pre-construction. Peak employment is projected at ~290 direct jobs, primarily for Guyanese workers with a focus on identifying and training workers from Region 8. Although peak direct employment will drop from 350 in construction to 200 for the initial phase of operations, the ~15-year operational phase offers long-term benefits. Operations are expected to enhance Guyana's GDP and tax revenues, positively affecting local economic conditions through job creation and increased purchasing power. The Project will prioritise local suppliers and contractors, generating ongoing economic benefits. However, potential adverse effects include limited direct job opportunities, which may worsen existing income inequality.

Within the AoI, some individuals and households of lower socioeconomic status are considered to have a **medium** level of sensitivity to Employment and Business Activity impacts due to more limited capacity to benefit from the Project and the employment and business activities it may bring. Formalisation of community investment programs and training or upskilling (capacity-building) opportunities may more fully support the realisation of sustainable economic benefits in these AoI communities where individual and household incomes are low, as well as local employment targets.

#### 9.3.1.2 IMPACTS TO LAND USE

The impacts to land use and governance are covered under the Construction Phase.

#### 9.3.1.3 IMPACTS TO COMMUNITY

Key potential impacts to the community identified for the operations phase of the Project include:

- Impacts to Community Health, Safety, and Wellbeing, including:
  - Overburdening of healthcare and medical services within the Social AoI;
  - Increased risk of communicable disease transmission;
  - Impacts to public safety; and



- Increased strain on the mental health and wellbeing of community members in the Social AoI.
- Impacts to Vulnerable/Indigenous Peoples.

Each of these potential impacts is discussed in detail in the sections below.

### **Community Health, Safety, and Wellbeing**

Impacts to community health, safety, and wellbeing are similar to those assessed in the pre-construction / construction phase of the Project. However, the scale of the impact will be reduced as the anticipated workforce will decrease from 350 in construction to 200 during the initial phase of operations, increasing to approximately 290 in later years.

### **Vulnerable/Indigenous Peoples**

Project activities during the operations phase that may impact Vulnerable/Indigenous Peoples include:

- Operation of accommodations, including sourcing, treatment, and delivery of potable water, and domestic waste management;
- Transport of supplies into the facility and gold out of the facility; and
- Transport of mine employees between the Project site and Georgetown or other nearby towns (considering the Amerindian communities in the Social AoI that use terrestrial and river-based navigation routes to be used by the Project).

#### **9.3.1.4 IMPACTS TO SOCIAL INFRASTRUCTURE**

Key potential impacts to social infrastructure and services in the operations phase include the following.

- Impacts to transportation networks, including:
- Increased land and river transportation resulting in traffic congestion on roadways and rivers; and
  - Strain on access roads due to the increased presence of heavy trucks and machinery (transportation of workers, materials, equipment, and supplies).
- Impacts to infrastructure and utilities, including:
  - There will be little to no potential impacts to infrastructure and utilities in the operations phase considering that the Project will be equipped to supply its own utilities and infrastructural needs, with limited to no reliance on government supported utilities.

### **Traffic and Transport**

As with the pre-construction / construction phase, the Project anticipates frequent use of ground transportation during the operations phase. Roads in the Social AoI will also be used to transport supplies to the EMPL, increasing the number of trucks (estimated to be up to 30 per day), including heavy-fuel trucks, travelling the road network, including the road from Mahdia to the EMPL, the primary road in the area, and the same one used for accessing much of the interior regions.

## Infrastructure and Utilities

During the operations phase, water usage plays an important role in processing ore, maintaining dust control, and cooling, which can potentially put a strain on nearby water sources. For processing, the main source of water will be water that is reclaimed from the TSF. Additional water will be sourced from water wells constructed by the Project. Potable water will be provided in jugs and available in refuge stations in the mine for the workforce's consumption.

The electric power will be generated by diesel generators at the mine site.

### 9.3.2 EXISTING CONTROLS/DESIGN MITIGATION

#### 9.3.2.1 SOCIOECONOMIC CONDITIONS

##### Employment and Business Activity

- Employing Guyanese citizens with appropriate skills and qualifications where possible;
- The majority of the workforce during operations will be Guyanese, with a focus on workers from Region 8;
- Partnering with select local institutions to support workforce development programs targeted to in-demand skillsets and provide Guyanese and Region 8 candidates with appropriate training; and
- Procure goods and services locally (within the AoI) when available and feasible.

#### 9.3.2.2 COMMUNITY

##### Community Health, Safety, and Wellbeing

Embedded controls for community health, safety, and well-being include the Project's Community Health and Safety Plan.

##### Vulnerable/Indigenous Peoples

The Project has included vulnerable and Indigenous Peoples in the Stakeholder Engagement Plan and Public Consultations.

#### 9.3.2.3 SOCIAL INFRASTRUCTURE

##### Traffic and Transport

Embedded controls for transportation include:

- The Project's commitment to maintenance and upgrades along access roads used within the Direct AoI.

##### Infrastructure and Utilities

Embedded controls for infrastructure and utilities include:

- Utilising the Project's own infrastructure and utilities (accommodation, power, water supply).

### 9.3.3 SIGNIFICANCE OF IMPACTS

#### 9.3.3.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

Potential impacts from Project activities on socioeconomic conditions during the operations phase are, as with pre-construction, anticipated to be primarily **direct, regional, long-term**, and **continuous** in nature. The magnitude of potential impacts is likely **positive** (Table 9.11).

**TABLE 9.11 POTENTIAL PROJECT IMPACTS TO SOCIOECONOMIC CONDITIONS (OPERATIONS)**

Significance of Impact					
Impact	Socioeconomic Conditions				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts to Socioeconomic Conditions would be <b>Positive</b> for: <ul style="list-style-type: none"><li>Employment and Business Activity</li></ul>				
Impact Type	Direct	Indirect		Induced	
	Impacts to Employment and Business Activity are <b>direct</b> .				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The operations phase of the Project is expected to be 12 to 14 years, which would be considered <b>long-term</b> for Employment and Business Activity.				
Impact Extent	Local	Regional		International	
	Impacts to Employment and Business Activity are <b>regional</b> .				
Frequency	Impacts to Employment and Business Activity <b>continuous</b> .				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impacts to Employment and Business Activity are <b>positive</b> .				
Receptor Sensitivity	Low	Medium		High	
	Receptor sensitivity to Employment and Business Activity is <b>medium</b> .				

#### 9.3.3.2 IMPACTS TO COMMUNITY

The potential Project impact to overburdening the healthcare and medical services in the Social AoI is **indirect, regional** (likely concentrated to Bartica but potentially impacting hospitals in Georgetown), and **long-term** in nature. The magnitude of the impact is likely **small**, while the sensitivity of the community health in the Social AoI is **high**, given multiple levels of vulnerability exist (difficulty accessing health resources, high levels of prevalence of disease such as malaria, etc.). While the workforce presence is continuous, the frequency of an emergency is unpredictable, and therefore **episodic**.

Potential impacts from Project activities on Amerindian communities during the pre-construction phase are anticipated to be **induced, regional, long-term**, and **episodic** in nature. The magnitude of potential impacts is likely **small** due to the Amerindian communities being in the Indirect AoI, and sensitivity of the Amerindian communities is **high** (Table 9.12).

TABLE 9.12 POTENTIAL PROJECT IMPACTS TO COMMUNITY (OPERATIONS)

Significance of Impact				
Impact	Impacts to Community			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to Community during operations would be <b>Negative</b> for: <ul style="list-style-type: none"><li>Community Health, Safety, and Wellbeing</li><li>Vulnerable/Indigenous Peoples</li></ul>			
Impact Type	Direct	Indirect		Induced
	Impacts to Community Health, Safety, and Wellbeing are <b>indirect</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>induced</b> .			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The operations phase of the Project is expected to last 12-14 years, which would be considered <b>long-term</b> for Community Health, Safety, and Wellbeing, and Vulnerable/Indigenous Peoples.			
Impact Extent	Local	Regional		International
	Impacts to Community Health, Safety, and Wellbeing are <b>regional</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>regional</b> .			
Frequency	Impacts to Community Health, Safety, and Wellbeing are <b>episodic</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>episodic</b> .			
Impact Magnitude	Positive	Negligible	Small	Medium
	Impacts to Community Health, Safety, and Wellbeing are <b>small</b> . Impacts to Vulnerable/Indigenous Peoples are considered <b>small</b> .			
Receptor Sensitivity	Low	Medium		High
	Sensitivity for all receptors under Community is <b>high</b> .			
Impact Significance	Negligible	Minor	Moderate	Major
	Impact significance for Community Health, Safety, and Wellbeing is <b>Moderate</b> . Impact significance for Vulnerable/Indigenous Peoples is <b>Moderate</b> .			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	With the application of mitigation measures, residual impact significance for Community Health, Safety, and Wellbeing and Vulnerable/Indigenous Peoples is <b>Negligible</b> .			

### 9.3.3.3 IMPACTS TO SOCIAL INFRASTRUCTURE

With frequent, daily movement of supplies workers to and from the Project site, it is anticipated that potential Project impacts to transportation are considered **indirect, regional, continuous** and **long-term** in nature. The magnitude of the impact is **medium** given the proximity of Amerindian communities, and sensitivity **medium**.

Considering that the Project intends to generate its own infrastructure and utilities, it is anticipated that the potential impact is **indirect, local**, and **long-term** in nature. The impact

will be **continuous** throughout operations. The magnitude of the impact during operations will likely be **small**, considering the Project will self-supply power, and the sensitivity is **low**, considering most communities in the Social AoI use power from generators (Table 9.13).

**TABLE 9.13 POTENTIAL PROJECT IMPACTS TO SOCIAL INFRASTRUCTURE (OPERATIONS)**

Significance of Impact				
Impact	Social Infrastructure			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to terrestrial and river-based transportation networks in the operations phase is <b>negative</b> . Potential impacts to infrastructure and utilities in the operations phase is <b>negative</b> .			
Impact Type	Direct	Indirect		Induced
	Impacts to land and river-based transportation are considered <b>indirect</b> . Impacts to infrastructure and utilities are considered <b>indirect</b> .			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	The impacts to terrestrial and river-based transportation and infrastructure and utilities would be considered <b>long-term</b> .			
Impact Extent	Local	Regional		International
	Impacts to terrestrial and river-based transportation are considered <b>regional</b> . Impacts to infrastructure and utilities are considered <b>local</b> .			
Frequency	Impacts to terrestrial and river-based transportation and infrastructure and utilities are considered <b>continuous</b> .			
Impact Magnitude	Positive	Negligible	Small	Medium
	Impact magnitude to terrestrial and river-based transportation is considered <b>medium</b> . Impact magnitude to infrastructure and utilities is considered <b>small</b> .			
Receptor Sensitivity	Low	Medium		High
	Sensitivity of terrestrial and river-based transportation is considered <b>medium</b> . Sensitivity of infrastructure and utilities is considered <b>low</b> .			
Impact Significance	Negligible	Minor	Moderate	Major
	Impact significance on land and river-based transportation is considered <b>moderate</b> . Impact significance on infrastructure and utilities is considered <b>negligible</b> .			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	Residual impact significance on terrestrial and river-based transportation is considered <b>Moderate</b> . Residual impact significance on access to utilities and services is considered <b>Negligible</b> .			

### 9.3.3.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

#### Impacts to Socioeconomic Conditions

##### ***Employment and Business Activity:***

- Develop local hiring and procurement plan with KPIs for all Project phases that include focus on workforce diversity;
- Develop capacity program support for hiring Guyanese nationals and Region 8 residents, including support to obtain formal identification documents required for all paid positions;
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding employment and business activities.
- Monitor percentage of workforce made up of Guyanese nationals and Region 8 workforce throughout all Project phases.
- Monitor percentage of Project goods and services procured locally throughout all Project phases.
- Report on progress against employment and procurement targets annually throughout all Project phases.

#### Impacts to Community

##### ***Community Health, Safety, and Wellbeing:***

- Development of a Community Health and Safety Management Plan.
- Require Project workers to adhere to a Worker Code of Conduct, which would consider workforce off-duty behaviour to mitigate impacts to community safety and security.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding community health, safety, and security.
- Development of a Traffic Management Plan to anticipate Project impacts to road networks in the Social AoI and implement safety measures for Project vehicles.

##### ***Vulnerable/Indigenous Peoples:***

- Continue inclusion of vulnerable and Indigenous (Amerindian) peoples in the Stakeholder Engagement Plan (SEP). Update the SEP as needed throughout the Project lifecycle to adapt to the needs of those in Amerindian communities in the Social AoI.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Amerindian communities in the Social AoI. Monitor grievances registered by those in the Amerindian communities by theme and topic; take actions to adapt the Project, as practicable, to the needs of Amerindian peoples.



## Impacts to Social Infrastructure

### ***Traffic and Transportation:***

- Develop a comprehensive Traffic Management Plan that includes mitigation measures for transportation, including coordinating transport of workforce/materials/supplies to minimise disruption in local communities.
- Develop a Project Grievance Mechanism available to those in the Social AoI and track any feedback received regarding the Project's generation of traffic. Adjust Project activities, as appropriate and feasible, based on stakeholder feedback received.

### ***Infrastructure and Utilities:***

- Development of a Waste and Wastewater Management Plan.
- Development of a Hazardous Waste Management Plan.
- Develop a Project Grievance Mechanism available to those in the Social AoI and track any feedback received regarding the Project's use of infrastructure and utilities. Adjust Project activities, as appropriate and feasible, based on stakeholder feedback received.

## 9.3.4 RESIDUAL IMPACT SIGNIFICANCE

### 9.3.4.1 IMPACTS TO SOCIOECONOMIC CONDITIONS

With the application of recommended mitigation measures, and given the magnitude of impacts is **positive**, residual significance of impacts to Employment and Business Activity during the operations phase is **Negligible**.

### 9.3.4.2 IMPACTS TO LAND USE

With the application of recommended mitigation measures, the residual significance of impacts to Land Use and Governance during the pre-production phase is **Minor**.

### 9.3.4.3 IMPACTS TO COMMUNITY

With the application of mitigation measures, residual impact significance for Community Health, Safety, and Wellbeing and Vulnerable/Indigenous Peoples is **Negligible**.

### 9.3.4.4 IMPACTS TO SOCIAL INFRASTRUCTURE

With the application of recommended mitigation measures, residual significance of impacts to Social Infrastructure during the pre-production phase are as follows:

- Residual impact significance for terrestrial and river-based transportation is **Moderate**.
- Residual impact significance for infrastructure and utilities is **Negligible**.

## 9.4 IMPACTS FROM CLOSURE PHASE

The impacts of closure and decommissioning activities on socio-economic receptors are expected to be similar to those identified during the pre-construction / construction phase, although their scale is anticipated to be lower. Unlike the construction phase, closure is not expected to require a peak workforce or intensive material and equipment transport.

Workforce numbers will be substantially lower than the peak number of 350 personnel anticipated during construction, and the presence of heavy-duty vehicles - particularly haul

trucks and high-frequency transport movements - will also reduce as mining operations wind down.

In the absence of detailed information regarding progressive reclamation, closure procedures, or local development initiatives at the time of closure, it is necessary to assume that both the significance of impacts and the recommended mitigation measures will align with those established for the pre-production phase. The rehabilitation and closure process and measures to restore disturbed areas will be detailed in a Mine Rehabilitation and Closure and Plan prepared for the Project (a conceptual level Rehabilitation and Closure Plan in Appendix B).

## 10. CULTURAL HERITAGE IMPACT ASSESSMENT

### 10.1 INTRODUCTION

This Chapter presents the Cultural Heritage impact assessment chapter for the Eagle Mountain Gold Mine Project.

#### 10.1.1 DEFINING AREA OF INFLUENCE

The Cultural Heritage Area of Influence (AoI) for this impact assessment is limited to the Eagle Mountain Prospect License (EMPL) (as detailed in Volume 2, Cultural Heritage Baseline), focusing on study areas at the boundaries of ground disturbance and infrastructure placement for the following mine infrastructure:

- Mine pits;
- Borrow pits;
- Tailings Storage Facility (TSF);
- Waste Storage Facilities (WSF);
- Processing plant;
- Stockpile areas;
- Truck tie down area;
- Haul and access roads; and
- Accommodation camp.

#### 10.1.2 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

ERM's impact assessment standard criteria for determining cultural heritage impact significance are aligned with IFC PS8 guidance, categorising cultural heritage resources as 'Low', 'Medium', or 'High' value, as detailed in Table 10.1.

**TABLE 10.1 CRITERIA FOR CULTURAL HERITAGE SENSITIVITY OF RECEPTOR**

Cultural Heritage Resource Sensitivity		
Low	Medium	High
<p>Defining Characteristics:</p> <ul style="list-style-type: none"> <li>• Site is not specifically protected under local, national or international laws or treaties;</li> <li>• Site can be moved to another location or replaced by a similar site, or is a type of site that is common in the surrounding region;</li> <li>• Site has limited or no cultural value to local, national or international stakeholders; and/or</li> <li>• Site has limited scientific value or similar information can be obtained at numerous sites</li> </ul>	<p>Defining Characteristics:</p> <ul style="list-style-type: none"> <li>• Site is specifically or generally protected by local or national laws, but laws allow for mitigated impacts;</li> <li>• Site can be moved or replaced, or data and artefacts recovered in consultation with stakeholders;</li> <li>• Site has considerable cultural value for the local and/or national stakeholders; and/or</li> <li>• Site has substantial scientific value, but similar information can be obtained</li> </ul>	<p>Defining Characteristics:</p> <ul style="list-style-type: none"> <li>• Site is protected by local, national and international laws or treaties;</li> <li>• Site cannot be moved or replaced without a major loss of cultural value;</li> <li>• Legal status specifically prohibits direct impacts or encroachment on site and/or protection zone;</li> <li>• Site has substantial value to local, national and international stakeholders; and/or</li> <li>• Site has exceptional scientific value and similar</li> </ul>

Cultural Heritage Resource Sensitivity		
(Replicable Cultural Heritage)	at a limited number of other sites. (Non-replicable Cultural Heritage)	site types are rare or non-existent (Critical Cultural Heritage)

Source: ERM

Note: Derived from international guidance and best practice.

Impact magnitude for cultural heritage is calculated based on the following as provided in Table 10.2.

**TABLE 10.2 CRITERIA FOR CULTURAL HERITAGE IMPACT MAGNITUDE**

Rating	Definition
Negligible Magnitude	<ul style="list-style-type: none"> <li>No discernible change in the physical condition, setting or accessibility of the site.</li> </ul>
Small Magnitude	<ul style="list-style-type: none"> <li>Small part of the site is lost or damaged, resulting in a loss of scientific or cultural value;</li> <li>Setting undergoes temporary or permanent change that has limited effect on the site's perceived value to stakeholders;</li> <li>Stakeholder/public or scientific access to site is temporarily impeded; and/or</li> <li>Historic building suffers minor and repairable structural damage.</li> </ul>
Medium Magnitude	<ul style="list-style-type: none"> <li>A significant portion of the site is lost or damaged, resulting in a loss of scientific or cultural value;</li> <li>Setting undergoes permanent change that permanently diminishes the site's perceived value to stakeholders;</li> <li>Site becomes inaccessible for the life of the Project to stakeholders including traditional users or researchers; and/or</li> <li>Historic building suffers significant, not fully repairable structural damage.</li> </ul>
High Magnitude	<ul style="list-style-type: none"> <li>The entire site is damaged or lost, resulting in a nearly complete or complete loss of scientific or cultural value;</li> <li>Setting is sufficiently impacted to cause site to lose nearly all or all cultural value or functionality;</li> <li>Site becomes permanently inaccessible to stakeholders including traditional users or researchers; and</li> <li>Historic building suffers major structural failure</li> </ul>

## 10.2 IMPACTS FROM PRE-CONSTRUCTION AND CONSTRUCTION PHASES

Impacts to Cultural Heritage receptors are primarily expected to arise from ground-breaking and land clearance activities associated with the preparation and construction phases and are therefore assessed together.

During the pre-construction and construction phases of the Project, activities such as site preparation, land clearance, and laydown for Project infrastructure including access roads, worker camps, and mining facilities, as well as creating borrow pits for construction materials, will result in significant removal of vegetation.

This process may result in the concealment, disturbance, damage, or partial or complete removal of both known and unknown heritage receptors.

### 10.2.1 POTENTIAL IMPACTS

This assessment considers both potential direct, indirect and setting effects of cultural heritage assets.

#### 10.2.1.1 DIRECT (PHYSICAL)

The assessment of physical effects considers the direct impact to cultural heritage features of interest, where sites or potential sites / buried archaeology may be at risk of disturbance or destruction, either in whole or in part. Such physical impacts are most likely to occur during ground-disturbance activities in the construction and decommissioning phases of the development and are considered permanent and irreversible.

The potential for the occurrence of direct effects was assessed based on findings gathered through field surveys.

#### 10.2.1.2 INDIRECT

This assessment considers the potential for indirect effects, which may include increased noise, vibration, hydrological and geochemical changes, and changes in soil stability. While these indirect effects do not physically alter the heritage receptor itself, they can influence its value by affecting how it is experienced or by negatively impacting its conservation environment.

#### 10.2.1.3 SETTING

The setting of cultural heritage assets encompasses more than the immediate surroundings of a site or place and extends setting to include how a site was designed to function, its intended use, how it fits within the broader landscape or townscape, and how it was meant to be seen or to allow areas to be seen. This definition recognises that setting can include areas that are important for protection of the place, site, or building, where the surroundings contribute to how the asset or place is experienced, understood, and valued. This can incorporate a range of factors such as views to, from, and across the asset or place, key vistas, relationships between built and natural features, aesthetic qualities, the character of the surrounding landscape, and non-visual aspects such as sensory, historical, or artistic factors.

Setting may be tangible, such as a defined boundary, or intangible, such as atmosphere or ambience. The main concern regarding visual impacts on a cultural heritage setting is the potential for the development to fragment the relevant landscape, disrupt connections between sites, and affect views to and from sites with important landscape associations. While indirect effects can occur during the construction, operation, and decommissioning phases, this assessment focuses on the greatest impacts during construction, with a continuation of the resultant effect through operation.

### 10.2.2 EXISTING CONTROLS / DESIGN MITIGATION

Pre-commencement archaeological walkover surveys have been undertaken within the EMPL, targeted at areas of expected ground disturbance to identify receptors. This included processing plant site, proposed quarry and WSF, TSF, and the Mine Pit. The surveys did not identify any designated cultural heritage assets within the EMPL, and therefore no interaction with the Project design is anticipated.

To manage the possibility of discovering unknown archaeological material and remains, a Cultural Heritage Management Plan (CHMP) including a Chance Finds Procedure (CFP), will be

incorporated into the Construction Environment Management Plan (CEMP) or its equivalent document. This plan will also set out the procedures for subsequent phases.

### 10.2.3 SIGNIFICANCE OF IMPACTS

The impact magnitude, receptor sensitivity and significance of impacts for the three identified CH receptors in the AoI are provided in Table 10.3. These all have low sensitivity and small magnitude resulting in a Minor impact significance.



TABLE 10.3 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

ERM_ID	Name	Designation	Development Interaction	Mitigation Measures	Sensitivity	Magnitude of effect	Significance of effect
MAK_CH_001	Bottle cluster	Non-designated	Within vicinity of Mine Pit location	No action	Low	Small	Minor
MAK_CH_002	Cave / rock shelter	Non-designated	Within Pit location	No action	Low	Small	Minor
MAK_CH_003	'Pork-knocking' activity	Non-designated	Within Mine site area including Waste Storage Facility 1 site	No action	Low	Small	Minor

Table 10.4 outlines the assessed effects as a result of the Project.

**TABLE 10.4 CULTURAL HERITAGE IMPACTS PRE-CONSTRUCTION AND CONSTRUCTION PHASE**

MAK_CH_001: Bottle Cluster Significance of Impact					
Impact	Disturbance from groundwork activities during pre-construction and construction phases.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	The clearance and groundwork activities for the Project development locations would remove MAK_CH_001 bottle cluster				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The removal of vegetation and surface material during pre-construction and construction phase will result in the permanent removal of the bottle cluster.				
Impact Extent	Local	Regional		International	
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised, but medium.				
Frequency	The removal of the bottle cluster will be a single action during groundwork activities.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Small.				
Receptor Sensitivity	Low	Medium		High	
	MAK_CH_001 bottle cluster site is low sensitivity.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Low Resource Sensitivity and Small Impact Magnitude will result in a Minor impact significance.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	The residual impact, post mitigation, is assessed as Minor				

<b>MAK_CH_002: Rock Shelter Significance of Impact</b>			
<b>Impact</b>	Disturbance from groundwork activities during pre-construction and construction phases.		
	<b>Negative</b>	Positive	Neutral

MAK_CH_002: Rock Shelter Significance of Impact					
Impact Nature	Potential impacts to MAK_CH_002 rock shelter would be considered to be negative.				
Impact Type	Direct	Indirect		Induced	
	The groundwork activities for the Project development locations would remove MAK_CH_002 cave / rock shelter site.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The groundwork activities during the pre-construction and construction phases removal will result in the permanent removal of the rock shelter.				
Impact Extent	Local	Regional		International	
	The impact will be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised, but medium impact as observations indicates more recent occupation of the rock shelter by pork-knockers.				
Frequency	The removal of the rock shelter site will be a single action during groundworks.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the assessment above, the impact is likely to be Small.				
Receptor Sensitivity	Low		Medium		High
	MAK_CH_002 is classified as low sensitivity.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Low Resource Sensitivity and Small Impact Magnitude will result in a Minor impact significance.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Pork-knocking activities in the EMPL will be prohibited during pre-construction and construction phases for safety and security reasons. The residual impact, post-mitigation, is assessed as Minor.				

MAK_CH_003: Pork-Knocking Activity Significance of Impact				
Impact	Disturbance due to groundwork activities during the pre-construction and construction phases			
Impact Nature	Negative	Positive		Neutral
	Potential impacts to small- and medium-scale miners in the area.			
Impact Type	Direct	Indirect		Induced
	The preparation and construction for the Project development areas would directly alter these areas.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Groundworks during the pre-construction and construction phase would alter the environmental landscape and restrict pork-knocker activity.			

MAK_CH_003: Pork-Knocking Activity Significance of Impact					
Impact Extent	Local		Regional		International
	The impact will only be localised within the Area of Influence of the Project.				
Impact Scale	Impact scale is considered localised, but medium.				
Frequency	The practice of artisanal mining will be restricted during the pre-construction and construction phases of the Project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristics above, the impact is likely to be Small.				
Receptor Sensitivity	Low		Medium		High
	MAK_CH_003 pork-knocker activity is classified as low sensitivity.				
Impact Significance	Negligible	Minor		Moderate	Major
	The combination of a Low Resource Sensitivity and Small Impact Magnitude will result in Minor Impact Significance.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Disturbance in the Project Area of Influence due to historical and recent small – and medium-scale mining is notable throughout the area. The environmental disturbance in the area limits the potential for intact archaeological deposits. In addition. pork-knocking activities in the EMPL will be restricted during pre-construction and construction phases. The residual impact, post-mitigation, is assessed as Minor.				

#### 10.2.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

No additional mitigation measures are proposed. However, a Chance Find Procedure (CFP) will need to be prepared and implemented during the pre-construction phase for any unknown cultural heritage artefacts. In addition, it is recommended to conduct archaeological walkovers for the TSF and WSF areas in line with the cultural heritage survey approach previously employed in the EMPL. The outcome of the walkovers may result in a recommended mitigation approach involving targeted excavation or simpler adherence to the CHMP.

#### 10.2.5 RESIDUAL IMPACT SIGNIFICANCE

The residual impact significance of the Project Development overall should be classified as **Adverse** in nature. Successful implementation of mitigation measures will support the minimisation of these effects:

##### 10.2.5.1 MAK\_CH\_001 (BOTTLE CLUSTER)

- Introduction of a Small impact resulting in a Minor adverse effect.
- Mitigation Measure: Appropriate archaeological walkover survey, resulting in a Minor adverse effect.

#### 10.2.5.2 MAK\_CH\_002 (CAVE/ROCK SHELTER)

- Introduction of a Small impact resulting in a Minor adverse effect.
- Mitigation Measure: Appropriate archaeological walkover survey, development and implementation of a robust CHMP.

#### 10.2.5.3 MAK\_CH\_003 (PORK-KNOCKING ACTIVITY)

- Introduction of a Small impact resulting in a Minor adverse effect.
- Mitigation Measure: Appropriate archaeological walkover survey, development and implementation of a robust CHMP.

### 10.3 IMPACTS FROM OPERATION PHASE

#### 10.3.1 POTENTIAL IMPACTS

All interactions with Cultural Heritage receptors are expected to occur during the pre-operation phase. Therefore, the permanent effects identified above will persist throughout operation, with no additional effects anticipated.

#### 10.3.2 EXISTING CONTROLS / DESIGN MITIGATION

A CHMP will outline the approach to any Cultural Heritage receptor identified during the operation phase.

### 10.4 IMPACTS FROM CLOSURE PHASE

Closure activities and associated impacts to cultural heritage will be of a very similar nature and extent to those of the pre-construction and construction phases. Impact significance and mitigation will therefore be mostly identical to construction phase. As such, they are not repeated here.

The rehabilitation and closure process and measures to restore disturbed areas will be detailed in a Mine Rehabilitation and Closure and Plan prepared for the Project (a conceptual level Rehabilitation and Closure Plan in Appendix B).

## 11. IMPACT ASSESSMENT OF UNPLANNED EVENTS

### 11.1 INTRODUCTION

This Chapter presents the impact assessment of unplanned events for the Eagle Mountain Gold Mine Project. Unplanned events are defined as events that, while not planned to occur as part of the Project, could reasonably occur as a result of project activities, such as accidents, even if the probability of occurrence is low.

The assessment covers possible impacts for these events for the Project infrastructure, including:

- Mining Pits;
- Processing Plant;
- Tailing Storage Facility;
- Waste Storage Facilities; and
- Roads.

The mine operation may result in several unpredictable events, such as accidental incidents and natural hazards, which may have the potential to adversely affect sensitive receptors, such as people, flora and fauna. This Chapter outlines the potential impacts of these events and the mitigation measures designed to reduce these impacts.

Unforeseen events that could potentially arise are identified and addressed through ongoing risk management. This process covers political risks, community relations, water-related issues, and other potential challenges.

### 11.2 DEFINING AREA OF INFLUENCE

The unplanned events Area of Influence (AoI) is the area located within or adjacent to the proposed Project facilities (mine site footprint) that would be affected by the proposed Project. The AoI considered the following Project facilities:

- Mine Pits;
- Processing Plant;
- Water Management Facilities;
- Waste Management Facilities;
- Storage Facilities (e.g. explosives, fuel, tailings and waste)
- Maintenance Facilities;
- Offices; and
- Accommodation Camp.

### 11.3 IMPACT ASSESSMENT METHODOLOGY AND CRITERIA

The impact assessment methodology and criteria, including how impacts are defined regarding type, extent, scale, duration, and frequency, are set out in Chapter 5: EIA Approach.

Impacts related to unplanned events, for example accidental release of contaminants (e.g., traffic accidents), are assessed against an additional characteristic of likelihood. The likelihood of an unplanned event occurring is designated using a qualitative (or semi-quantitative, where



appropriate data are available) scale. Using the designations detailed in Table 11.1, likelihood is estimated based on experience and / or evidence that such an outcome has previously occurred.

**TABLE 11.1 DEFINITIONS FOR LIKELIHOOD DESIGNATIONS**

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Source: ERM, 2012

It is important to note that likelihood is a measure of the degree to which the unplanned event is expected to occur, and not the degree to which the impact or effect of an unplanned event is expected to occur.

### 11.3.1 RECEPTOR SENSITIVITY AND IMPACT MAGNITUDE

The sensitive receptors considered in the assessment include:

- **Environmental Receptors:**
  - Air;
  - Soils; and
  - Watercourses;
- **Ecological Receptors:**
  - Designated internationally or nationally protected habitats; and
  - Habitats and locations identified as sensitive and / or protected following ecology surveys
- **Human Receptors:**
  - Towns, villages, settlements, and homesteads

The Project is located within an area characterised by thick tropical jungle. Although the area experienced significant land degradation, many of the areas have since regrown. During the ecology surveys, more than 460 terrestrial wildlife species were identified within the Study Area, including 14 International Union for Conservation of Nature Red List species (for further information see Chapter 9: Biological Resources). There are no protected areas within the Area of Influence (AoI), or 25 km of the Project boundary. As a result, environmental and ecological receptors are assessed as **Medium**.

Human receptors within the AoI of the Project are limited, and as a result, the sensitivity of human receptors has been assessed as **Low**.

### 11.3.2 POTENTIAL IMPACTS

Potential impacts to the facilities during the pre-construction and operational phases will primarily relate to the following unplanned events:

- Accidental pollution (e.g. from leaks and spills);
- Extreme weather events;
- Flooding;
- Natural hazards (e.g. earthquakes);
- Slope instability and landslides;
- Traffic accidents; and
- Fire and explosions.

The impacts from these unplanned events are assessed qualitatively and estimates of the probability of these events occurring have been provided. The impacts will typically be of the same nature for each phase of the Project.

## 11.4 IMPACT ASSESSMENT FROM TIDAL FLOODING AND EXTREME RAINFALL

### 11.4.1 POTENTIAL IMPACTS

The Potaro-Siparuni Region 8 has a tropical climate with two rainy seasons, one from April to August and one from November to February. Heavy seasonal rain can lead to rapid water runoff and ponding of surface water, resulting in extreme flooding. During the wet season the Mahdia River to the northeast of the Project and the watercourses within the Site have the potential to flood. Access roads could additionally be liable to impacts from heavy rainfall and flash flooding.

### 11.4.2 EXISTING CONTROLS AND DESIGN MITIGATION

The Project will reduce risk through design and construction mitigation and environment, health, safety, security, and society systems and procedures.

Design criteria aimed at reducing the likelihood, impacts and effects of unplanned events have been adopted by the Project. In addition, a series of health, safety, and environmental studies have been, and will continue to be, undertaken at each stage of the design process.

The design, EIA processes, and the development of mitigation measures have all been informed by risk assessments and additional risk assessments will be undertaken during detailed engineering and construction planning.

Pre-construction mitigation will, as a minimum, include best-practice measures to mitigate the impacts of naturally occurring events. However, an Emergency Response Plan (ERP) will be prepared which:

- Clearly identifies possible emergency scenarios;
- Sets out actions to be undertaken in the event of an emergency;
- Defines resources that will be made available to respond to an emergency;
- Include management plans and procedures (e.g. a Contamination Management and Response Plan (CMRP) and a Health, Safety and Security Plan (HSSP))

During the operation of the Project, risk management sessions will be held to ensure that workers are aware of, and prepared to manage, critical risks.

The Project will be decommissioned based on Guyanese regulations and standards and international standards and protocols at the time of decommissioning. The closure plan will include specific consideration of unplanned events which may occur during closure in line with the Guyana Geology and Mines Commission project requirements.

#### 11.4.3 SIGNIFICANCE OF IMPACTS

Potential impacts as a result of flooding and extreme weather events are anticipated to be temporary, short-term and local. The potential impacts of flooding on the Project facilities, workers and the local community are likely to be Moderate. However, with the existing controls and mitigation measures outlined above the impact significance is anticipated to be reduced to Minor.

#### 11.4.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional mitigation, management and monitoring measures include, but are not limited to:

- Routine on- and off-site inspections, to monitor infrastructure conditions (e.g. floodwalls and levees) and compliance with permit requirements. Inspection results would be recorded and made available to local authorities upon request;
- As far as practicable, plan site layout so that the power plant is elevated and protected from contamination to watercourses;
- Ensure facilities near riverbanks are protected against frequent flooding events predicted to increase with climate change; and
- Erect adequate barriers around ancillary facilities or at the Site Boundary at sufficient and effective heights.

#### 11.4.5 RESIDUAL IMPACT SIGNIFICANCE

Following the implementation of the proposed mitigation adopted, the residual impact significance from flooding is assessed as Moderate. The significance of impacts from flooding are set out in Table 11.2.

**TABLE 11.2 IMPACTS FROM FLOODING AND EXTREME RAINFALL**

Significance of Impact				
Impact	Tidal flooding and extreme rainfall causing damage to Project infrastructure, workers and the community.			
Impact Nature	Negative	Positive		Neutral
	Potential impacts from flooding and extreme rainfall would be considered to be Negative.			
Impact Type	Direct	Indirect		Induced
	Potential flooding impacts in the AoI could be exacerbated by the change in land cover during the pre-construction phase.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Flooding and extreme rainfall are expected to be temporary and short-term in nature.			
Impact Extent	Local	Regional		International

Significance of Impact				
	Potential impacts would be limited to the vicinity of the Project.			
Impact Scale	Scale of impact depends on the severity of the flooding and the extreme rainfall.			
Frequency	Flooding and extreme rainfall is likely to occur occasionally during the rainy seasons (April to August and November to February).			
Likelihood	Unlikely	Possible		Likely
	The likelihood of impact from flooding and extreme rainfall in the AoI is anticipated to be Likely.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the characteristic above, the impact is likely to be Large.			
Receptor Sensitivity	Low	Medium		High
	In terms of tidal flooding, the sensitivity of human receptors is considered to be 'Medium.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the level of consequence and likelihood, the significance of the impact is expected to be Moderate.			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	Upon implementing the additional mitigation measures, the residual impact is expected to be Moderate			

## 11.5 IMPACT ASSESSMENT FOR SLOPE INSTABILITY AND LANDSLIDES

### 11.5.1 POTENTIAL IMPACTS

Potential impacts for slope instability and landslides are anticipated to be similar to those identified for flooding and extreme rainfall and are detailed in Section 11.4.1.

### 11.5.2 EXISTING CONTROLS / DESIGN MITIGATION

The existing controls relating to slope instability and landslides are anticipated to be similar to those identified for flooding and extreme rainfall and are detailed in Section 11.4.2.

### 11.5.3 SIGNIFICANCE OF IMPACTS

As a result of heavy season rain, and nearby logging activities resulting in slope instability, there is a potential risk of landslide events.

Landslide events are expected to cause temporary, long term and local impacts. However, the likelihood of landslide events is assessed as being **Possible**. As a result, the potential impacts on sensitive receptors are likely to be **Moderate**.

### 11.5.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional mitigation, management and monitoring measures include, but are not limited to:

- Routine on- and off-site inspections, to monitor infrastructure conditions (e.g. floodwalls and levees) and compliance with permit requirements. Inspection results would be recorded and made available to local authorities upon request; and
- Revegetation of land cleared for construction to increase soil stability.

### 11.5.5 RESIDUAL IMPACT SIGNIFICANCE

With the proposed mitigation adopted, the residual impact significance from landslides is Moderate. The significance of impacts from slope instability and landslides is set out in Table 11.3.

**TABLE 11.3 IMPACTS FROM SLOPE INSTABILITY AND LANDSLIDES**

Significance of Impact					
Impact	Potential impacts on project infrastructure, electricity supply, access roads and worker and community health and safety.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts from landslides would be considered to be Negative.				
Impact Type	Direct	Indirect		Induced	
	Potential landslide impacts in the AoI could be exacerbated by the change in land use from logging activities.				
Impact Duration	Temporary	Short-term	Long-term		Permanent
	Landslides are expected to result in long-term impacts.				
Impact Extent	Local	Regional		International	
	Potential impacts would be limited to the vicinity of the Project area				
Impact Scale	Scale of impact would depend on the severity of the landslide				
Frequency	Landslides may occur occasionally and will be more likely to occur throughout the wet seasons and during periods of extreme rainfall.				
Likelihood	Unlikely	Possible		Likely	
	The event is likely to occur at some time during normal operating conditions.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Large.				
Receptor Sensitivity	Low	Medium		High	
	In terms of landslides, the sensitivity of human receptors is considered to be Medium.				
Impact Significance	Negligible	Minor	Moderate		Major
	Considering the level of consequence and likelihood, the significance of the impact is expected to be Moderate.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large

Significance of Impact				
Residual Impact Significance	Negligible	Minor	<b>Moderate</b>	Major
	Upon implementing the additional mitigation measures, the residual impact is expected to be Moderate.			

## 11.6 IMPACT ASSESSMENT FOR EARTHQUAKES

### 11.6.1 POTENTIAL IMPACTS

The Eagle Mountain Gold Mine Project is located in an area of low seismic activity, located more than 300 km from the Caribbean and South American plate boundary. Within 300 km of the Project area, eight earthquakes have occurred in recorded history. Recorded magnitudes ranged from 4.1 to 5.5. More details on earthquakes in Guyana are presented in Volume 2: Chapter 4.

### 11.6.2 EXISTING CONTROLS / DESIGN MITIGATION

The existing controls relating to earthquakes are anticipated to be similar to those identified for flooding and extreme rainfall and are detailed in Section 11.4.2.

### 11.6.3 SIGNIFICANCE OF IMPACTS

The potential risks of earthquakes is considered **Low** given the rarity of their occurrence in the area.

### 11.6.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

No additional mitigation measures are proposed.

### 11.6.5 RESIDUAL IMPACT SIGNIFICANCE

With the proposed mitigation adopted, the residual impact significance from earthquakes is assessed as **Negligible**. The significance of impacts from earthquakes is set out in Table 11.4.

TABLE 11.4 IMPACTS FROM EARTHQUAKES

Significance of Impact				
Impact	Potential impacts on Project infrastructure, electricity supply, and access roads.			
Impact Nature	Negative	Positive		Neutral
	Potential impacts from earthquakes would be considered to be Negative.			
Impact Type	Direct	Indirect		Induced
	Potential earthquake impacts in the AoI could result in landslides and slope instability.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Earthquakes are expected to cause temporary and short-term impacts.			
Impact Extent	Local	Regional		International
	Potential impacts would be regional.			



Significance of Impact				
Impact Scale	Scale of impact depends on the severity of the earthquake.			
Frequency	Earthquakes are likely to occur only occasionally.			
Likelihood	Unlikely	Possible		Likely
	The event is unlikely to happen and not expected to be severe.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the characteristic above, the impact is likely to be Large.			
Receptor Sensitivity	Low	Medium		High
	In terms of earthquakes, the sensitivity of human receptors is considered to be Low.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the level of consequence and likelihood, the significance of the impact is expected to be Moderate.			
Residual Impact Magnitude	Positive	Negligible	Small	Medium
Residual Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact is expected to be Negligible.			

## 11.7 IMPACT ASSESSMENT FOR ACCIDENTAL POLLUTION (LEAKS AND SPILLS)

### 11.7.1 POTENTIAL IMPACTS

There is a potential for an accidental pollution event to occur from the diesel generators used during the pre-construction and operational phases of the Project. The release of fuel and other contaminants may negatively impact soil and water quality, the ecological habitats that they support, and the people who rely on these habitats as a source of food and/or income.

### 11.7.2 EXISTING CONTROLS / DESIGN MITIGATION

The existing controls for accidental pollution events are detailed in Section 11.4.2. These will apply to the Project site as well as along the transportation network from the Site to Georgetown.

### 11.7.3 SIGNIFICANCE OF IMPACTS

The impact significance on Medium sensitivity receptors from accidental leaks and spills would be **Moderate**.

### 11.7.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

The following additional mitigation measures should be adopted to reduce the likelihood of accidental pollution events occurring:

- All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems with bund

capacity in excess of 110% of the liquid volume stored there. Floors should be sealed and all areas roofed to prevent the bunds filling with rain;

- Provision of secondary containment for components (tanks) of the hazardous material storage system, where possible;
- Develop and maintain comprehensive emergency response plans that include spill response protocols;
- Conduct regular training programs for employees to ensure they are familiar with spill response procedures;
- Emergency response kits to control any fuel and /or oil spills should be readily available throughout the Project area;
- Ensure equipment is readily available on site to clean any spillages, and clean up spillages as soon as reasonably practicable after the event
- Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines;
- Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill; and
- Cyanide use should be consistent with the principles and standards of practice of the International Cyanide Management Code

#### 11.7.5 RESIDUAL IMPACT SIGNIFICANCE

With the proposed mitigation adopted, the residual impact significance for leaks and spills is assessed as **Minor**. The significance of impacts from accidental pollution events is set out in Table 11.5.

**TABLE 11.5 IMPACTS FROM ACCIDENTAL POLLUTION**

Significance of Impact				
Impact	Potential impacts due to contaminants entering soil and watercourses as a result of the diesel generators used during pre-construction and operation.			
Impact Nature	Negative	Positive		Neutral
	Potential impacts from pollution events would be considered to be Negative.			
Impact Type	Direct	Indirect		Induced
	Direct impacts on soil and water quality, ecology and community health from a pollution event.			
Impact Duration	Temporary	Short-term	Long-term	Permanent
	Pollution events are expected to cause temporary and short-term impacts.			
Impact Extent	Local	Regional		International
	Potential impacts could have regional impact			
Impact Scale	Scale of impact depends on the severity of the pollution event.			
Frequency	Pollution incidents are likely to occur infrequently			
Likelihood	Unlikely	Possible		Likely
	A pollution incident is possible to occur			

Significance of Impact					
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Large				
Receptor Sensitivity	Low	Medium		High	
	In terms of pollution, the sensitivity for environmental, ecological, and human receptors is considered to be Medium.				
Impact Significance	Negligible	Minor	Moderate		Major
	Considering the level of consequence and likelihood, the significance of the impact is expected to be Moderate.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Upon implementing the additional mitigation measures, the residual impact is expected to be Minor.				

## 11.8 IMPACT ASSESSMENT FOR TRAFFIC ACCIDENTS

### 11.8.1 POTENTIAL IMPACTS

In comparison to the pre-construction phase, the operational phase will lead to less traffic and less All-Terrain Vehicles (ATVs) and Heavy Goods Vehicles (HGVs) on the road. However, during all phases of the Project, the main access road will be utilised by both the local people and workers of the Project. As a result, there is the potential for the Project to lead to an increase in traffic accidents. Traffic accidents involving pedestrians during pre-construction and operation are likely to affect people of all ages. Between five and nine trucks per day will travel between Georgetown and the Site during construction and operations phases, respectively.

### 11.8.2 EXISTING CONTROLS / DESIGN MITIGATION

As the main access road will be utilised by local communities and workers of the Project, an overpass will be constructed to reduce impacts from local vehicles interacting with heavy plant and trucks. Other existing controls relating to traffic accidents are outlined in Section 11.4.2.

### 11.8.3 SIGNIFICANCE OF IMPACTS

The significance of the impact of traffic accidents and incidents on local communities and workers is assessed as Major. However, the implementation of existing controls and mitigation measures will reduce the impact significance to **Moderate**. The impact will be long-term or permanent (in the case of death). The impact extent will be local and regional, depending on where materials are sourced from and where the final product is transported to.

### 11.8.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

Additional mitigation measures include, but are not limited to:

- Continue to survey the current use and traffic along the old Potaro-Konawaruk and existing mine site access roads;

- Prepare a Traffic Management Plan; and
- Reinforce the existing access road to ensure it is suitable to support both haulage vehicles and is still accessible for community use.

### 11.8.5 RESIDUAL IMPACT SIGNIFICANCE

With the proposed mitigation adopted, the residual impact significance for traffic accidents is assessed as **Moderate**. The significance of impacts from traffic incidents is set out in Table 11.6.

**TABLE 11.6 IMPACTS FROM TRAFFIC ACCIDENTS**

Significance of Impact					
Impact	Road and traffic accidents which pose a risk to the health and safety of local people and workers.				
Impact Nature	Negative	Positive		Neutral	
	Impacts to community health and safety would be considered to be Negative.				
Impact Type	Direct	Indirect		Induced	
	Impacts to communities’ health and safety would be direct owing to the increase in road traffic, ATVs and HGVs.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Impacts would not be confined to the operational phase. Furthermore, if an individual is injured, this may result in long-term injuries or even death and, therefore, a permanent impact duration.				
Impact Extent	Local	Regional		International	
	The impact will be local and / or regional depending on where materials are sourced from and where the final products are transported to.				
Impact Scale	Impact scale is considered large owing to the nature of the operation activities. Additionally, local communities’ population will increase and consequently as will their use of roads, increasing the number of people exposed to the risk.				
Frequency	Accidents may happen occasionally.				
Likelihood	Unlikely	Possible		Likely	
	The event is likely to occur at some time during normal operating conditions.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Impact magnitude is considered to be Large owing to the nature of the operation activities and the fact that there will be significantly more local road users (population increase) during the operational phase compared to the pre-construction phase				
Receptor Sensitivity	Low	Medium		High	
	Community and Project traffic will utilise the Potaro-Konawaruk Road, which will increase traffic the likelihood of accidents.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Large magnitude coupled with a Medium receptor sensitivity means the impact significance will be Major.				

Significance of Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate		Major
	Upon considering the additional mitigation measures, the residual impact is expected to be Moderate.				

## 11.9 IMPACT ASSESSMENT FOR FIRE AND EXPLOSIONS

### 11.9.1 POTENTIAL IMPACTS

Project activities have the potential to result in fire and explosions.

The potential sources of fire and explosions during the construction phase are likely to be:

- Electrical shocks and explosion of transformers;
- Failure in electrical installation;
- The use of inflammable materials;
- Smoking; and
- Natural wildfires.

A fire or explosion could result in intense heat, smoke, and unplanned or uncontrolled release of gases. The local community and workers have the potential to be affected, for example, through temporary or permanent physical and economic displacement. Environmental and ecological receptors, such as air, flora and fauna also have the potential to be affected by a fire or explosion. The severity of the consequences depends on the characteristics of the fire or explosion.

### 11.9.2 EXISTING CONTROLS / DESIGN MITIGATION

The existing controls relating to fire and explosions are set out in Section 11.4.2.

### 11.9.3 SIGNIFICANCE OF IMPACTS

The potential impacts on community and worker health, safety and security as a result of fires and explosions is likely to have a Moderate impact. However, with the existing controls and mitigation measures in place, the likelihood of occurrence is reduced to incidental. However, as the impact consequence will remain Major, the overall impact significance post-mitigation will also remain as **Moderate**. Fire and explosions are expected to only cause short-term, local impacts.

### 11.9.4 ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING MEASURES

The following additional mitigation measures should be adopted:

- An emergency response plan will be developed for the Project and implemented during the construction phase;
- Storage of incompatible materials (acids, bases, flammables, oxidisers, reactive chemicals) in separate areas, and with containment facilities separating material storage areas;

- Storage of hazardous materials in an area of the facility separated from the main production works;
- Avoid burning of waste materials by open fires - only use approved incineration methods; and
- An appropriate firefighting system will be provided at the construction site. The fire extinguishers are placed at strategic locations such as site offices, laydown areas, etc.

### 11.9.5 RESIDUAL IMPACT SIGNIFICANCE

With the proposed mitigation adopted, the residual impact significance for fire and explosions is assessed as **Moderate**. The significance of impacts from fire and explosions is set out in Table 11.7.

**TABLE 11.7 IMPACTS FROM FIRE AND EXPLOSIONS**

Significance of Impact					
Impact	Potential impacts on community and worker health, safety and security as well as Project facilities.				
Impact Nature	Negative	Positive		Neutral	
	Potential impacts from fire and explosions would be considered to be Negative.				
Impact Type	Direct	Indirect		Induced	
	Potential impacts from fire and explosions would likely be direct impacts from Project activities				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Fire and explosions are expected to only cause short-term impacts.				
Impact Extent	Local	Regional		International	
	Potential impacts would be limited to the Project footprint and the surrounding area, and as a result the impact extent is considered to be Local.				
Impact Scale	The impact is limited within the Project area, and potentially the nearby surrounding area.				
Frequency	This incident may occur infrequently.				
Likelihood	Unlikely		Possible	Likely	
	The event is likely to occur at some time during normal operating conditions.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the characteristic above, the impact is likely to be Large.				
Receptor Sensitivity	Low		Medium		High
	The sensitivity for human health within the general population is considered to be Low due to distance of settlements from landing area.				
Impact Significance	Negligible	Minor		Moderate	Major
	Considering the level of consequence and likelihood, the significance of the impact from fire and explosion is expected to be Moderate.				



Significance of Impact					
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Upon considering the additional mitigation measures, the residual impact is expected to be Moderate.				

## 12. CUMULATIVE IMPACT ASSESSMENT

### 12.1 INTRODUCTION

This chapter presents the cumulative impact assessment (CIA) for the Eagle Mountain Gold Mine Project (the Project) conducted to evaluate its potential contribution towards the cumulative impacts on the resources identified as valued environmental and social components (VECs). Analysis in this chapter is based on the publicly available data and primary baseline surveys and results, which have been presented as part of Volume 2 of this EIA report.

Cumulative impacts are defined in the IFC's Cumulative Impact Assessment and Management Good Practice Handbook<sup>1</sup> as *"those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones"*. These can also be defined as the multiple and successive environmental and social impacts caused by existing activities or conditions, combined with the possible incremental impacts that could result from future proposed and/or planned projects, can potentially generate greater cumulative impacts than would be expected in the case of a single project. According to the IFC, the assessment and management of cumulative impacts is appropriate when there is concern that a project or activity under consideration could contribute to generating cumulative impacts on one or more valued environmental and social component.

This CIA follows the IFC's Cumulative Impact Assessment and Management Good Practice Handbook. The Handbook provides a methodology for identifying the most significant cumulative impacts; which includes a desktop review of publicly available information and consultation with key stakeholders and focuses on environmental and social components, defined in the Handbook to as VECs. VECs are environmental and social attributes that are considered to be important in assessing risks. VECs can be: (1) rated as "critical" by potential project-affected communities and/or the scientific community; and (2) cumulatively impacted by the Project under evaluation, by other projects, and/or by external, natural environmental and social drivers.

### 12.2 OBJECTIVE AND SCOPE

The overall objective of this CIA is to identify and assess the contribution by the Project to cumulative impacts in the Project's area of influence (AoI). It is based on information presented throughout prior chapters of this EIA, information provided by Stronghold Guyana as the Project's sponsor, and information in the public domain. The specific objectives are to:

- Identify VECs that could be impact cumulatively in areas potentially affected by the Project, considering input from stakeholders through the consultation process and the scientific community;
- Identify other existing and planned projects and external environmental and social drivers that could cumulatively impact VECs;
- Undertake a high-level assessment of potential cumulative impacts on VECs, considering the Project and the other identified existing and planned projects and external drivers in the area; and

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<sup>1</sup> IFC Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets (the "Handbook"), 2013.

- Recommend a management framework for the integrated management of potential cumulative impacts.

## 12.3 METHODOLOGY

### 12.3.1 DEFINITIONS OF KEY TERMINOLOGY FOR THE CIA

The following are definitions for key terminology used in the CIA.

**Cumulative Impact:** Impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities. For practical reasons, the identification, assessment, and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concern and/or concerns of affected communities.

**CIA:** Process to identify and evaluate cumulative impacts.

**External Drivers:** Sources or conditions that could affect or cause physical, biological, or social stress on VECs, such as natural environmental and social drivers, human activities, and external stressors. These can include climate change, population influx, natural disasters, or deforestation, among others. These are typically less defined and planned than Other Projects (see 12.5.2).

**Other Projects:** Existing, planned, or reasonably expected future developments, projects and/or activities potentially affecting VECs.

**VEC:** Environmental and social components considered as important by the scientific community and/or project-affected communities. VECs may include:

- Physical features, habitats, wildlife populations (e.g., biodiversity, water supply);
- Ecosystem services (e.g., protection from natural hazards, provision of food);
- Natural processes (e.g., water and nutrient cycles, microclimate);
- Social conditions (e.g., community health, economic conditions); and
- Cultural heritage or cultural resources aspects (e.g., archaeological, historic, or traditional sites).

VECs reflect the public and scientific community's concern or special interest about environmental, social, cultural, economic, or aesthetic values. VECs are considered the ultimate recipients of cumulative impacts because they tend to be at the ends of ecological pathways.

### 12.3.2 LIMITATIONS

The limitations applicable to this CIA include:

- (1) incomplete information about Other Projects and activities (e.g., the information is not available in the public domain);
- (2) uncertainty with respect to the implementation of future projects; and
- (3) difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

Impacts from the Project have been thoroughly assessed in Volume 3 of the EIA Report. However, due to the unavailability of detailed emissions and discharge data from other developments, the Project cannot quantitatively assess these impacts. The CIA relies on publicly available information about other proposed developments within the Area of Influence. Since additional baseline data from other facilities is not accessible, the cumulative impact assessment assumes that neighbouring gold mines have similar project activities.

## 12.4 DETERMINATION OF SPATIAL AND TEMPORAL BOUNDARIES

Based on the identified Other Projects and VECs, a 5 km radius from the Project boundary was determined that the Project's AoI. This AoI has been deemed appropriate as the spatial boundary of the CIA, in that it covers:

- (1) the extent of the VECs; and
- (2) the extent of the potential impacts from the Project, Other Projects, and external drivers.

The definition of the CIA temporal boundaries is frequently a challenge, due to the uncertainty related to potential future projects and activities. To reduce the risks surrounding this uncertainty, good international industry practice has been applied, and the recommended 3-year temporal boundary considered for this assessment.

However, as the Project has a greater level of certainty, a 15-year temporal boundary is used with respect to it, considering the duration of the construction activities (approximately 2 years), and operations (15 years).

## 12.5 IDENTIFICATION OF OTHER PROJECTS AND EXTERNAL DRIVERS

### 12.5.1 OTHER PROJECTS

Region 8 is the small and medium scale gold mining centre of Guyana, and there is currently a high level of ASM and medium-scale mining activity in the region and moderately high level within the Social AoI. There are no known commercial Large-Scale Mining Licences bordering the Eagle Mountain Prospect License (EMPL) area. However, there are a number of active Medium and Small-Scale Mining Licenses in the Region, with some small-scale mining bordering the EMPL and a medium scale mining operation, the Hopkinson mine, located 4km to the northeast of the EMPL. The closest project with a potential large-scale mining licence is the Omai Gold Project. However, this is located in Region 10 and is over 50 km from the EMPL, therefore cumulative impacts are unlikely.

**FIGURE 12.1 HISTORIC MINING ACTIVITY IN THE SOCIAL AOI**

Source: ERM, 2025

From the social baseline, it is noted that artisanal small-scale mining is a significant economic activity in Region 8 and particularly in Mahdia. The majority of households within the Social AoI are involved in mining in some manner, with many directly involved in small-scale dredging operations. Surveys demonstrated that most men in Region 8 are employed in the mining sector, including both formal and informal mining (ERM Fieldwork, 2024), and usually work in backdams for lengthy periods (three months to one year, on average).

### 12.5.2 EXTERNAL DRIVERS

Regionally present external drivers and stressors were identified through the EIA. These include natural hazards (e.g., landslides, flooding, and extreme heat) as discussed in Volume 3: Chapter 11 of this EIA.

## 12.6 VEC IDENTIFICATION AND SELECTION

### 12.6.1 OVERVIEW

To be included in a CIA, a VEC must first be confirmed to be valued by some identifiable stakeholder group and/or the scientific community. Second, the VEC must be reasonably expected to be affected by both the Project's components under evaluation (e.g., mine site and ancillary infrastructure) and some combination of Other Projects and/or external drivers. Input



from stakeholders has been collected as part of the EIA's stakeholder engagement and consultation process.

### 12.6.2 SELECTION OF VECs

Potentially eligible VECs were analysed against the following criteria:

- Confirmed to be valued by an identifiable stakeholder group (in the case of local communities, identified by a representative number of communities in the AoI) and/or the scientific community;
- Reasonably expected to be potentially impacted by the Project; and
- Reasonably expected to be potentially impacted by some combination of other projects and/or external drivers.

Table 12.1 summarises the VEC screening results for this CIA.

Interviews with stakeholders were conducted to develop Valued Environmental Components (VECs) as detailed in Volume 1: Chapter 6 and Volume 2: Chapter 11 of the EIA Report. These interviews addressed various issues and questions regarding social, environmental, infrastructure, health and safety, and potential Project impacts, which were then integrated into the impact assessment. The Stakeholder Engagement Plan (SEP) identifies key stakeholders for engagement, including local companies, artisanal miners, and Amerindian communities.

**TABLE 12.1**      **SELECTED VECs FOR INCLUSION IN CIA**

<b>VEC</b>	<b>Valued by Stakeholders or Scientific Community</b>	<b>Significantly Affected by the Project*</b>	<b>Potentially Affected by One or More Other Projects</b>	<b>Potentially Affected by One or More External Drivers</b>	<b>VEC Selected for the CIA</b>
Air quality	Yes	Yes	Yes	Yes	Yes
Noise and vibration	Yes	No	No	No	No
Water quality (surface and ground)	Yes	Yes	Yes	Yes	Yes
Soil and geology	Yes <sup>+</sup>	Yes	No	No	Yes
Landscape and visual	Yes	No	No	No	No
Biodiversity and ecosystem Services	Yes	Yes	Yes	Yes	Yes
Social impacts (livelihoods, demographics, etc.)	Yes	Yes	Yes	Yes	Yes
Cultural heritage	Yes	Yes	Yes	Yes	Yes



VEC	Valued by Stakeholders or Scientific Community	Significantly Affected by the Project*	Potentially Affected by One or More Other Projects	Potentially Affected by One or More External Drivers	VEC Selected for the CIA
Traffic and transport	Yes	Yes	Yes	Yes	Yes

CIA = cumulative impact assessment; VEC = valued environmental and social component

\* A residual impact significance rating of Moderate or above.

+ = construction phase only.

Noise and vibration environmental receptors or components were not selected as potentially eligible for the CIA as they were not identified as components reasonably expected to be significantly impacted by the Project, or as components not reasonably expected to be potentially impacted by some combination of other projects and/or external drivers. All other environmental and social receptors were selected as potentially eligible for the CIA.

### 12.6.3 DESCRIPTION OF VEC CONDITIONS

The baseline conditions of the selected VECs are presented in the Volume 2 of this EIA.

A summary of baseline results, potential impacts identified and mitigation measure for the selected VECs has been included in the following sections of this Chapter.

### 12.6.4 ASSESSMENT OF CUMULATIVE IMPACTS ON VECs

The significance of cumulative impacts is assessed based on the response of VECs and their resulting condition and sustainability, rather than solely on the magnitude of change. If cumulative impacts remain below the established thresholds for VECs, the Eagle Mountain Gold Mine Project is considered acceptable. This study was not designed to collect sufficient baseline data to define thresholds for the selected VECs or to determine the significance of cumulative impacts. Instead, using information generated through the current EIA and publicly available sources, cumulative impacts have been prioritised and categorised according to the following definitions:

- **High Priority:** The VEC is expected to be or is currently being adversely impacted by Other Projects and/or external drivers and the future addition of the Project could incrementally contribute to the adverse impact. Actions should be implemented in the short term to mitigate potential adverse cumulative impacts on the VEC.
- **Medium Priority:** The VEC could potentially be impacted by Other Projects and/or external drivers, and the Project could potentially incrementally contribute to the adverse impact. Actions should be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC.
- **Low Priority:** The VEC is not expected to be potentially impacted by Other Projects and/or external drivers, and therefore the Project's impacts would not be expected to contribute to an adverse cumulative impact. No actions are required to mitigate potential adverse cumulative impacts on the VEC beyond the Project's existing mitigation measures.

Table 12.2 summarises the assessment of cumulative impacts for the VECs identified for the CIA.

## 12.7 AIR QUALITY

### 12.7.1 BASELINE

The baseline air quality monitoring program was successfully implemented during the 2025 wet and dry season to assess background concentrations of VOCs, CO, NO<sub>2</sub>, SO<sub>2</sub>, dustfall, TSP, and PM<sub>10</sub> at the mine site. Overall, results indicate low concentrations of key pollutants, consistent with expectations for a remote location. VOC data recovery was limited but valid, with most compounds at low or non-detect levels, except for ethyl acetate and acetone, which were elevated due to common sources such as sanitisers, vehicle exhaust, and decomposition byproducts. Carbon monoxide was not detected during the wet season, suggesting negligible concentrations, while an average concentration of 2.61 mg/m<sup>3</sup> was recorded in the dry season, which is substantially below the WHO Air Quality Guidelines. Enhanced sample handling ensured high-quality NO<sub>2</sub> and SO<sub>2</sub> data, with average concentrations during the wet and dry season of 5.33 µg/m<sup>3</sup> and 2.01 µg/m<sup>3</sup> for NO<sub>2</sub>, and 7.28 µg/m<sup>3</sup> and 22.29 µg/m<sup>3</sup> for SO<sub>2</sub> respectively. All values are below the WHO AQG. Dustfall rates exceeded UK guideline values in both seasons, likely due to dirt roads and increased vehicle traffic near the monitoring station. Particulate matter (TSP, PM<sub>10</sub>) concentrations did not exceed WHO annual or 24-hour guidelines in either season, though full-year data are needed for comparison.

The study concluded that the results of the baseline air quality monitoring program at the mine site during the 2025 wet season indicate generally low concentrations of key air pollutants, reflecting favourable ambient conditions typical of this remote area and seasons.

### 12.7.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

#### 12.7.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The potential impacts from the pre-construction phase on air quality are anticipated to be negligible due to the limited scale and duration of activities. Therefore, specific mitigation measures are not required for this phase.

During the construction phase, the potential impacts include construction dust and construction traffic. The construction dust impact is expected to be large due to activities such as land clearing, road construction, and material handling, which can generate significant dust. The construction traffic impact is anticipated to be negligible from the exhaust emissions of vehicles transporting materials and workers.

#### 12.7.2.2 OPERATIONAL PHASE

In the operational phase, the potential impacts include operational traffic and mine operations. The operational traffic impact is expected to be negligible from the exhaust emissions of operational vehicles. The mine operations impact is assessed as major due to emissions from activities such as drilling, blasting, loading, unloading, crushing, and stockpiling. Key pollutants include dust, PM<sub>10</sub>, NO<sub>2</sub>, and SO<sub>2</sub>.

### 12.7.3 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Develop and implement a dust management plan (DMP).
- Regularly review mining activities for dust emissions and adjust water spraying as needed.

- Avoid dust-raising activities during dry and windy periods.
- Use solid screens, barriers, and enclosures for dust-producing activities.
- Maintain cleanliness of site fencing, barriers, and scaffolding.
- Cover or seed stockpiles to prevent wind whipping.
- Ensure adequate water supply for dust suppression.
- Use enclosed chutes and conveyors, minimise drop heights, and use fine water sprays.
- Clean up spillages promptly using wet methods.
- Conduct ambient PM10 and TSP monitoring.

#### 12.7.4 POTENTIAL CUMULATIVE IMPACTS

The cumulative impacts on air quality from the proposed project, combined with other existing and planned developments in the area, could be moderate during operations. The increased emissions during the dry season, along with dustfall deposition rates exceeding UK guidelines during the wet season at the Mine Site, may exacerbate air quality issues. Additionally, emissions from construction activities such as land clearing, road construction, and material handling, as well as operational activities including drilling, blasting, loading, unloading, crushing, and stockpiling, could lead to higher concentrations of pollutants like dust, PM<sub>10</sub>, NO<sub>2</sub>, and SO<sub>2</sub>.

### 12.8 NOISE AND VIBRATION

#### 12.8.1 BASELINE

Measurements were taken at five locations during April 2025. These locations were considered to be representative of the acoustic environment of the receptors in the vicinity of the Project. Two locations were identified as non-residential (L3 and L5) while the remaining locations were identified as residential (L1, L2 and L4). The existing baseline noise levels recorded at all measurement sites were below the Guyanese standards.

Baseline noise monitoring indicated that daytime noise was primarily influenced by traffic (cars, trucks, motorcycles), community activities such as music from shops, domestic sounds, and conversations, as well as nearby work activities including generators, small-scale mining, and frequent overhead aircraft. Natural sources such as birds, howler monkeys, and insects also contributed. Nighttime noise was dominated by natural sounds from insects, frogs, and birds.

#### 12.8.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

##### 12.8.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASES

During the pre-construction and construction phases, noise levels are expected to rise due to activities such as earthworks, site clearance, pit excavation, development of tailings facilities, creation of stockpiles, disposal of waste rock, and construction of fuel storage areas. The building of processing facilities will also contribute to elevated noise in the surrounding area. Additionally, increased traffic associated with construction is likely to further raise ambient noise levels. However, these impacts are considered negligible, as predicted noise levels are expected to remain within the International Finance Corporation (IFC) daytime standards for residential areas at all affected locations. Overall, the noise impacts will be localised, temporary, and short-term, occurring only during daytime hours.

### 12.8.2.2 OPERATIONAL PHASE

During the operational phase, the use of mining equipment including excavators, bulldozers, and haul trucks is anticipated to raise noise levels at sensitive locations near the project site. Additional noise will result from the processing plant's crushers, conveyors, and mills, as well as from the power plant and its related infrastructure. Increased operational traffic will further contribute to ambient noise, while blasting activities are expected to generate airblast overpressure and ground-borne vibrations, potentially affecting nearby communities, infrastructure, and the surrounding environment. Despite these sources, the overall significance of noise impacts is assessed as negligible, since predicted levels are expected to remain within the International Finance Corporation (IFC) guidelines. While these effects are localised and persist throughout the operational period, noise levels are projected to stay within acceptable thresholds.

### 12.8.2.3 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Construction activities will be limited to daytime hours.
- Regular inspection and maintenance of equipment to ensure it is in good working order.
- Regular monitoring at sensitive receptors to ensure compliance with noise standards.
- Blasting will be limited to daytime hours, and modern techniques will be used to minimise impacts.

### 12.8.3 POTENTIAL CUMULATIVE IMPACTS

While cumulative impacts from noise and vibration associated with the project and other external activities may occur, these effects are assessed as negligible. Consequently, noise and vibration receptors were not included in the cumulative impact assessment, as they are not expected to experience significant effects from the project or other contributing factors.

## 12.9 WATER QUALITY

### 12.9.1 BASELINE

Stream discharge and total suspended solids (TSS) were measured at several key sites from June 2024 to May 2025. The South Salbora River showed relatively stable flows, while the Minnehaha River exhibited higher variability, with peak flows and TSS concentrations during storm events. The Mahdia River's flows were stable, but data were limited. TSS values were generally moderate under baseline conditions but increased during storms, especially in the Minnehaha River (up to 830 mg/L), highlighting the episodic nature of sediment transport. Most sediment movement occurs during high-flow events, which are critical for understanding downstream impacts.

Sampling at six stations in 2025 showed that, for most parameters, water quality was within International Finance Corporation (IFC) mining effluent guidelines. pH remained within the 6–9 range, and TSS was generally below the 50 mg/L limit except for a single exceedance at SWSB (Minnehaha) during a storm. Oil and grease were compliant with IFC standards but approached the limit at one site. Total iron exceeded the IFC limit at several stations during the wet season, but dissolved iron and other metals (lead, mercury, arsenic, cadmium, copper, chromium, nickel, zinc, antimony) were consistently below guideline values. Major ions,

nutrients, and phenols were low, and microbiological indicators in the community reservoir reflected typical wet season increases.

The Eagle Mountain project area is characterised by high rainfall and soils that allow significant infiltration, resulting in a dynamic groundwater system. The geology comprises three main units: saprolite (weathered clay-rich topsoil), a transition zone (partially weathered bedrock), and hard rock (fractured bedrock). The saprolite acts as an aquitard, limiting groundwater movement, while the transition zone and fractured rock locally host groundwater with variable conductivity. Streams in the area are generally gaining, meaning groundwater discharges into surface water, with the Mahdia and Minnehaha Rivers serving as final discharge points.

Ten groundwater monitoring wells were installed across the site, targeting key areas such as waste rock dumps, the process plant, and tailings storage facility. These wells span different stratigraphic units and provide data on groundwater levels and quality. Groundwater levels fluctuate seasonally by 1-5 meters, with artesian conditions observed in some fractured rock zones. No significant groundwater users or irrigated agriculture exist in the project vicinity.

Baseline groundwater quality was assessed through four sampling campaigns (Jan, Mar, Jul, Aug 2025). Most samples meet IFC standards for metals and general chemistry, but elevated iron and aluminium levels were observed in some wells. Microbiological contamination (coliforms and *E. coli*) was detected in several samples, making groundwater unsuitable for potable use without treatment. pH values ranged from slightly acidic to neutral (5.9–6.8), and conductivity indicated moderate mineralisation. No significant exceedances for arsenic, cadmium, chromium, mercury, or nickel were found.

## 12.9.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

### 12.9.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The project could cause erosion and sedimentation from land clearing, leading to sedimentation in local streams. Sewage disposal and accidental spills of petroleum products from equipment or storage facilities could also impact water and sediment quality. The significance of these impacts is generally considered negligible to minor, with mitigation measures in place to reduce their severity.

The project will involve extensive land disturbance, increasing the potential for erosion and sedimentation. Effluent discharge from sediment ponds, seepage from the TSF and WSF, and accidental spills will also be concerns. The impact magnitude is considered small due to limited spatial extent, temporal nature of activities, and control measures in place. Mitigation measures include sediment control structures, effluent treatment, and spill prevention plans.

During this phase, activities such as the construction of surface infrastructure, stripping of the pit area, and development of access roads are expected to impact groundwater levels and qualities. Excavation will breach the groundwater level, leading to dewatering and a reduction in groundwater volumes in surrounding aquifers. The saprolite aquitard's low permeability will limit the extent of the drawdown cone. Contamination sources include sanitary waste, hydrocarbon spills, and waste rock dumps. The impacts on groundwater qualities are expected to be localised due to the short duration of this phase and the low permeability of the saprolite.

### 12.9.2.2 OPERATION PHASE

The project will continue to pose risks of erosion and sedimentation, effluent discharge, seepage, and spills. However, the established stormwater management system and ongoing mitigation measures will help manage these impacts. The significance of impacts is expected to be negligible to minor, with mitigation measures reducing the residual impact to negligible or minor.

The operational phase involves continuous dewatering of aquifers around the mine pit, increasing the vertical drawdown and zone of influence. Groundwater levels in the transition zone and fractured rock aquifers will initially rise due to pressure release but will eventually decline. Contaminant migration from the TSF and WSF will be limited by the low permeability of the saprolite. The impacts on groundwater qualities will be managed through extensive mitigation measures, including groundwater monitoring, pit dewatering, and waste rock storage facility and tailings storage facility management.

### 12.9.2.3 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Implement a sustainable water supply management plan to minimise drawdown of groundwater levels.
- Construct the WSF and TFS with an impermeable base and walls formed from clay-rich saprolite to minimise seepage.
- Construct and equip all hazardous material, waste storage areas, fuel storage, and dispensing areas with secondary containment systems.
- Install and maintain efficient oil and grease traps at refuelling facilities, workshops, and fuel storage depots.
- Control blasting to minimise residual nitrogen in the waste rock.
- Implement a comprehensive Cyanide Management Plan.
- Development of settling ponds to store excess water from the TSF overflow and allow sediment settling before discharging to the receiving environment.
- Monitor groundwater levels and pit discharge rates continuously using level loggers, and undertake quarterly groundwater quality monitoring through sampling..
- Collect and analyse groundwater samples quarterly.

### 12.9.3 POTENTIAL CUMULATIVE IMPACTS

Increased erosion, sedimentation, effluent discharge, seepage, and spills from all project phases may worsen water quality. Heavy metals, seasonal variations, and contamination near roadways and artisanal mining areas could accumulate further. Residual effects on surface water are predicted to be negligible to minor due to existing poor quality. Groundwater impacts, including contamination from metals, sulphate, and nitrogenous compounds, could result in moderate cumulative impacts during operations.



## 12.10 SOILS AND GEOLOGY

### 12.10.1 BASELINE

The Project site is characterised by a diverse landscape that ranges from low-lying alluvial valleys at approximately 100 metres above mean sea level (amsl) to the summit of Eagle Mountain, which reaches about 725 metres amsl. The majority of the mineral deposit is located on the northwestern and southwestern slopes of Eagle Mountain, generally between 160 and 500 metres amsl. The topography within the mineralised zones features steep sections that are separated by less steep “benches”.

The geology of the region is part of the Guiana Shield, composed of Paleoproterozoic rocks affected by tectonic, metamorphic, and intrusive events. The Property is underlain by metavolcanic and metasedimentary rocks intruded by a composite granodiorite pluton that hosts the gold mineralisation at the Eagle Mountain deposit. At the Salbora deposit, mineralisation is within metavolcanic rocks adjacent to a northeast-trending monzonite dyke. A large diabase to gabbro-norite sill, which is part of the Avanavero Suite, intrudes the granodiorite pluton and metavolcanic-sedimentary sequence and forms the ridge and cliffs at the top of Eagle Mountain. Associated dikes are oriented 120° and are estimated to be less than 10 metres thick. As is typical for the Guiana Shield, the area has been affected by tropical saprolite weathering.

Soil samples were collected from various locations within the AoI in dry season 2025. The soils were analysed for physical characteristics, type, classification, productivity, and potential contaminants. The soils in the AoI are generally characterised by well-drained gravelly clays, silts, or laterite soils, with granular or blocky textures and low to medium plasticity. These soils, dominated by sand and silt, generally allow good drainage and are not prone to waterlogging, despite the presence of clay soils potentially slowing drainage in upland areas.

Potential environmental quality concerns were assessed by analysing the soil samples for trace metals, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), and benzene, toluene, ethylbenzene, and xylene (BTEX). The concentrations of these contaminants were found to be below the USEPA screening levels for residential and industrial benchmarks.

### 12.10.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

#### 12.10.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASES

During these phases, the project will cause soil erosion, sedimentation, and topsoil loss across approximately 409 hectares. Heavy equipment movement will lead to soil rutting and compaction, affecting hydrology and soil productivity. Soil contamination risks arise from fuel storage, hazardous materials, and accidental spills.

#### 12.10.2.2 OPERATION PHASE

Soil erosion and sedimentation risks persist due to disturbed areas and heavy precipitation. Soil contamination may occur from hydrocarbons, chemicals, and acid-mine drainage.

#### 12.10.2.3 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Strip and stockpile topsoil, overburden, saprolite, and organic materials for subsequent rehabilitation.
- Install sediment and water drainage control structures.
- Construct diverted channels, sediment ponds, and check dams.
- Limit clearing of vegetation and soil cover to necessary areas only.
- Remediate areas that are no longer required by the Project immediately.
- Maintain buffers along stream channels and minimise vegetation removal on steep slopes.
- Implement a Soil Erosion and Sedimentation Control Plan.
- Construct hazardous material and waste storage areas with secondary containment systems.
- Provide temporary waste storage areas across the Project area.
- Ensure emergency response kits are readily available.

### 12.10.3 POTENTIAL CUMULATIVE IMPACTS

During the pre-construction and construction phases, soil erosion, sedimentation, and topsoil loss are expected to affect roughly 409 hectares, with heavy equipment use further causing soil rutting and compaction. Mitigation strategies include stockpiling topsoil (noting that quantities are expected to be limited), installing sediment control structures, and restricting vegetation clearance. In the operational phase, additional disturbances are anticipated to be minimal. The closure phase will prioritise rehabilitating disturbed areas through revegetation and erosion control to restore soil quality.

## 12.11 BIODIVERSITY AND ECOSYSTEM SERVICES

### 12.11.1 BASELINE

The biological baseline evaluation conducted in 2013, 2021 and 2025 aimed to comprehensively assess the major taxonomic groups and habitats within the Study Area. These included vegetation, Lepidoptera (butterflies), and other invertebrates, fish, mammals, birds, amphibians, and reptiles. The primary objectives were to identify special status species, particularly threatened or endangered species, and locate critical habitats.

#### Terrestrial Ecology Results:

- **Ecosystems and Flora:** The Study Area, situated within the Guiana Shield in west-central Guyana, features extensive primary tropical forests, highland linkages, and a mosaic of habitats shaped by both natural processes and mining activities. Surveys identified 97 tree species from 38 families in earlier years, and 58 species from 31 families in the 2025 walkover, with the Leguminosae family being particularly dominant. Vegetation composition varies with altitude, and while higher elevations retain largely intact forests, lower areas show significant disturbance and secondary regrowth due to artisanal mining. Despite these impacts, there are strong signs of natural recovery, including dense understories and pioneer species.
- **Mammals:** Surveys recorded 59 mammal species, with the greatest diversity in less disturbed transects. Common species include agouti, lowland paca, brocket deer, howler monkey, and Guiana spider monkey. Notably, five of Guyana's six cat species were detected, including jaguar (tracks and scats). Several species of conservation concern were

identified, such as the lowland tapir, Guiana spider monkey, giant anteater, and white-lipped peccary, all listed as Vulnerable (VU) on the IUCN Red List. eDNA analysis in 2025 further revealed the presence of additional species, including the red-faced black spider monkey and neotropical otter.

- **Birds:** A total of 244 bird species from 47 families were recorded, with abundance and diversity varying across seasons and survey years. Common species include swifts, green oropendola, silver-beaked tanager, and brown-throated parakeet. Special status species observed include the channel-billed toucan, white-throated toucan, and Guianan streaked antwren (all Vulnerable), as well as several Near Threatened parrots and falcons. The area supports a rich avifauna, with notable endemics and CITES-listed species.
- **Amphibians and Reptiles:** Surveys documented 36 amphibian species (over 1,492 individuals) and 46 reptile species (over 1,082 individuals), with diversity and abundance fluctuating by season and habitat. Common amphibians include the cane toad and red snouted treefrog, while reptiles such as teiid lizards and caimans are prevalent. Endemic amphibians include Woodley's stefania, Evan's stefania, and the Kaie rocket frog. Notable reptiles include the yellow-footed tortoise (VU) and several CITES-listed caimans and boas. eDNA analysis detected additional species of conservation concern, such as *Allobates amissibilis* [frog species] (VU) and the spot-legged turtle (NT).

#### Aquatic Ecology Results:

- **Macroinvertebrates:** 26 orders of macro-invertebrates were recorded, with greater diversity in less disturbed areas. Groups such as Diptera, Hymenoptera, and Odonata were common. No aquatic macroinvertebrates were listed as threatened or endangered.
- **Fish:** A total of 48 fish species from 17 families were recorded, with higher numbers during the dry season as fish concentrate in smaller water bodies. Characidae and Cichlidae were the most common families, and key species included Moenkhausia lepidura, Jupiaba spp., and Hoplias malabaricus. No fish species were found to be threatened or endangered, but several are endemic to Guyana, such as Aequidens potaroensis and Crenicichla wallacii.
- **eDNA Analysis:** eDNA analysis from both the wet and dry seasons detected 94 mammal species (including microchiropteran bats) and 40 bird species, many of which were not observed during conventional surveys, 40 amphibians, and eight reptiles. Notably, eDNA identified eight IUCN-listed species of conservation concern: Red-faced Black Spider Monkey, South American Tapir, Giant Anteater, White-lipped Peccary, *Allobates amissibilis*, and Yellow-Footed Tortoise (all Vulnerable), and Neotropical Otter and Spot-legged Turtle (Near Threatened).
- **Special Status Species:** The Study Area includes species listed as NT, VU, EN, or CR on the IUCN Red List, endemic species, and those listed under CITES.

Ecosystem services cover benefits people derive from the natural environment, supporting fundamental human needs, economic activities, and cultural satisfaction.

## 12.11.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

### 12.11.2.1 PRE-CONSTRUCTION PHASE

During the pre-construction phase, vegetation removal and habitat fragmentation will disrupt local flora and fauna, affecting species such as large mammals and various birds and amphibians. Dust generated from site preparation and traffic will accumulate on plants, potentially affecting their metabolic functions and reducing photosynthesis and nutrient

exchange. Noise and light emissions from equipment will cause sensory disturbances, disrupting wildlife communication, breeding, and foraging behaviours. Heavy machinery poses risks to slower-moving species, leading to increased injury and mortality rates. Aquatic habitat loss will be limited, mostly due to preparatory earthworks, while increased runoff and erosion will affect water quality and sediment dynamics, impacting fish and macroinvertebrates. Encounters with earth-moving equipment and changes in drainage areas will lead to mortality of aquatic life.

#### 12.11.2.2 CONSTRUCTION PHASE

During the construction phase, ongoing land clearing and infrastructure development will lead to habitat degradation through soil erosion and pollution. Dust from mining activities will impair photosynthesis and overall plant health. Noise and light from construction equipment will disrupt wildlife communication, mating calls, and feeding behaviours, leading to increased stress and habitat avoidance. Heavy machinery and blasting will pose risks to wildlife, including species of conservation concern. Significant aquatic habitat loss will occur with the construction of mine infrastructure, while altered water quality, flow regimes, and stream connectivity will impact aquatic habitats. Encounters with machinery and changes in hydrology will lead to mortality of aquatic life, and construction activities at the port of entry will disturb aquatic species.

#### 12.11.2.3 OPERATION PHASE

During the operation phase, dust from ongoing operations will continue to affect plant metabolic functions. Noise and light from mining operations will disrupt wildlife behaviours, although these impacts will be less intense and more localised compared to the construction phase. Vehicle collisions and entrapment in mining infrastructure will pose risks to wildlife. Pit dewatering and excavation will alter sediment dynamics and water quality, impacting aquatic organisms. Maintenance activities and vehicle movements will lead to injury and mortality of aquatic species.

#### 12.11.2.4 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Restrict additional phased clearing and habitat disturbance to designated work areas.
- Minimise bare soil exposure and progressively revegetate or stabilise disturbed areas.
- Implement dust control measures, such as wetting dusty areas.
- Use well-maintained construction equipment with noise mufflers.
- Enforce speed limits on construction roads.
- Conduct surveys to determine the presence of wildlife in the construction zone.
- Safely remove and relocate wildlife to suitable habitats.

#### 12.11.3 POTENTIAL CUMULATIVE IMPACTS

Pre-construction and construction activities will lead to vegetation removal, some habitat fragmentation, and increased runoff and erosion, affecting sensitive species and ecosystem services. Areas cleared of vegetation may face increased temperatures, altered drainage patterns, and reduced humidity, potentially resulting in vegetation disease, soil degradation,

and habitat loss. Dust from construction activities may impair plant metabolic functions and obscure them from pollinators. Noise and light emissions may cause behavioural disturbances in wildlife, while heavy machinery poses risks to slower-moving species, leading to increased injury and mortality rates. Aquatic habitat loss will be limited, but increased runoff and erosion may affect water quality and sediment dynamics, impacting fish and macroinvertebrates. The ecological integrity of the habitat is already limited due to historical degradation, making it moderately sensitive to further impacts.

During the operation phase, ongoing dust, noise, and light will continue to affect wildlife, and vehicle collisions will pose risks. Pit dewatering and excavation may alter sediment dynamics and water quality, impacting aquatic organisms. Maintenance activities and vehicle movements may lead to injury and mortality of aquatic species. The closure phase will involve short-term disruptions from decommissioning activities, with potential injury and mortality risks to wildlife. Capping of waste facilities and removal of infrastructure may alter sediment dynamics and water quality, impacting aquatic habitats. Regrading and removal of infrastructure may lead to injury and mortality of aquatic species. Cumulative impacts on climate change resilience include increased greenhouse gas emissions from deforestation, soil disruption, and machinery use.

## 12.12 SOCIAL (INCLUDING LIVELIHOODS, DEMOGRAPHICS, AND COMMUNITY HEALTH AND SAFETY, AND HUMAN RIGHTS)

### 12.12.1 BASELINE

- **Land Use:** Within the AoI, land use is dominated by mining, with gold and diamond extraction as the main economic activity. Most land remains forested, but there are competing claims for mining, forestry, and Indigenous customary use. Agriculture is mostly subsistence, limited by poor soils and remote access, while forestry and small-scale farming play secondary roles. Land administration is managed externally, and residents often face challenges accessing farming and hunting grounds.
- **Socioeconomic Conditions:** The AoI features a diverse, low-density population centred around Indigenous communities and Mahdia town. Mining is the main economic driver, with agriculture and forestry secondary. Education and health services are improving but remain limited, and residents face challenges such as food insecurity, poor infrastructure, and safety concerns. Community life is shaped by reliance on natural resources and ongoing development efforts.
- **Community Health:** Access to healthcare is challenging, and traditional medicine is widely used alongside biomedical care, sometimes leading to health risks. Immunisation rates and maternal health indicators are generally lower than national averages, and there is a shortage of trained healthcare staff. Substance abuse, especially alcohol and drugs, is a growing concern, affecting both youth and adults. Outreach programs and social services exist but are under-resourced, and food insecurity, poor water supply, and sanitation further impact overall health and wellbeing.
- **Indigenous peoples:** Known as Amerindians, make up 10.5% of Guyana's population, primarily residing in interior regions. The government supports Indigenous rights but has not ratified ILO Convention 169. The Amerindian People's Association advocates for land title boundaries. There are nine Amerindian groups with distinct languages and customs. Efforts to preserve languages include government and university programs. The Social AoI

includes several Indigenous communities, notably Campbelltown, Princeville, and Micobie, which are primarily inhabited by members of the Patamona, Wapishana, Macushi, Akawaio, Arawak, Carib, and Warrau tribes. These communities have titled lands and are governed by village councils led by a Toshao. Their economies rely on a mix of mining, subsistence farming, hunting, fishing, and gathering, with mining concessions providing critical income for community development. Residents face challenges such as declining soil quality, reduced hunting and fishing grounds, and impacts from mining activities. Cultural identity and land tenure are central to community life, and there are ongoing efforts to secure additional land and protect traditional livelihoods.

## 12.12.2 POTENTIAL IMPACTS

### 12.12.2.1 PRE-CONSTRUCTION PHASE

During the pre-construction phase, key impacts include increased employment and business activity, changes in land use and governance, and impacts on community health, safety, and wellbeing. The project is expected to create 350 jobs, primarily for Guyanese nationals, enhancing local skills and business growth. However, it may also lead to increased competition for skilled workers and exacerbate income inequality. Land use changes involve converting land for mining and infrastructure, potentially affecting Amerindian communities' land rights. Community health impacts include overburdening local healthcare services, increased risk of communicable diseases, and strain on public safety and wellbeing due to the influx of workers.

### 12.12.2.2 OPERATIONS PHASE

In the operations phase, notwithstanding a reduction in the number of jobs, impacts are similar but extend over a longer period (15 years). Land use impacts persist, with ongoing mining activities and infrastructure development. Community health impacts remain significant, with continued strain on healthcare services and potential for increased disease transmission and crime rates.

### 12.12.2.3 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Employ Guyanese citizens with appropriate skills and qualifications where possible.
- Focus on developing local skill and hiring workers from Region 8.
- Develop and update a Stakeholder Engagement Plan to structure engagement with stakeholders in the Social AoI.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI.
- Implement the Project's Emergency Response Plan.
- Develop a Community Health and Safety Management Plan.
- Require Project workers to adhere to a Worker Code of Conduct.
- Develop a Traffic Management Plan to anticipate Project impacts on road networks.
- Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI.



### 12.12.3 POTENTIAL CUMULATIVE IMPACTS

- **Socioeconomic Conditions:** The project will boost employment for Guyanese nationals, enhance local skills, and stimulate local businesses. However, it may increase competition for skilled workers and exacerbate income inequality. The influx of workers could cause community disruptions.
- **Land Use:** Land conversion for mining and infrastructure could limit indigenous land rights, particularly around the barge landing site.
- **Community Health, Safety, and Wellbeing:** The influx of workers may strain local healthcare services, increase disease transmission, and affect public safety and mental health. The Mahdia Regional Hospital will face additional pressure, although the new hospital under construction may help. Increased traffic will impact road and river networks, causing congestion and safety hazards.
- **Indigenous Peoples:** Amerindian communities may face loss of identity, reduced access to resources, and social conflicts due to the influx of workers from the wider Region.
- **Infrastructure and Utilities:** The project will rely on its own infrastructure, minimising strain on public resources. However, increased transportation will cause traffic congestion and wear on access roads.
- **Closure Phase:** Decommissioning will reduce employment opportunities, potentially leading to economic downturns. Land use impacts will include regrading and revegetation. Community health impacts may lessen, but long-term monitoring is necessary.

## 12.13 CULTURAL HERITAGE

### 12.13.1.1 BASELINE

The baseline assessment identified three cultural heritage resources, all considered to have low sensitivity and none with legal protection. These include a cluster of two historic English bottles linked to past mining activity, two rock shelters that show evidence of both historical and modern mining-related use but yielded no intact archaeological deposits. There was also broader evidence of pork-knocking (artisanal mining) activity across the site, such as remnants of old infrastructure and waste. The area has been heavily disturbed by historic mining, which limits the likelihood of finding intact archaeological sites, and no designated heritage resources were recorded within the project footprint.

### 12.13.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

#### 12.13.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

During this phase, activities such as preparing the site, clearing land, and constructing infrastructure can result in cultural heritage sites being concealed, disturbed, damaged, or even removed. Direct impacts may involve the physical alteration or destruction of archaeological locations. Indirectly, these works can change environmental factors like noise, vibration, water flow, and soil stability, which may affect the integrity of heritage assets. Additionally, the fragmentation of the landscape and loss of connectivity between sites can alter the context and setting of cultural heritage resources.

### 12.13.2.2 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Carry out archaeological walkover surveys before starting work to identify cultural heritage sites within the project area.
- Where possible, avoid disturbing known heritage assets. If avoidance is not feasible, conduct surveys and evaluate sites through excavation.
- Prepare and incorporate a Cultural Heritage Management Plan (CHMP), including a Chance Finds Procedure (CFP).

### 12.13.2.3 OPERATION PHASE

No new impacts are anticipated during the operation phase, as all interactions with cultural heritage receptors occur pre-operation. The permanent effects from the pre-construction and construction phases will be maintained.

### 12.13.2.4 POTENTIAL CUMULATIVE IMPACTS

Site preparation, clearing, and infrastructure development may lead to the disturbance of cultural heritage sites. Direct impacts include physical disturbance, while indirect impacts involve changes in noise, vibration, hydrology, and soil stability. Overall, the project's cumulative impacts on cultural heritage are not considered significant.

## 12.14 TRAFFIC AND TRANSPORT

### 12.14.1 BASELINE

Transport in the AoI relies on a combination of road, river, and air travel. The main access road from Georgetown to Mahdia is essential for connecting communities and the project site, but sections are unpaved and can be challenging, especially in the rainy season. Mahdia and Campbelltown have more developed roads, while Micobie and Princeville depend on laterite roads and river transport. Residents use vehicles, minibuses, motorcycles, ATVs, and walk for short distances. Air travel via the Mahdia airstrip is important for reaching remote areas and for emergency or administrative needs.

### 12.14.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

#### 12.14.2.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The potential impacts of traffic accidents include an increase in traffic due to site preparation and equipment mobilisation, which can lead to higher congestion on roads and an increased risk of vehicle collisions. Collisions may occur due to mechanical failures, human errors, environmental conditions, or a combination of these factors. The severity of collisions depends on vehicle characteristics, speed, and the number of people involved. Additionally, vehicles related to the project may accelerate the degradation of roads and associated transportation infrastructure.

#### 12.14.2.2 MITIGATION MEASURES

The mitigation measures adopted for the Project are applicable for management of cumulative impacts. These include:

- Construction overpass for access road to reduce health and safety and congestion issues on the main access road.
- Maintain and upgrade access roads used within the Direct AoI.
- Conduct a comprehensive Traffic Impact Assessment.
- Develop a comprehensive Traffic Management Plan based on the Traffic Impact Assessment results.
- Develop a Project Grievance Mechanism available to those in the Social AoI.

#### 12.14.2.3 OPERATIONS PHASE

During the operations phase, traffic will be less than during construction but still higher than the pre-construction phase. Haulage roads, including the main Access Road in the EMPL, will be used for delivering supplies, transporting the workforce, and personal vehicles. On-site vehicles will use internal haul routes and rehabilitated access roads. However, the increased use of the public access road for truck transport poses risks to other road users, pedestrians, and livestock in the social area of influence (AoI). Traffic accidents involving pedestrians are likely to affect people of all ages. Communities, whose populations are expected to increase significantly, will experience predictable traffic from haulage and worker transport, increasing the risk of accidents.

#### 12.14.3 POTENTIAL CUMULATIVE IMPACTS

The project will add traffic during pre-construction, construction, and operations phases, increasing congestion and accident risks. Heavy construction traffic will accelerate road degradation. Given existing congestion, additional traffic will be incremental but not a fundamental shift.

Increased traffic from site preparation, equipment mobilisation, and material transportation will lead to higher congestion and accident risks. The project routes will impact public roads and waterways across multiple regions, including areas with low traffic.

### 12.15 CUMULATIVE IMPACT ASSESSMENT SUMMARY

A summary of the cumulative impacts assessed in this chapter is presented in Table 12.2.

TABLE 12.2 SUMMARY OF THE CUMULATIVE IMPACT ASSESSMENT

VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Significance
Air Quality	<ul style="list-style-type: none"> <li>Dust emissions from earthworks, construction of infrastructure, and unpaved roads.</li> <li>Emissions from drilling, blasting, loading, unloading, crushing, and stockpiling. These activities will generate dust (PM10), nitrogen oxides (NOx), and sulphur dioxide (SO2).</li> <li>Emissions from the power plant, primarily NO2 and PM10,</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on Air Quality.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter (Vol 2: Chapter 4), the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> </ul>	<ul style="list-style-type: none"> <li>The cumulative impacts on air quality are expected from dust emissions from the project activities, power plant emissions, and external drivers such as wildfires. Other projects, including numerous artisanal mining sites and small-scale ASM activities in the AoI, could further contribute to air quality impacts. These combined effects could potentially have moderate impacts on air quality during operational phase.</li> </ul>	<b>Moderate (Operation)</b>
Noise and Vibrations	<ul style="list-style-type: none"> <li>Increased noise levels at sensitive receptors near the project due to the operation of mining equipment, such as excavators, bulldozers, and haul trucks.</li> <li>Elevated noise levels due to the processing plant, including crushers, conveyors, and mills.</li> <li>Additional noise emissions from the power plant and its associated infrastructure.</li> <li>Increased noise levels due to operational traffic.</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on noise and vibrations</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter (Vol 2: Chapter 4), the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> </ul>	<ul style="list-style-type: none"> <li>Noise and vibration environmental receptors or components were not considered potentially eligible for the CIA because they were not identified as elements likely to be significantly affected by the Project. Additionally, they were not deemed likely to be impacted by a combination of other projects and/or external factors.</li> </ul>	<b>Negligible (Construction and Operation)</b>
Water Quality (surface and groundwater)	<ul style="list-style-type: none"> <li>Decrease in surface and quality during construction and operations through erosion of disturbed soils, runoff, effluent discharge, seepage and spills.</li> <li>Seepage from the surface stockpiles, open pits and TSF, and contamination from spills will cause a direct impact on the groundwater qualities, during the construction and operational phases.</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Historical artisanal mining activities have previously impacted the water quality of local streams and watersheds.</li> <li>During the dry seasons, some streams within the AOI may dry up entirely due to the influence of legacy pits retaining runoff.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> <li>Surface water quality was within IFC mining effluent guidelines. pH remained within the 6–9 range, and TSS was generally below the 50 mg/L limit except for a single exceedance at SWSB (Minnehaha) during a storm in March 2025. Total iron exceeded the IFC limit at several stations during the wet season, but dissolved iron and other metals (lead, mercury, arsenic, cadmium, copper, chromium, nickel, zinc, antimony) were consistently below guideline values.</li> <li>In groundwater, most samples meet IFC standards for metals and general chemistry, but elevated iron and aluminium levels were observed in some wells. No significant exceedances for arsenic, cadmium, chromium, mercury, or nickel were found.</li> </ul>	<p><b>Surface Water</b></p> <ul style="list-style-type: none"> <li>Residual impacts on surface water quality are predicted to range from negligible to minor during construction and negligible to minor during operations. The sensitivity of surface water is considered to be Medium due to the existing poor water quality impacted by anthropogenic activities under pre-development conditions, the absence of sensitive species relying on surface water and sediment in the EMPL area, and the avoidance of using the water-supply basin providing surface water to communities for drinking or recreational use in the EMPL area. The sensitivity to pit dewatering is considered low as the surface-water features, including the Salbora Water Supply, falls outside the zone of influence.</li> </ul> <p><b>Groundwater</b></p> <ul style="list-style-type: none"> <li>Groundwater modelling indicates negligible cross-basin groundwater exchange throughout mine life. Drawdown from the Eagle Mountain and Salbora pits does not result in meaningful changes to groundwater flux toward the Mahdia water supply basin. Despite the Mahdia water intake being approximately 500 m from the Salbora pit boundary, the source waters are much further away and upstream, reducing the receptor sensitivity. The sensitivity of groundwater is considered to be Low during construction and Medium during operations and the residual impact magnitude is assessed as negligible to small, resulting in an overall residual impact significance of negligible (for construction) and negligible to minor (for operations).</li> </ul>	<p><b>Surface Water – Minor (Construction and Operations)</b></p> <p><b>Groundwater - Minor (Construction and Operation)</b></p>

VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Significance
				<b>Discharges</b> <ul style="list-style-type: none"> <li>Cumulative impacts could result from waste management and water discharges including potential contamination of groundwater and surface water from metals, sulphate, and nitrogenous compounds. It is expected a moderated impact significance during the Operational Phase. It is noted that no effluent discharge from the Project will occur to watercourses without prior treatment.</li> </ul>	
Soil and Geology	<ul style="list-style-type: none"> <li>Geological disturbance from mining activities, resulting in poor stability.</li> <li>Potential impacts during the construction phase include disturbance of soils and modification of the relief, erosion, sedimentation, compaction and contamination which can cause intensification of waterlogging, decrease in soil quality and changes in the soil water regime and land use and direct soil contamination.</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on land use and soil quality.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> <li>Artisanal mining and deforestation are likely to have already impacted soils from their natural state.</li> <li>There are areas in the Project area where the soil erosion potential is medium to high due to steep slopes.</li> </ul>	<ul style="list-style-type: none"> <li>Based on the analysis made as part of the baseline, the soil in the Project area shows signs of anthropogenic contamination and it presents an overall low fertility, most likely due to deforestation in the area and artisanal mining activities. For these reasons, the receptor sensitivity has been assigned as "low". The impact magnitude for this analysis has been classified as "large", due to the impacted area being approximately 409 Ha. As such, there is a potential minor negative cumulative impact on change in land use and topsoil during construction and operations.</li> <li>During operation, there will be fewer additional disturbances to the soil resources, other than the expansion of mine pits and stockpiles.</li> </ul>	<b>Minor (Construction and Operations)</b>
Biodiversity & Ecosystem Services	<p><b>Biodiversity</b></p> <ul style="list-style-type: none"> <li>Habitat loss and fragmentation of habitats will be direct results of the Project during both construction and operations. This would affect the movement or range of some species and the connectivity of animal populations.</li> <li>Disturbance from noise and vibration during construction and operations, including blasting, lighting and human presence could affect faunal species, in particular, for sensitive species such as mammals, birds and vocal amphibians.</li> </ul> <p><b>Ecosystem Services</b></p> <ul style="list-style-type: none"> <li>The Project could reduce human access to ecosystem services due to the implementation of safety exclusion zones, construction and operations activities. This would reduce people's ability to gather wild foods, medicinal plants grow crops or graze livestock.</li> <li>During the closure phase, further land clearing may occur, but there is also potential for positive impacts through reforestation and ecosystem restoration efforts</li> <li>A reduction in flood and erosion control could be caused by clearing vegetation.</li> <li>A reduction in access to cultural or recreation features, including disturbance of the local setting for</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on biodiversity and the accessibility of ecosystem services by local communities and species.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> <li>The Project's area is located in a mosaic of lowland and upland forests, savannah and grassland habitats.</li> <li>The study area is located within a region of high biodiversity significance. There are more than 460 terrestrial species identified in the Study Area, along with more than 130 aquatic species.</li> </ul>	<ul style="list-style-type: none"> <li>Construction and operations could lead to cumulative impacts due to several factors, including soil erosion and pollution. This could have impacts to sensitive species and to ecosystem services.</li> <li>Areas cleared of vegetation during pre-construction activities will be exposed to increased temperatures, altered drainage patterns, and reduced humidity potentially resulting in vegetation disease, soil degradation, and habitat loss.</li> <li>Fragmentation of continuous forest landscapes will isolate wildlife populations in the Project Area during the construction and operations phases.</li> <li>Edge effects from habitat fragmentation will expose animals to increased human disturbance and predation, further degrading habitat quality, which species like the giant armadillo are sensitive to.</li> <li>Dust from construction activities will accumulate on plants, affecting their metabolic function, productivity, and obscure them from pollinators.</li> <li>Pre-construction and construction activities will increase runoff and erosion, increasing turbidity and affecting sediment dynamics in rivers. However, the watersheds have all been heavily impacted by historical artisanal mining and it is not thought the Project will significantly change this.</li> <li>Sensory disturbance to wildlife from noise and light emissions during construction and operation can cause behavioural and injurious impacts to terrestrial wildlife.</li> <li>The ecological integrity and conservation value of much of the habitat in the Project area is limited, due primarily to extensive historical degradation. Therefore, sensitivity to further habitat loss and/or degradation is considered Medium</li> <li>The magnitude of impacts from loss and degradation of vegetation and wildlife habitat is considered Medium, primarily due to the long-term duration of the effect and the scale of habitat changes that will occur within the AoI. Combining a medium receptor sensitivity and medium</li> </ul>	<b>Moderate (Construction and Operations)</b>



VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Significance
	local communities, visitors and species.			<p>impact magnitude will result in a moderate adverse impact significance.</p> <ul style="list-style-type: none"> <li>Cumulative impacts on climate change resilience include increased greenhouse gas emissions from deforestation, soil disruption, and machinery use. Mitigation measures aim to enhance resilience by reducing the project's carbon footprint and improving adaptation to environmental changes. The highest impact significance is expected during the construction phase, due to peak land disturbance and emissions.</li> </ul>	
Social (including livelihoods, demographics, community health and safety, human rights, land use and Indigenous people)	<ul style="list-style-type: none"> <li>The land utilised for the project covers potential agricultural lands as well as artisanal mining lands.</li> <li>Should the construction lead to any immigration and establishment of labour accommodation within the community, there is a risk of spread of communicable diseases and other security issues.</li> <li>Positive impacts might arise from the creation of employment opportunities for local residents.</li> <li>The project impacts Indigenous people, particularly Amerindian communities, through changes in employment, land use, and community health.</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on socio-economic conditions, land use, social infrastructure, health, safety and security of local communities.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> </ul>	<ul style="list-style-type: none"> <li>During pre-construction, construction and operations phases, the Project will have a positive impact on socio-economic conditions through increasing employment of Guyanese nationals, increasing local skills and capacity and increasing local businesses.</li> <li>Some villages may see a population decline in the pre-construction phase as those who rely on small scale mining migrate to other villages due to the transient nature of the practice. This movement is expected to be limited due to the extent of artisanal mining surrounding Mahdia and outside of the EMPL.</li> <li>There is a belief amongst the local communities that the arrival of immigrants in search of work opportunities will lead to an increase in competition and cause community disruptions. This impact is considered moderate with the inclusion of mitigation measures in place.</li> <li>It is also expected that there will be increased spread of communicable disease, perception or actual rates of increased crime, and potential for increased strain on community mental health and wellbeing during the construction and operations phases. This impact is considered moderate.</li> </ul>	<b>Moderate (Construction and Operations)</b>
Cultural Heritage	<ul style="list-style-type: none"> <li>Direct impacts to known and unknown cultural heritage resources are expected during construction due to ground disturbance. There is a potential to partially or wholly remove these resources. These impacts have the potential to be once off, non-reversible and permanent.</li> <li>Indirect impacts to known and unknown cultural heritage resources could arise through the introduction of intrusive visual, auditory or dust elements to their physical environment or 'setting'. Indirect impacts also include restricted access to existing cultural heritage resources as a result of construction or operation phases.</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> <li>Other Projects include artisanal mining sites. There are numerous landings and small scale ASM in the AoI.</li> <li>These would have impacts on local tangible and intangible cultural heritage.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> </ul>	<ul style="list-style-type: none"> <li>Only low sensitivity resources were recorded in the Study Area for the Project, although some unknown heritage resources could occur in the region. As such, cumulative impacts are considered to be minor.</li> </ul>	<b>Minor (Construction)</b>
Traffic and Transport	<ul style="list-style-type: none"> <li>Increased traffic during pre-construction and construction may lead to increased congestion on roadways and vehicle collisions in the area due to the close proximity of receptors to</li> </ul>	<ul style="list-style-type: none"> <li>There are no other Large Scale commercial mining operations within the AoI of the Project. Although there are various Medium to Small scale mining licenses.</li> </ul>	<ul style="list-style-type: none"> <li>From the climate change chapter, the area is at risk from flooding, extreme heat, landslides, and wildfires.</li> <li>In many places, the traffic routes show considerable deficiencies and are often not</li> </ul>	<ul style="list-style-type: none"> <li>Given that drivers already experience substantial traffic congestion and road safety risks in parts of Georgetown, additional traffic will likely be viewed as incremental, but not a fundamental shift in conditions.</li> <li>As the Project transportation routes will impact public roads and waterways across multiple regions in Guyana, including some areas that do not experience significant</li> </ul>	<b>Moderate (Construction and Operation)</b>



VEC	Potential Impacts from the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Significance
	<p>construction and operational activities.</p> <ul style="list-style-type: none"><li>Increased traffic during operations due to transport of supplies and equipment from Georgetown to the mine site may lead to increased vehicle collisions with risk of fuel and/or chemical spillages to sensitive receptors.</li><li>Increased land and river transportation (via ferry crossings) resulting in traffic congestion on roadways and rivers.</li></ul>	<ul style="list-style-type: none"><li>Other projects include artisanal mining sites. These would have impacts on local roads and transport networks from Georgetown to the Project area.</li></ul>	<p>in a particularly good condition.</p>	<p>traffic, the magnitude of the impacts is medium, and the receptor sensitivity is also medium. Due to the sensitivity of some of the transportation routes, the impact sensitivity is Moderate in the construction and operation phases.</p>	

## 12.16 CUMULATIVE IMPACT MANAGEMENT

Project design features and management measures included in the current EIA provide a means to mitigate the specific contributions of the Project to effects on VECs, following the mitigation hierarchy (refer to Volume 1: Chapter 5).

The monitoring and management of cumulative and Project impacts by the developer (Stronghold Guyana) is provided in Volume 3: Chapter 13 (Environmental and Social Management and Monitoring Plan). At the Project level, these measures are considered sufficient to address the contributions of the Project to cumulative impacts.

Ultimately, the management of cumulative impacts is the responsibility of government and regional planners. However, it is considered best international practice that private-sector developers make best efforts to engage relevant stakeholders and promote management of cumulative impacts in their project areas (IFC, 2013; Franks et al., 2010). For the Project, Stronghold Guyana will prepare a number of environmental and social management plans to mitigate the risks of the potential impacts noted in this chapter. It is recommended that Stronghold Guyana, to the extent feasible and practicable, participate in working groups and/or government initiatives aimed at addressing management of potential impacts on regional resources to which the Project could incrementally contribute with respect to cumulative impacts.

## 13. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The Section includes an overview of the Environmental and Social Management Plans that will be required for the Project. It is noted that the Closure and Rehabilitation Plan, Waste Management Plan, Emergency Response Plan, and Stakeholder Engagement Plan have been provided in Volume 4: Appendices as per the Terms and Scope.

### 13.1 PROJECTS ENVIRONMENTAL & SOCIAL MANAGEMENT PLANS

As per the Project's E&S Policies to manage the Project's E&S risks described in Volume 1: Chapter 4, and in line with local regulations and in consideration of the IFC Performance Standards, Stronghold Guyana has established respective procedures to address the identified E&S as part of the ESMS and various environmental and social management plans (provided in Sections 13.1.1 to 13.1.10). Based on the risks and impacts identified in the EIA, various mitigation measures and monitoring plans were specified. These plans and mitigation measures cover the different phases of the Project (i.e., construction, operation, and closure) and include respective KPIs/targets/acceptable criteria for the Project to track and monitor the E&S performance and adherence to these plans.

In case of any exceedances and/or non-compliance, these will be investigated, and necessary actions will be taken immediately to address the exceedances and/or non-compliance. The monitoring results, along with any exceedances and/or non-compliance, will be recorded in the monthly monitoring report.

As part of Stronghold Guyana's commitment to fulfil the environmental and social commitments as stipulated in this ESMS, Stronghold Guyana has allocated respective budget per year, covering but not limited to the execution of the environmental and social monitoring activities conducted by both Project team and the Project contractors and suppliers, environmental and social events, and additional external support. Any additional budget required for the commitment execution will be submitted for Project E&S team review and approval on case-by-case basis.

This section serves the purpose of introducing each environmental and social management plans of the Project, provide the consolidated summary of these Plans, and how the Project manages the commitments. These plans will form the basis of the Environmental and Social Management System and Management Plans that will be prepared prior to construction. It is important to note that at this time, full plans cannot be provided as the full plans will need to be developed closer to the start of construction once the final design and feasibility study is conducted. Plans for construction and operation will be developed by the Project contractors or Stronghold Guyana and will be the responsibility of Stronghold Guyana to ensure they are implemented and monitored.

#### 13.1.1 AIR QUALITY AND DUST MANAGEMENT PLAN

##### 13.1.1.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;

- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework

### 13.1.1.2 APPLICABLE STANDARDS

Air quality pollution prevention and reduction is considered in the Environmental Protection (air quality) Regulations 2000 developed under the Environmental Protection Act 1996. The Regulations indicate that anyone who emits any air contaminant in the construction, installation, operation, modification or extension of any facility related to industry, commerce, agriculture or any institution shall apply to the EPA for an environmental authorisation and shall submit an application to the EPA at least one hundred and eighty days before the date on which the emission is to commence. The Regulations also indicate that the EPA shall establish parameter limits with respect to emission of smoke, solid particles, sulfuric acid mist or sulfuric trioxide, fluoride compounds, hydrogen chloride, chlorine, hydrogen sulphide, nitric acid or oxides of nitrogen and carbon monoxide. At the time of writing, no parameters limits have been made available. The Project will adhere to a combination of The IFC General EHS Guidelines for Air Emissions (2007) the WHO Ambient Air Quality (2021).

The IFC (2007) General EHS Guidelines for Air Emissions and Ambient Air Quality state that projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimise impacts by ensuring that:

- Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines or other internationally recognised sources; and
- Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this guideline suggests 25 percent of the applicable air quality standards to allow future sustainable development in the same airshed.

The WHO Air quality guidelines are a set of evidence-based recommendations of limit values for specific air pollutants developed to help countries achieve air quality that protect public health. Table 13.1 presents the IFC/WHO guideline values for NO<sub>2</sub>, SO<sub>2</sub> and PM<sub>10/2.5</sub> that will be used in this EIA.

**TABLE 13.1 IFC/WHO AIR QUALITY STANDARDS (AQS)**

Pollutant	Averaging Period	Value (µg/m <sup>3</sup> )
PM <sub>2.5</sub>	Annual mean	35 (interim target 1)
	24 hours 99th percentile	75 (interim target 1)

Pollutant	Averaging Period	Value ( $\mu\text{g}/\text{m}^3$ )
PM <sub>10</sub>	Annual mean	70 (interim target 1)
	24 hours 99th percentile	150 (interim target 1)
NO <sub>2</sub>	Annual mean	40 (guideline)
	1 hour mean	200 (guideline)
SO <sub>2</sub>	24 hours mean	125 (interim target 1)
	10-minute mean	500 (guideline)
Arsenic (As)	EU (Annual Ambient AQS)	0.006
Chromium VI (Cr VI)	Defra (Annual Mean)	0.00025
Chromium III (Cr III)	Defra (Annual Mean)	5
Copper (Cu)	Defra (24 hour mean)	0.05
Lead (Pb)	Defra (Annual Mean)	0.25
Mercury (Hg)	Defra (Annual Mean)	0.25
Nickel (Ni)	EU (Annual Mean)	0.02
Zinc (Zn)	Defra (Annual Mean)	50 (as zinc oxide)

#### 13.1.1.3 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to air quality are provided in Table 13.2. These measures will be included in the Air Quality and Dust Management Plan.

TABLE 13.2 MITIGATION AND MANAGEMENT CONTROLS FOR AIR QUALITY (CONSTRUCTION)

Receptor	Activity / Impact	Control Description
Air Quality, Community Health, Biological Resources	Dust generation	<ul style="list-style-type: none"> <li>Develop and implement a stakeholder communications plan that includes community engagement before work commences on site</li> </ul>
		<ul style="list-style-type: none"> <li>Record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken</li> </ul>
		<ul style="list-style-type: none"> <li>Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the logbook</li> </ul>
		<ul style="list-style-type: none"> <li>Carry out regular site inspections to monitor compliance with the construction environmental management plan (CEMP), record inspection results and make inspection log available to stakeholders when asked</li> </ul>
		<ul style="list-style-type: none"> <li>Increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions</li> </ul>
		<ul style="list-style-type: none"> <li>Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible</li> </ul>
		<ul style="list-style-type: none"> <li>Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles</li> </ul>
		<ul style="list-style-type: none"> <li>Fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period</li> </ul>
		<ul style="list-style-type: none"> <li>Keep site fencing, barriers and scaffolding clean using wet methods</li> </ul>
		<ul style="list-style-type: none"> <li>Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover as detailed below</li> </ul>
		<ul style="list-style-type: none"> <li>Cover, seed or fence stockpiles to prevent wind whipping</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate</li> </ul>
		<ul style="list-style-type: none"> <li>Use enclosed chutes and conveyors</li> </ul>
		<ul style="list-style-type: none"> <li>Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate</li> </ul>



Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods</li> </ul>
		<ul style="list-style-type: none"> <li>If feasible, consider installing and operating monitoring of ambient PM<sub>10</sub> and TSP</li> </ul>
	Emissions from construction	<ul style="list-style-type: none"> <li>Avoid scabbling (roughening of concrete surfaces) if possible</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery</li> </ul>
		<ul style="list-style-type: none"> <li>For smaller supplies of fine powder material ensure bags are sealed after use and stored appropriately to prevent dust</li> </ul>
	Track out of mud / debris	<ul style="list-style-type: none"> <li>Avoid dry sweeping of large areas</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport</li> </ul>
		<ul style="list-style-type: none"> <li>Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable</li> </ul>
		<ul style="list-style-type: none"> <li>Record all inspections of haul routes and any subsequent action in a site logbook</li> </ul>
		<ul style="list-style-type: none"> <li>Install hard surfaced haul routes where practicable</li> </ul>
		<ul style="list-style-type: none"> <li>Use surface binder sprays on unpaved haul roads where practicable to minimise dust emissions</li> </ul>
		<ul style="list-style-type: none"> <li>Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)</li> </ul>

TABLE 13.3 MITIGATION AND MANAGEMENT CONTROLS FOR AIR QUALITY (OPERATION)

Receptor	Activity / Impact	Control Description
Air Quality, Community Health, Biological Resources	Dust generation	<ul style="list-style-type: none"> <li>Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.</li> </ul>
		<ul style="list-style-type: none"> <li>Record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken.</li> </ul>
		<ul style="list-style-type: none"> <li>The development and implementation of a dust management plan (DMP) to include the monitoring of dust deposition and continuous PM monitoring.</li> </ul>
		<ul style="list-style-type: none"> <li>Mining activities should be kept under review with regards to dust emissions to assess the need for additional water spraying at the in-pit activities and the haul roads.</li> </ul>
		<ul style="list-style-type: none"> <li>Avoiding dust-raising activities during dry and windy periods and when is blowing towards nearby sensitive receptors.</li> </ul>
		<ul style="list-style-type: none"> <li>Upgrading from Tier 2 to Tier 3 compliant engines for haul trucks and engines at the Power Plant would help to mitigate impacts of NO<sub>2</sub>.</li> </ul>
		<ul style="list-style-type: none"> <li>Preventative maintenance of all equipment to ensure optimal operation.</li> </ul>
		<ul style="list-style-type: none"> <li>Road wetting will be a daily occurrence during the drier periods and as necessary in the rainy season.</li> </ul>
		<ul style="list-style-type: none"> <li>Use of a combination of an environmentally approved chemical dust suppressant mixed with water on regular roads onsite (width of 12 m) to prolong dust suppression.</li> </ul>
		<ul style="list-style-type: none"> <li>A second large water truck to be used on crushed rock materials on haul roads to reduce the release of dust. Both type of trucks will have a cycle time of two hours and are able to spray the full width of the road they are wetting.</li> </ul>

#### 13.1.1.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.1.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.2 NOISE AND VIBRATION MANAGEMENT PLAN

#### 13.1.2.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework

#### 13.1.2.2 APPLICABLE STANDARDS

- Operations that emit noise while carrying out activities such as construction, transport, industry, and commerce, are required to apply to the EPA for an environmental authorisation under the Environmental Protection Noise Management Regulations 2000. The EPA is responsible for establishing standards for permissible noise levels across various sectors such as industry and construction. The categories for which permissible noise levels are fixed by the EPA are as follows: Residential
- Institutional

- Educational
- Industrial
- Commercial
- Construction
- Transportation; and
- Recreational.

The Guyana National Bureau of Standards (GNBS) and the EPA together with other relevant agencies developed, in 2010, a first revision of Guidelines for Noise Emission into the Environment. Under these guidelines, noise emissions from industrial and commercial sources for both day (06:00h – 18:00h) and night (18:00h – 06:00h) would be 100 and 80 decibels (industrial) and 80 and 65 decibels (commercial) respectively at the property boundary or 15 meters from the source.

Table 13.4 provides the applicable noise level standards per WBG EHS General guidelines. The most stringent standard will be adopted for the Project. According to the WB EHS guidelines, noise impacts should not exceed the levels presented in the table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

The most stringent standards will be adopted for the Project.

**TABLE 13.4 NOISE STANDARDS (DBA)**

Category	GNBS Guidelines	
	One Hour LAeq (dBA)	
	Daytime (06:00 – 18:00)	Night-time (18:00 – 06:00)
Residential	75	60
Industrial	100	80
Commercial	80	65
Construction	90	75
Transportation	100	80
Recreational	100	100 – 70
Institutional	75	60
Educational	75	60

### 13.1.2.3 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to noise and vibration are provided in Table 13.5 and Table 13.6 respectively. These measures will be included in the Noise and Vibration Management Plan.

TABLE 13.5 MITIGATION AND MANAGEMENT CONTROLS FOR NOISE (CONSTRUCTION)

Receptor	Activity / Impact	Control Description
Noise	Impacts to ambient noise from facilities construction	<ul style="list-style-type: none"> <li>Where practicable, stationary noisy equipment will be sited as far away as possible from receptors and orientated away from the receptors.</li> <li>Construction contractors will use alternatives to audible reversing alarms where possible and/or close to EMPL boundaries, such as visual and/ or broadband noise emitting models, that provide a safe system of work or configure the Project's work sites to maximise forward movements of mobile plant.</li> <li>Where practicable, alternatives to noisy diesel and petrol engines and pneumatic units will be used, such as hydraulic or electric-controlled units.</li> <li>Where practicable, stationary equipment (such as compressors, generators etc.) will be fitted with an acoustically treated enclosure.</li> <li>Throttle settings will be reduced, and equipment and plant turned off, when not being used.</li> <li>Onsite chutes and bins will be lined with damping material.</li> <li>Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.</li> <li>Storage of excavated material between the construction site and sensitive receptors to form noise barriers (with cover to avoid dust erosion) or installation of other (temporary) noise barriers.</li> <li>Minimising drop height of materials.</li> <li>Taking advantage of the natural topography and vegetation cover for noise shielding (such as locating facilities behind tress covered ridges).</li> <li>Implementation of speed limits (50 km/h) for trucks while travelling to and from construction sites (25 km/h for village roads in poor condition).</li> <li>Reducing the Project's traffic through Mahdia and other communities, when feasible, to avoid disturbing residential receptors.</li> <li>Limiting hours of operation for specific equipment or operations (e.g. trucks or machines operating in or passing through communities).</li> </ul>

TABLE 13.6 MITIGATION AND MANAGEMENT CONTROLS FOR NOISE (OPERATION)

Receptor	Activity / Impact	Control Description
	Impacts to ambient noise from facilities operation	<ul style="list-style-type: none"> <li>Since saprolite is a soft, weathered material that allows for excavation without the need for blasting, saprolite layers will be managed using free-digging techniques, avoiding unnecessary blasting.</li> <li>Blasting events will be undertaken only during daytime. Communities in the direct Social AoI will be notified in advance of any blasting activities.</li> </ul>



#### 13.1.2.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.2.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.3 SUSTAINABLE WATER RESOURCES MANAGEMENT

#### 13.1.3.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework

#### 13.1.3.2 APPLICABLE STANDARDS

##### **Mining water quality standards**

The Environmental Protection Water Quality Regulations 2000 require registration and environmental authorisation by any person whose construction, installation, operation, modification or extension of any facility causes the discharge of effluents. The Regulations cover parameter limits of effluent discharges, new sources of effluent discharges, fees for registration and environmental authorisation, sampling points, records and reports and general

provisions for the registration of water effluent, biological integrity, spills or accidental discharges and standard methods of analysis. Guidelines on the discharge of effluents and disposal of sludge are detailed in these regulations.

In accordance with these regulations the EPA was mandated to establish parameter limits for concentration of constituent of effluent which can be discharged into any inland or coastal waters or lands of Guyana. These include: Ammoniacal Nitrogen, Sulphate, Chloride, Cobalt, Colour, Detergents, Anionic, Fluoride (as F), Molybdenum, Phosphate 9 as P, Polychlorinated Biphenyls, Selenium, Silver, Beryllium, Vanadium, Radioactive Material, Nitrate Nitrogen, Temperature, Pesticides, Fungicides, Herbicides, Insecticides, Rodenticides, Fumigants or any other Biocides or any other Chlorinated Hydrocarbons.

The Guyana National Bureau of Standards (GNBS), along with the EPA, have developed interim industrial effluent standards which does not provide any specifications for mining.

In addition to the mandates for effluent discharge to the environment, the EPA has established guidelines for water quality associated with mining. These guidelines mandate that both surface and groundwater associated with mining operations be analysed for pH, TDS, TSS, turbidity, conductivity, organic compounds (phenol and oil and grease), major anions (Ca, Mg, Na, K), nutrients (TKN, total ammonia, phosphate, nitrate + nitrite), trace metals (Al, As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sb, Zn). The EPA also indicates that concentration levels of these analytes shall not exceed levels of environmental concern (generally set as levels to protect aquatic species). The EPA also reserves the right to request analyses to determine bacteriological levels (coliforms, faecal coliforms and standard plate counts), rare earth elements, radioactive elements and other trace metals.

As no limits for water quality have been defined by the EPA regarding construction or mining operations, the Project will apply the effluent guideline values provided by the WBG EHS General guidelines for mining. These guidelines for liquid effluents, residual heavy metals and cyanide are detailed below in Table 13.7. Effluent guidelines should be applicable for site runoff and treated effluents to surface waters for general use. These standards do not apply to direct discharge of tailings to the environment.

If natural concentrations of heavy metals exceed the levels indicated in Table 13.8 the discharge may contain concentrations up to natural background levels. Concentrations up to 110% of natural background are acceptable if no significant adverse impact can be demonstrated.

Regarding cyanide, in no instance should the concentration in the receiving water outside of a designated mixing zone exceed 0.022 mg/l.

**TABLE 13.7 MINING EFFLUENT DISCHARGES – MINING**

Parameter	Unit	WB Group EHS Guidelines Indicative Values for Site Run Off and Effluents to Surface Water
Total Suspended Solids	mg/L	50
pH	pH (SU)	6 – 9
COD	mg/L	150
BOD <sub>5</sub>	mg/L	50

Parameter	Unit	WB Group EHS Guidelines Indicative Values for Site Run Off and Effluents to Surface Water
Oil and grease	mg/L	10
Arsenic	mg/L	0.1
Cadmium	mg/L	0.05
Chromium (VI)	mg/L	0.1
Copper	mg/L	0.3
Cyanide	mg/L	1
Cyanide Free	mg/L	0.1
Cyanide WAD	mg/L	0.5
Iron (total)	mg/L	2.0
Lead	mg/L	0.2
Mercury	mg/L	0.002
Nickel	mg/L	0.5
Phenols	mg/L	0.5
Zinc	mg/L	0.5
Temperature	°C	<3 degree differential

Note: Metal concentrations represent total metals

### Domestic Wastewater Standards

The WBG EHS General guidelines also provide standards for domestic wastewater quality. Table 13.8 provides the applicable standards.

**TABLE 13.8 DOMESTIC WASTEWATER (WBG)**

Parameter	Unit	WB Group EHS Guidelines Indicative Values for Treated Sanitary Sewage Discharges
pH	pH	6 – 9
BOD	mg/L	30
COD	mg/L	125
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Oil and grease	mg/L	10
Ammonia	mg/L	-
Total Coliform	MPN/100mL	-
Total coliform bacteria	MPN/100 ml	400
Total Suspended Solids	mg/L	50

### 13.1.3.3 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to water resources are provided in Table 13.9 and Table 13.10 respectively. These measures will be included in the Sustainable Water Resources Management Plan.

**TABLE 13.9 MITIGATION AND MANAGEMENT CONTROLS FOR WATER RESOURCES (CONSTRUCTION)**

Receptor	Activity / Impact	Control Description
Hydrology and Surface water	Impacts to surface water hydrology from facilities construction	<ul style="list-style-type: none"> <li>Maintain clean/dirty-water separation; isolate runoff from disturbed areas to the construction pond network; route clean water around works.</li> </ul>
		<ul style="list-style-type: none"> <li>Erosion and sediment control measures, including silt fences, check dams, sediment basins, and stabilised drainage channels, will be established.</li> </ul>
		<ul style="list-style-type: none"> <li>The extent of open, unvegetated ground will be minimised to reduce the mobilisation and transport of fine sediments.</li> </ul>
		<ul style="list-style-type: none"> <li>Fuel and chemical storage areas will be fully contained and bunded to prevent spills from running off into water courses.</li> </ul>
		<ul style="list-style-type: none"> <li>Refuelling and equipment maintenance will be conducted on impermeable pads to eliminate the risk of hydrocarbon infiltration.</li> </ul>
		<ul style="list-style-type: none"> <li>Spill-prevention and spill-response equipment will be provided on site, enabling rapid containment and clean-up of any accidental releases.</li> </ul>
		<ul style="list-style-type: none"> <li>Hazardous materials will be stored in secure, weather-protected facilities with leak-proof floors to prevent contamination.</li> </ul>
		<ul style="list-style-type: none"> <li>Explosives housekeeping (if blasting occurs): Enforce zero-loss loading; recover misfires/spillage; deploy perimeter sumps around blast/work pads and pump back to the construction pond prior to compliant release.</li> </ul>
		<ul style="list-style-type: none"> <li>Existing hydrology studies will be updated using newly collected flow rate and hydrological data to enhance the understanding of streamflow characteristics within and around the Project Area of Influence (AoI) and associated ancillary facilities. These studies will incorporate data from surface water monitoring gauge stations, water level surveys, and periodic stream discharge measurements.</li> </ul>
		<ul style="list-style-type: none"> <li>Stage clearing and cut/fill so that the active disturbed area matches available attenuation/settling capacity; defer bulk earthworks during peak wet-season weeks if storage or discharge windows are constrained.</li> </ul>

Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>Provide perimeter drains and sumps at borrow pits and laydown yards and pump recoverable waters (if required) to the construction sedimentation pond for settling prior to compliant discharge.</li> <li>Install temporary surface covers (e.g. geotextiles) in sensitive areas to prevent sediment-laden runoff from infiltrating into drainage channels.</li> <li>Train construction personnel in surface water-protection practices, including correct handling of materials and spill-response procedures.</li> <li>Monitor short-term surface water discharge and quality around active construction areas to detect unexpected changes.</li> </ul>
Hydrogeology and Groundwater	Impacts to groundwater quality from facilities construction	<ul style="list-style-type: none"> <li>Erosion and sediment control measures, including silt fences, check dams, sediment basins, and stabilised drainage channels, will be established.</li> <li>The extent of open, unvegetated ground will be minimised to reduce the mobilisation and transport of fine sediments.</li> <li>Temporary surface covers (e.g. geotextiles) will be installed in sensitive areas to prevent sediment-laden runoff from infiltrating into the subsurface.</li> <li>Fuel and chemical storage areas will be fully contained and bunded to prevent spills from entering the soil or groundwater.</li> <li>Refuelling and equipment maintenance will be conducted on impermeable pads to eliminate the risk of hydrocarbon infiltration.</li> <li>Spill-prevention and spill-response equipment will be provided on site, enabling rapid containment and clean-up of any accidental releases.</li> <li>Hazardous materials will be stored in secure, weather-protected facilities with leak-proof floors to prevent contamination.</li> <li>Construction personnel will be trained in groundwater-protection practices, including correct handling of materials and spill-response procedures.</li> <li>Short-term groundwater level and quality monitoring will be undertaken around active construction areas to detect unexpected changes.</li> </ul>

TABLE 13.10 MITIGATION AND MANAGEMENT CONTROLS FOR WATER RESOURCES (OPERATION)

Receptor	Activity / Impact	Control Description
Hydrology and Surface water	Impacts to surface water hydrology from facilities operation	<ul style="list-style-type: none"> <li>Installation and active management of sediment ponds collecting water from all major disturbance areas, including construction areas, borrow areas, WSF, and pit workings. Sediment ponds will provide retention time to facilitate the settling of suspended solids before discharge into the environment.</li> </ul>
		<ul style="list-style-type: none"> <li>Maintain clean/dirty-water separation; route contact water and pit dewatering flows through attenuation/sedimentation ponds prior to any compliant, controlled discharge. Capture clean upgradient runoff through appropriately designed interception ditches and diversion channels.</li> </ul>
		<ul style="list-style-type: none"> <li>All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems.</li> </ul>
		<ul style="list-style-type: none"> <li>Emergency response kits to control any fuel/oil spill should be readily available across the Project area.</li> </ul>
		<ul style="list-style-type: none"> <li>Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill.</li> </ul>
		<ul style="list-style-type: none"> <li>Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines.</li> </ul>
		<ul style="list-style-type: none"> <li>Conduct regular training programs for employees to ensure they are familiar with spill response procedures.</li> </ul>
		<ul style="list-style-type: none"> <li>Develop and maintain comprehensive emergency response plans that include spill response protocols.</li> </ul>
		<ul style="list-style-type: none"> <li>In order to minimise baseflow reduction in surface waters, progressive and adaptive dewatering management will be implemented to minimise unnecessary lowering of groundwater levels. Dewatering rates will be adjusted based on the operational monitoring data and the updated modelling studies to maintain safe operating conditions in the pits.</li> </ul>
		<ul style="list-style-type: none"> <li>Controlled discharge routing will be maintained to ensure that all dewatering water is directed through the site's attenuation ponds and engineered drainage channels before release, reducing hydrological disruption at downstream points.</li> </ul>
		<ul style="list-style-type: none"> <li>A targeted groundwater and surface-water monitoring network will be maintained around the Mahdia and Minnehaha Creek and local streams to track groundwater-level changes and verify any emerging trends in baseflow reduction.</li> </ul>
		<ul style="list-style-type: none"> <li>Operational water reuse will be maximised, including reuse of pit water in mining and processing circuits, reducing the overall requirement for continuous dewatering discharge.</li> </ul>
		<ul style="list-style-type: none"> <li>Erosion and sediment control measures will be maintained along discharge pathways to prevent secondary turbidity impacts associated with increased dewatering flows.</li> </ul>



Receptor	Activity / Impact	Control Description
Hydrogeology and groundwater	Impacts to groundwater from facilities operation	<ul style="list-style-type: none"> <li>A groundwater monitoring programme has been established, comprising a network of monitoring wells to measure groundwater levels and undertake quarterly groundwater quality sampling. Monitoring data will be analysed to identify trends and potential Project-related impacts, with the programme reviewed and updated as required to reflect changes in Project layout and operational activities.</li> </ul>
		<ul style="list-style-type: none"> <li>The waste storage facility (WSF) is not expected to be lined at the base due to its size and chemical composition, although an impermeable base and walls can be formed from the clay rich saprolite to contain any potentially acid forming (PAF) rock identified, internal of the main landform. This will reduce the impact of poor-quality leachate seeping from the WSF into the underling soils and eventually joining the saturated zone.</li> </ul>
		<ul style="list-style-type: none"> <li>The WSF benches may vary in height to facilitate drainage toward the working crest while avoiding ponding water on top of the WSF. The WSF will be started at higher ground elevations to avoid the pooling of runoff or seepage at the toe of the facilities.</li> </ul>
		<ul style="list-style-type: none"> <li>Collection and treatment of tailings effluent to reduce concentrations of constituents of concern, enhancement of natural degradation of cyanide in the tailings pond, cut-off walls within or adjacent to the containment dams and dikes, sand drains for the interception and collection of seepage should it occur, and pumping wells for the return of seepage that is collected.</li> </ul>
		<ul style="list-style-type: none"> <li>Hydrocarbon storage tanks shall be designed and constructed above ground (i.e. not buried), and will have a system to detect leaks and recover products (e.g. visual inspections, active leak detection system, annual integrity testing). Secondary containment will have a typical water permeability equivalent to untreated concrete. Hydrocarbon use, transfer, distribution, and storage facilities will be designed to control meteoric water, including drainage within and around containment areas.</li> </ul>
		<ul style="list-style-type: none"> <li>Efficient oil and grease traps or sumps will be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas, and spill kits will be available with emergency response plans. Water quality in open storage systems (e.g. leachate areas, solution ponds, and tailings ponds or impoundments) will be based on the results of a site-specific risk assessment with appropriate control measures put in place to mitigate the risk or meet the IFC EHS's effluent guideline values.</li> </ul>
		<ul style="list-style-type: none"> <li>Implement phased and optimised pumping schedules to minimise unnecessary drawdown.</li> </ul>
		<ul style="list-style-type: none"> <li>Continuous monitoring of groundwater levels, pit discharge rates, and water quality will be carried out through open pit monitoring wells, village springs, and community water depots/fountains. Monitoring of mine water use for operational activities will also be performed to maintain an up-to-date mine water balance.</li> </ul>
		<ul style="list-style-type: none"> <li>Identify any additional nearby groundwater users (if any) and monitor their water sources (e.g. wells, natural springs, etc.) regularly.</li> </ul>

Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>Where a dewatering-related reduction in water availability at community water supply source locations is identified, appropriate alternative water supply options will be developed in consultation with affected communities, taking into account their water demand.</li> <li>Maintain communication with affected communities and share monitoring results transparently.</li> <li>Monitor stream baseflow and correlate with groundwater drawdown data.</li> <li>Consider controlled discharge of treated pit water to maintain ecological flow in critical streams during dry periods.</li> <li>Ensure the tailings storage facility is constructed on a low-permeability compacted saprolite foundation to minimise seepage.</li> <li>Install interception trenches or pumping wells to capture and treat seepages and contact waters before it reaches groundwater.</li> <li>Maintain strict protocols for handling fuels and chemicals, including secondary containment and emergency spill kits.</li> <li>To effectively manage groundwater-related impacts during the operation phase, a comprehensive Water Resources Management Plan will be implemented. This plan will guide all water-related activities, ensuring sustainable use and protection of groundwater resources.</li> <li>A detailed technical study (i.e. updated and improved numerical modelling) will be completed to determine the number of dewatering wells and the optimal dewatering strategy. The findings of the numerical groundwater flow model will be compared with actual hydrogeological conditions observed during operations. The model will be calibrated using real inflow rates obtained during pit dewatering to ensure accurate water management and effective control of drawdown impacts.</li> <li>All required drainage and construction procedures will be applied to minimise impacts on soil hydrology and enhance infiltration. Interception channels will be constructed around the open pit, waste storage facility (WSF), tailings storage facility (TSF), and processing plant to divert runoff waters and prevent erosion. These measures will reduce the risk of seepage and protect groundwater quality.</li> <li>Seepage collection systems and diversion ditches will be installed for WSF and TSF to prevent contamination. Spill prevention protocols, secondary containment for fuel and chemical storage, and emergency response plans will remain in place throughout the operational phase.</li> </ul>

#### 13.1.3.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.3.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.4 SOIL AND EROSION CONTROL MANAGEMENT

#### 13.1.4.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.4.2 APPLICABLE STANDARDS

##### **Environmental Provisions**

Provisions are made in the regulations concerning the construction of dams, which can be understood to relate to the construction of tailings, detention and sediment control structures.

A dam can be constructed on state land as part of a mining operation. However, no earth, stone, gravel, debris, or tailings is to be deposited on a claim held by another person without their consent. This regulation also mandates that any area of water containing poisonous or

hazardous substances used in the treatment of gold or other minerals must be fenced to prevent unintentional access and notice warning signage erected to prevent the use of the water. In addition, contaminated water must not knowingly be allowed to be released by a claim holder or his agents or to enter any water body, watercourse or any stagnant water without having been appropriately treated. The stipulations of these regulations are applicable to the siting of tailings ponds and the management of effluent discharge from ponds.

Further provisions are made regarding the use and impacts on water resources (including damming), specifically watercourses and their use for navigation purposes. Limits on effluent disposal are also covered by the requirement preventing water containing any poisonous or injurious chemical solution to be released or enter any water courses or water bodies without having been previously rendered innocuous.

### **Pesticides And Toxic Chemicals Control Act And Regulations**

The Pesticides and Toxic Chemicals Control Act No. 13 of 2000, amended in 2007, regulates the manufacture, importation, transportation, storage, sale, use and disposal of pesticides and toxic chemicals. The Act is relevant to Project activities as the Project will require toxic chemicals, such as cyanide, to be imported and used.

The Act established the Pesticides and Toxic Chemicals Control Board, which is responsible for registering pesticides and toxic chemicals, advising the Minister on matters relevant to the making of regulations under this Act, and advising on the monitoring and implementation of those regulations. The Act also established that only licensed persons are allowed to import, manufacture, and sell pesticides or toxic chemicals.

The Act's regulations include the Pesticides and Toxic Chemicals Regulations 2004 and its subsequent amendments of 2006 and 2019. These regulations provide for the control of the manufacture, importation, handling, storage, placing on the market, and use of pesticides and toxic chemicals. The regulations also require hazardous substances to be classified and registered.

#### **13.1.4.3 MANAGEMENT AND MITIGATION MEASURES**

The management plans will be implemented during the construction, operation, and closure phases.

The mitigation measures for construction and operation related to soil are provided in Table 13.11 and Table 13.12 respectively. These measures will be included in the Soil and Erosion Control Management Plan.

TABLE 13.11 MITIGATION AND MANAGEMENT CONTROLS FOR SOIL (CONSTRUCTION)

Receptor	Activity / Impact	Control Description
Soils and Geology	Increased soil erosion and sedimentation and topsoil loss	<ul style="list-style-type: none"> <li>During construction, topsoil, overburden, and saprolite, and organic materials will be stripped or excavated and stockpiled, to the extent possible, for subsequent rehabilitation of areas where land disturbance has been completed.</li> </ul>
		<ul style="list-style-type: none"> <li>During construction, sediment control structures will be installed.</li> </ul>
		<ul style="list-style-type: none"> <li>Diverted channels and sediment ponds will be constructed before disturbance to avoid run-off with high sediment content flow to water courses.</li> </ul>
		<ul style="list-style-type: none"> <li>Construction of area drainage and sediment control structures that relies on: (1) run-off controls, (2) source controls near the disturbance, (3) intermediate controls, and (4) perimeter controls. Releases from the perimeter controls must meet effluent limits and achieve ambient criteria at downstream compliance points.</li> </ul>
		<ul style="list-style-type: none"> <li>Limit clearing of vegetation and soil cover to necessary areas only. As practicable as possible, undertake land clearance within shortest period possible before commencement of construction activities.</li> </ul>
		<ul style="list-style-type: none"> <li>Areas that are no longer required by the Project should be remediated immediately. Avoid the disturbance of areas with steep slopes and areas prone to landsides to the extent possible.</li> </ul>
		<ul style="list-style-type: none"> <li>Maintaining buffers along stream channels and minimising vegetation removal on steep slopes.</li> </ul>
		<ul style="list-style-type: none"> <li>Maintaining water drainage structures and check dams along access roads.</li> </ul>
		<ul style="list-style-type: none"> <li>Implement a Soil Erosion and Sedimentation Control Plan and good management practices to control soil erosion, stormwater runoff, and sedimentation control (e.g., silt fences, check dams, and implementing progressive revegetation practices).</li> </ul>
Soils and Geology	Soil rutting and compaction	<ul style="list-style-type: none"> <li>Limit, when practical, off-road access.</li> </ul>
		<ul style="list-style-type: none"> <li>Vehicles to use only existing roads or those newly constructed for the Project. This limitation will minimise the environmental impact on undisturbed areas and ensure that vehicular activity is confined to designated routes.</li> </ul>
		<ul style="list-style-type: none"> <li>Areas that were disturbed as part of construction and are no longer required should be remediated immediately.</li> </ul>
Soils and Geology		<ul style="list-style-type: none"> <li>All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems with bund capacity in excess of 110</li> </ul>

Receptor	Activity / Impact	Control Description
	Soil contamination, accidental spills and chemical release	<p>percent of the liquid volume stored there. Floors should be sealed, and all areas roofed to prevent the bunds filling with rain.</p> <ul style="list-style-type: none"> <li>• There will be approved temporary waste storage areas located across the Project area, to collect the waste properly until the landfill will be operating.</li> <li>• Emergency response kits to control any fuel/oil spill should be readily available across the Project area.</li> <li>• Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill.</li> <li>• Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines.</li> <li>• Conduct regular training programs for employees to ensure they are familiar with spill response procedures.</li> <li>• Develop and maintain comprehensive emergency response plans that include spill response protocols.</li> <li>• To minimise the potential for contamination of soils from accidental spills, control measures will be implemented, including use of secondary containment, drip trays for fuelling, specialised training, inspections and a Spill Prevention, Control and Countermeasures Plan (SPCC). The SPCC Plan describes measures to be implemented by Stronghold Guyana and its contractors to prevent, and if necessary, contain and control inadvertent spill of hazardous material such as fuels, lubricants, and mine operation chemicals.</li> <li>• Spills of contaminants should be excavated immediately to the depth of contamination, removed and the area suitably rehabilitated. All contaminated material should be suitably disposed of or remediated.</li> <li>• The Project should prevent any ad hoc maintenance of vehicles/equipment in and around the Project area. All vehicles/equipment should be maintained at a designated workshop. The workshop should include an oil/grease trap.</li> <li>• Contractors and relevant Project staff should be trained regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact soil resources.</li> <li>• Store chemicals in the appropriate container with a clear label.</li> <li>• Spill control measures such as storage and handling of chemicals and fuel in concrete areas with secondary containment implemented to minimise impacts in the event or release.</li> <li>• Use of release control kits to contain and clean small spills or leakage.</li> <li>• Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakage.</li> </ul>



Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>Unloading, loading, and refuelling protocols are required for the transfer of diesel, oil and other chemicals are trained to prevent/contain spills and leaks.</li> <li>Guidelines and procedures shall be prepared and followed for immediate clean-up actions following any releases.</li> <li>Prepare the emergency response plan to cover the event of a chemical spill/ leakage.</li> <li>The loading and unloading of dangerous and hazardous material and fuels should be confined to areas that are provided with secondary containment and in line with hazardous-material handling procedures and include emergency spill control measures such as shutoff valves and isolation sumps. Spill kits should be provided in all areas where hazardous liquid materials and fuels are stored and handled.</li> </ul>

TABLE 13.12 MITIGATION AND MANAGEMENT CONTROLS FOR SOIL (OPERATION)

Receptor	Activity / Impact	Control Description
Soils and Geology	Increased soil erosion and sedimentation and topsoil loss	<ul style="list-style-type: none"> <li>Sediment control measures would be implemented before discharging to the receiving environment to reduce sediment loads discharging to surface water bodies from Project activities. This includes the development of sediment control structures/dams (sediment ponds) downstream of Project-impacted areas before the start of major earthworks.</li> </ul>
		<ul style="list-style-type: none"> <li>Areas that are no longer required by the Project should be remediated immediately. Avoid the disturbance of areas with steep slopes and areas prone to landslides to the extent possible.</li> </ul>
		<ul style="list-style-type: none"> <li>Maintaining buffers along stream channels and minimising vegetation removal on steep slopes.</li> </ul>
		<ul style="list-style-type: none"> <li>Implement a Soil Erosion and Sedimentation Control Plan and good management practices to control soil erosion, stormwater runoff, and sedimentation control (e.g., silt fences, check dams, implementing progressive re vegetation practices).</li> </ul>
		<ul style="list-style-type: none"> <li>Implement a concurrent rehabilitation program (i.e., a Mine Rehabilitation and Closure Plan) during Operations that minimises the amount of land that will be disturbed at one time.</li> </ul>
Soils and Geology	Soil contamination, accidental spills and chemical release	<ul style="list-style-type: none"> <li>Site grading to ensure appropriate long-term site drainage.</li> </ul>
		<ul style="list-style-type: none"> <li>Progressive regrading of the WSF as it depletes and revegetation using a seedlings facility to be developed in the Project area.</li> </ul>
		<ul style="list-style-type: none"> <li>Stabilisation of slopes through regrading and revegetation.</li> </ul>

Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>To minimise the potential for contamination of soils from accidental spills, control measures will be implemented, including use of secondary containment, drip trays for fuelling, specialised training, inspections and a Spill Prevention, Control and Countermeasures Plan (SPCC). The SPCC Plan describes measures to be implemented by Stronghold Guyana and its contractors to prevent, and if necessary, contain and control inadvertent spill of hazardous material such as fuels, lubricants, and mine operation chemicals.</li> <li>Spills of contaminants should be excavated immediately to the depth of contamination, removed and the area suitably rehabilitated. All contaminated material should be suitably disposed of or remediated.</li> <li>The Project should prevent any ad hoc maintenance of vehicles/equipment in and around the Project area. All vehicles/ equipment should be maintained at a designated workshop. The workshop should include an oil/grease trap.</li> <li>Contractors and relevant Project staff should be trained regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact soil resources.</li> <li>Store chemicals in the appropriate container with a clear label.</li> <li>Spill control measures such as storage and handling of chemicals and fuel in concrete areas with secondary containment implemented to minimise impacts in the event or release.</li> <li>Use of release control kits to contain and clean small spills or leakage.</li> <li>Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakage.</li> <li>Unloading, loading and refuelling protocols are required for the transfer of diesel, oil and other chemicals are trained to prevent/contain spills and leaks.</li> <li>Guidelines and procedures shall be prepared and followed for immediate clean- up actions following any releases.</li> <li>Prepare the emergency response plan to cover the event of a chemical spill/ leakage.</li> <li>The loading and unloading of dangerous and hazardous material and fuels should be confined to areas that are provided with secondary containment and in line with hazardous-material handling procedures and include emergency spill control measures such as shutoff valves and isolation sumps. Spill kits should be provided in all areas where hazardous liquid materials and fuels are stored and handled.</li> <li>All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be equipped with secondary containment systems with bund capacity in excess of 110 percent of the liquid volume stored there. Floors should be sealed, and all areas roofed to prevent the bunds filling with rain.</li> </ul>

Receptor	Activity / Impact	Control Description
		<ul style="list-style-type: none"> <li>There will be approved temporary waste storage areas located across the Project area, to collect the waste properly until the landfill will be operating.</li> </ul>
		<ul style="list-style-type: none"> <li>Hazardous waste will not be disposed in the on-site landfill(s). Hazardous waste generated by the Project will be temporarily stored on site pending off-site shipment for treatment and/or disposal at an approved facility by a licensed contractor.</li> </ul>
		<ul style="list-style-type: none"> <li>Contact runoff will be captured and diverted to treatment within the Project area, avoiding contamination of water bodies and external land.</li> </ul>
		<ul style="list-style-type: none"> <li>Emergency response kits to control any fuel/oil spill should be readily available across the Project area.</li> </ul>
		<ul style="list-style-type: none"> <li>Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill.</li> </ul>
		<ul style="list-style-type: none"> <li>Use drain covers or other barriers to prevent the spilled material from entering stormwater drains.</li> </ul>
		<ul style="list-style-type: none"> <li>Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines.</li> </ul>
		<ul style="list-style-type: none"> <li>Conduct regular training programs for employees to ensure they are familiar with spill response procedures.</li> </ul>
		<ul style="list-style-type: none"> <li>Develop and maintain comprehensive emergency response plans that include spill response protocols.</li> </ul>

#### 13.1.4.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided for plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor should hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.4.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.5 LANDSCAPE AND VISUAL MANAGEMENT PLAN

#### 13.1.5.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.5.2 APPLICABLE STANDARDS

##### **Guyana Lands And Surveys Commission**

The GLSC facilitates land administration in fulfilment of the needs of its clients and for national development. The GLSC is a governmental institution responsible for, among other things, advising the government on the management of state lands, land-use policies, issuance of land titles and leases, and provision of governmental support for land use development and collection of rents from leased lands. As a result, the GLSC acts as the custodian for state

lands, including rivers and creeks. In addition, it enables surveys; publishes maps and charts for different localities; approves, records, and clarifies all land surveys; and accounts for all financial transactions' payable concerning the sale of public lands as prescribed by law.

### **Town And Country Planning Act**

The Town and County Planning Act of Guyana provides for the planning and orderly development of land, cities, towns, and other rural and urban areas to maintain and improve their amenities, ensure fair sanitary conditions, and plan road infrastructure and public services.

The Act also guides the conservation and development of areas under its mandate. Execution and enforcement are vested under the Central Housing and Planning Authority (CH&PA). The CH&PA is responsible for preparing spatial development and land-use plans in collaboration with the local authorities of each geographic area. These plans guide all future development, including housing development and regulated land use through the planning permission process

#### **13.1.5.3      MANAGEMENT AND MITIGATION MEASURES**

The mitigation measures for construction and operation related to landscape and visual are provided in Table 13.13 and Table 13.14 respectively.

TABLE 13.13 MITIGATION AND MANAGEMENT CONTROLS FOR LANDSCAPE AND VISUAL (CONSTRUCTION)

Means of verification	Receptor	Activity / Impact	Control Description
Site Audit Reports	Landscape and Visual	Impacts from to visual amenity construction of facilities	<ul style="list-style-type: none"> <li>The extent of the construction areas should be limited to within Project design parameters where possible to minimise impact to surrounding area, as well as areas disturbed by construction activity are suitably top soiled and vegetated/covered as soon as is possible after final shaping.</li> </ul>
			<ul style="list-style-type: none"> <li>Existing tracks or roads should be used for access where possible.</li> </ul>
			<ul style="list-style-type: none"> <li>Dust from roads and work areas should be controlled during the dry season with watering and/or application of non-toxic dust surfactants.</li> </ul>
			<ul style="list-style-type: none"> <li>Demarcate Project boundaries and minimise areas of surface disturbance to within Project design parameters. Where limits are to be exceeded, prior internal and/or external permitting must be obtained. Where possible, locate laydown areas and construction camps in areas that are already disturbed and / or cleared of vegetation.</li> </ul>
			<ul style="list-style-type: none"> <li>Regular maintenance of the construction site to minimise waste.</li> </ul>
			<ul style="list-style-type: none"> <li>Use non-ultraviolet (UV) lights, where possible.</li> </ul>
			<ul style="list-style-type: none"> <li>Design Project facilities to avoid or limit the visibility of lighting from visual receptors.</li> </ul>
			<ul style="list-style-type: none"> <li>Reduce exterior lighting and implement operational strategies to reduce light spillage.</li> </ul>
			<ul style="list-style-type: none"> <li>Implement a restoration plan including replanting of indigenous species, landscaping and rehabilitation of construction yards.</li> </ul>
			<ul style="list-style-type: none"> <li>Structures should have a non-reflective finish, and the colour should be appropriate in order to merge itself as much as possible within the landscape.</li> </ul>
			<ul style="list-style-type: none"> <li>Temporary roads providing access to site compounds and work areas will be clear and tidy and dust will be controlled.</li> </ul>
			<ul style="list-style-type: none"> <li>Monitoring will be undertaken to ensure that visual screening and dust control measures for the Project are implemented effectively.</li> </ul>
			<ul style="list-style-type: none"> <li>Outdoor lighting will be as unobtrusive as possible and will be shielded and directed downwards to prevent spill, particularly in the direction of residential properties. The use of tall mast lights will be carefully assessed before being used especially at the gates and around fencing.</li> </ul>



TABLE 13.14 MITIGATION AND MANAGEMENT CONTROLS FOR LANDSCAPE AND VISUAL (OPERATION)

Means of verification	Receptor	Activity / Impact	Control Description
	Landscape and Visual	Site preparation, vegetation clearance and excavation	<ul style="list-style-type: none"> <li>• Use only downward-facing lighting with shielding that illuminates only the area that needs illumination and use only the minimum amount and intensity of lighting necessary for safe operation.</li> <li>• Use non-ultraviolet (UV) lights, where possible.</li> <li>• Reduce exterior lighting and implement operational strategies to reduce light spillage.</li> </ul>

#### 13.1.5.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided for plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor should hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.5.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.6 BIODIVERSITY MANAGEMENT PLAN

#### 13.1.6.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.6.2 APPLICABLE STANDARDS

##### **National Biodiversity Action Plan**

The National Biodiversity Action Plan (NBAP) was prepared in 1999 to integrate the implementation of the Convention on Biological Diversity into national development. The overall goal of the NBAP was "to promote and achieve the conservation of Guyana's biodiversity, to use its components in a sustainable way, and to encourage the fair and

equitable sharing of benefits arising out of the use of Guyana's biodiversity". The stated objectives of the plan were as follows:

- To evaluate the state of capacity nationally to achieve the above goal;
- To identify gaps and needs relating to achieving the above goal;
- To propose actions to achieve this goal and close the gaps;
- To develop activities in a number of priority areas relating to the overall goal;
- To identify the roles and responsibilities of the various stakeholder groups in the implementation of the plan; and
- To increase public awareness of biodiversity.

### **The Wildlife Conservation and Management Act**

The Wildlife Conservation and Management Act 2016 established the Guyana Wildlife Conservation and Management Commission. The aim and purpose of the Wildlife Conservation and Management Act 2016 are:

- To create a supportive mechanism cognisant of the national goals for wildlife protection, conservation, management and sustainable use;
- To create a national framework and mechanisms governing the local and international trade in all species of Guyana's wildlife;
- To implement the primary provisions of the Convention (this is required by Article VIII of the Convention); and
- To provide a framework of licensing and decisions which support core principles of transparency, certainty, natural justice and fairness.

The Project will develop biodiversity management plans in compliance with the Act.

### **Wild Birds Protection Act Chapter 71:01**

The Wild Birds Protection Act promotes the protection of certain wild birds. Wild birds are defined in the schedules 1 and 2 of the Act. Schedule 1 wild birds are protected, and it is an offence to wound, kill, expose for sale, and offer for sale or export these wild birds. Schedule 2 wild birds receive protection only during a prescribed closed season. However, it is not an offence to wound or kill any wild bird for the purpose of procuring food and if done ten miles or more from a plantation. There are no provisions for the protection of wild birds relative to mining operations. However, conservation of biological resources is applicable to the Project.

#### **13.1.6.3 MANAGEMENT AND MITIGATION MEASURES**

The mitigation measures for construction and operation related to ecology are provided in Figure 13.1. To expand on this, a full Biodiversity Management Plan (BMP) will be prepared and implemented to avoid and minimise impacts specifically on IUCN and endemic species. The BMP will include targeted strategies such as habitat preservation, species monitoring, and other adaptive management approaches to ensure minimal disruption to flora and fauna of conservation concern. At present, there is no change to the EIA submission. The full BMP will need to be developed closer to the start of construction once final design and feasibility study is conducted.

In terms of biodiversity, Stronghold Guyana will set aside an area to the east of the EMPL as a "reserve" i.e., no works will be conducted in this area. The total area will be approximately 8.6

km<sup>2</sup>. Stronghold Guyana are in discussions with the Forestry Commission on forestry permits to set-aside and preserve the area to the south east of the EMPL as shown in Figure 13.1.

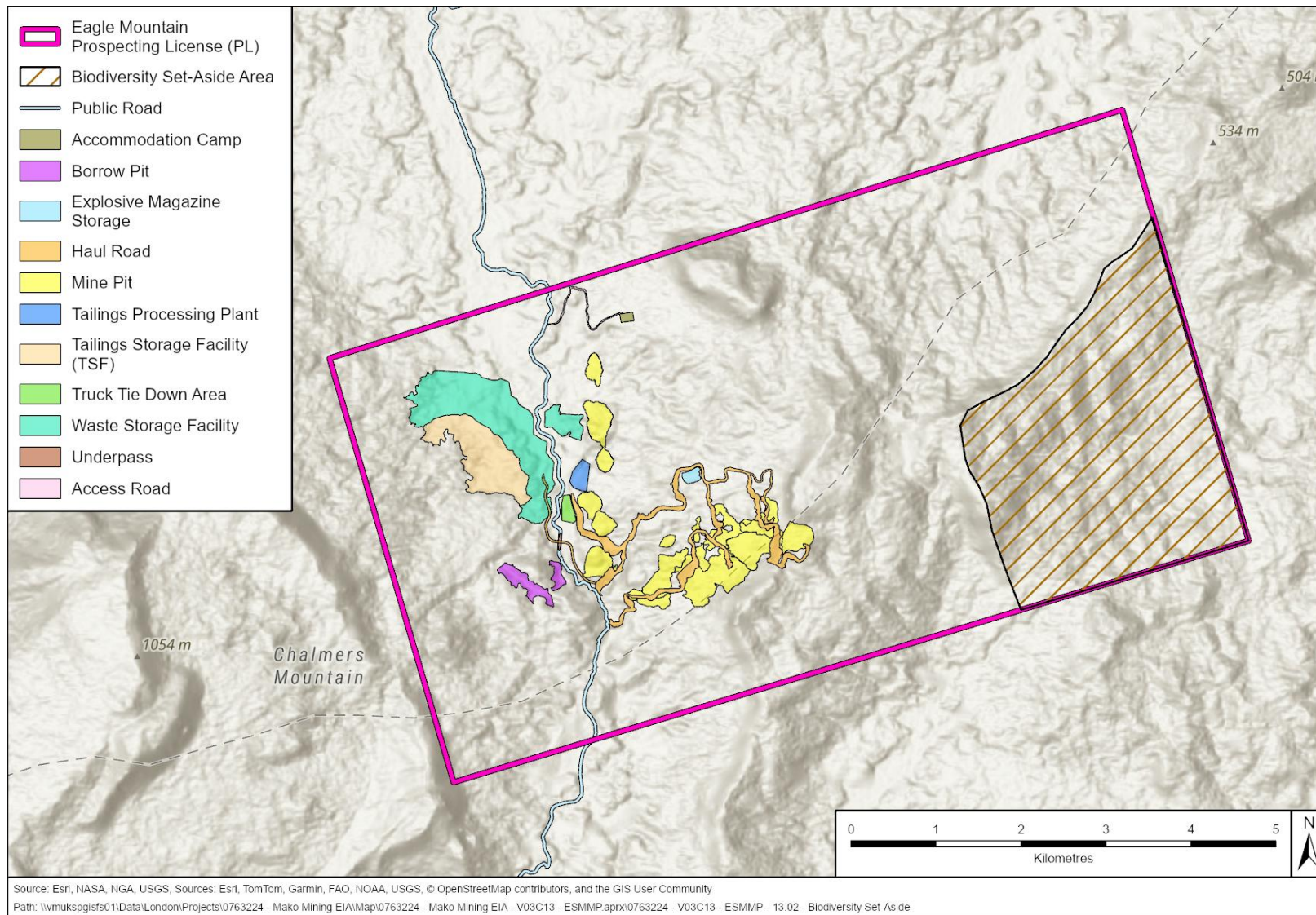
The onsite set-aside will be managed by Stronghold Guyana for biodiversity conservation and will be included in Stronghold Guyana's long term biodiversity monitoring program.

The primary purpose of this set-aside is to serve as compensation for the unavoidable impacts on biodiversity and natural habitats caused by project development. While the EIA identifies overall impacts as ranging from negligible to moderate, the presence of endemic and IUCN-listed endangered and vulnerable species within the EMPL necessitates additional conservation measures. The area within the EMPL will remain undisturbed by the Project development. Therefore, the set-aside is expected to serve as a refuge for flora and fauna, maintaining intact forest structure and species communities similar to those of the broader EMPL. This will be detailed in a Biodiversity Management Plan to be developed prior to Construction, once the detailed design is complete for the Project.

Stronghold Guyana will also discuss with the Protected Areas Commission regarding potential contributions to funding protection of Protected Areas outside of the EMPL such as the Kaieteur National Park.

Ecological criteria to establish the set aside area will look at ensuring ecological connectivity, vegetation cover and structure, and human disturbance management (i.e., prohibiting artisanal mining) and will include:

- Minimum size of area: the area to be reserve will be larger than the footprint of the Project. The Project footprint is 4.2km<sup>2</sup> and the set aside will be more than double the size of the developed area at 8.6km<sup>2</sup>.
- Presence of key ecological features; the set aside area is located in an area of forested habitat within the EMPL which has the little development and includes both terrestrial and aquatic habitats.
- Limited human activity (no agricultural, mining, etc.; the area selected has no to little human activity, it is difficult to access and does not include any known mining, logging, or agricultural areas.

**FIGURE 13.1 BIODIVERSITY RESERVE AREA**

Note: dashed line shows administrative boundary



TABLE 13.15 MITIGATION AND MANAGEMENT CONTROLS FOR ECOLOGY (PRE-CONSTRUCTION AND CONSTRUCTION)

Means of verification	Receptor	Activity / Impact	Control Description
Biodiversity Management Plan	Terrestrial Ecology	Impacts to habitats and species	<ul style="list-style-type: none"> <li>Survey and protect sensitive species: Conduct pre-construction surveys to avoid special-status species and transplant special status species' seedlings as needed.</li> </ul>
			<ul style="list-style-type: none"> <li>Minimise cleared width of roads and work areas, adhere to the most direct routes and avoid areas of high vegetation and faunal diversity.</li> </ul>
			<ul style="list-style-type: none"> <li>Minimise cleared width of roads and work areas, adhere to the most direct routes and avoid areas of high vegetation and faunal diversity.</li> </ul>
			<ul style="list-style-type: none"> <li>Construction will largely be conducted in the dry season, due to the challenging conditions present in the wet season, therefore appropriate mitigation measures will be utilised to control dust. Ensure noise level specifications are met, use well-maintained equipment with noise mufflers, and enforce speed limits on Project roads.</li> </ul>
			<ul style="list-style-type: none"> <li>Implement a wildlife awareness training program for workers.</li> </ul>
			<ul style="list-style-type: none"> <li>Wildlife will be safely removed and relocated to suitable habitats that are unaffected by construction activities to reduce the likelihood of injury and mortality.</li> </ul>
			<ul style="list-style-type: none"> <li>A Vegetative Clearance Procedure will be developed to guide preconstruction clearances.</li> </ul>
			<ul style="list-style-type: none"> <li>A Biodiversity Management Plan (BMP) will be prepared and implemented to avoid and minimise potential impacts, specifically on IUCN and endemic species.</li> </ul>
			<ul style="list-style-type: none"> <li>Biological monitoring, for example tracking population dynamics, will be used to assess potential impacts on wildlife within the AoI over time.</li> </ul>
			<ul style="list-style-type: none"> <li>Surveys will be conducted to determine the presence of wildlife, especially sensitive or special-status species, in the work areas.</li> </ul>
			<ul style="list-style-type: none"> <li>Any additional clearing not completed during the pre-construction phase will be paced and sequential, allowing wildlife to move away from work areas and, therefore, minimise the risk of injury and mortality.</li> </ul>
			<ul style="list-style-type: none"> <li>All clearing and activities associated with habitat disturbance will be restricted to work areas. Soil exposure will be minimised and progressively revegetated and / or stabilised as construction progresses.</li> </ul>
			<ul style="list-style-type: none"> <li>Dust control measures will be implemented to mitigate impacts resulting from construction activities largely occurring during the dry season.</li> </ul>



Means of verification	Receptor	Activity / Impact	Control Description
			<ul style="list-style-type: none"> <li>All equipment will be well-maintained and use noise muffles to reduce noise levels and meet noise regulations. Noise levels will be regularly monitored during construction activities.</li> </ul>
			<ul style="list-style-type: none"> <li>Access roads for the Project site will not be open to the public reducing potential impacts from poaching and / or hunting. However, the old Potaro-Konawaruk road will remain open for public access. There will be regular patrols alongside access roads and camera traps will be installed. Strict access controls will also be in place alongside continuous environmental monitoring and partnerships with local authorities for enforcement.</li> </ul>
			<ul style="list-style-type: none"> <li>Require adherence to Project-established speed limits for construction vehicles to reduce potential disturbances, injury, and mortality to wildlife.</li> </ul>
			<ul style="list-style-type: none"> <li>Environmental awareness campaigns for workers and communities, combined with a zero-tolerance policy on hunting and forest clearing will be implemented.</li> </ul>
	Aquatic Ecology	Impacts to habitats and species	<ul style="list-style-type: none"> <li>Ditches, culverts, and bridges will prevent runoff from directly entering the watershed and will convey runoff to suitable outflow locations.</li> </ul>
			<ul style="list-style-type: none"> <li>A phased approach to land clearing will be used to minimise the amount of disturbed land at one time.</li> </ul>
			<ul style="list-style-type: none"> <li>An erosion and sediment control management plan and a site water management plan will be implemented to mitigate environmental impacts.</li> </ul>
			<ul style="list-style-type: none"> <li>A Biodiversity Management and Monitoring Plan will be prepared for the Project.</li> </ul>
			<ul style="list-style-type: none"> <li>Monitor water quality downstream of active worksites to identify and address any pollution during construction, ensuring compliance with environmental regulations and reducing impacts to aquatic species.</li> </ul>
			<ul style="list-style-type: none"> <li>Regularly monitor water quality downstream to detect and address any pollution issues during construction, ensuring adherence to environmental regulations and minimising impacts on aquatic life.</li> </ul>
			<ul style="list-style-type: none"> <li>Establish and maintain buffer zones around waterways and carry out fish rescue and relocation efforts to safeguard aquatic habitats from construction-related disturbances.</li> </ul>
			<ul style="list-style-type: none"> <li>Create and maintain construction crossings at perennial streams, ideally using stone in the stream bed that allows water to pass rather than timber mats, dams or culverts. If bridges are required, maximise span to maximise natural flow characteristics.</li> </ul>

Means of verification	Receptor	Activity / Impact	Control Description
			<ul style="list-style-type: none"> <li>Maintain vegetated buffers between active construction sites (construction) and operating infrastructure (operations) and surface water features.</li> <li>Retain large woody debris in stream channels to increase instream habitat diversity but prevent drainage from cleared vegetation stockpiles from reaching streams to avoid excessive nutrients in runoff.</li> <li>To the extent possible, retain seasonally inundated habitats and the connections between these habitats and perennial stream channels.</li> <li>The majority of construction activities will take place in the dry season to avoid periods when seasonal migrating fish are present.</li> <li>Stronghold Guyana have made efforts to minimise the diversion of watercourses and avoid the Mahdia watershed in their Project design. The only watercourse diversion is associated with the location of the pit. It should be noted that due to historic artisanal mining in the Project Area, the watercourses near the TSF are already heavily diverted and segmented.</li> </ul>

TABLE 13.16 MITIGATION AND MANAGEMENT CONTROLS FOR ECOLOGY (OPERATION)

Means of verification	Receptor	Activity / Impact	Control Description
Biodiversity Management Plan	Terrestrial Ecology	Impacts to habitats and species	<ul style="list-style-type: none"> <li>Conduct ongoing surveys within and around operational areas to monitor the presence of special status species.</li> <li>Wildlife will be removed and relocated to suitable and safe habitats.</li> <li>Ensure noise level specifications are met, use well-maintained equipment with noise mufflers, and enforce speed limits on Project roads.</li> <li>Restrict any new disturbance to designated work areas, minimise bare soil exposure and progressively revegetate and / or stabilise disturbed soil to manage erosion and mitigate habitat disruption.</li> <li>Regularly water dusty surfaces, particularly on heavily trafficked roads to control dust generation.</li> </ul>

Means of verification	Receptor	Activity / Impact	Control Description
			<ul style="list-style-type: none"> <li>A full Biodiversity Management Plan (BMP) will be prepared and implemented and will detail mitigation, management and monitoring measures relating the operation of the Project.</li> </ul>
			<ul style="list-style-type: none"> <li>Implement a wildlife awareness training program for workers and run environmental awareness campaigns for workers and communities.</li> </ul>
			<ul style="list-style-type: none"> <li>Implement a zero-tolerance policy on hunting and forest clearing.</li> </ul>
	Aquatic Ecology	Impacts to habitats and species	<ul style="list-style-type: none"> <li>A pump back system will collect and return seepage through the embankment drain, further minimising environmental impact.</li> </ul>
			<ul style="list-style-type: none"> <li>Water from the camp will be treated.</li> </ul>
			<ul style="list-style-type: none"> <li>Water from the TSF dewatering and the Pit will be held in sediment ponds, allowing the sediment to settle out of the water before water is released to the downstream environment.</li> </ul>
			<ul style="list-style-type: none"> <li>Cyanide recycling and destruction circuit.</li> </ul>
			<ul style="list-style-type: none"> <li>Seepage control systems on at the TSF.</li> </ul>
			<ul style="list-style-type: none"> <li>Controls on blasting to limit excess nitrogen in waste rock.</li> </ul>
			<ul style="list-style-type: none"> <li>Sewage treatment plant to treat domestic wastewater.</li> </ul>
			<ul style="list-style-type: none"> <li>Treated water will be released to the environment at controlled rates to minimise downstream impacts.</li> </ul>
			<ul style="list-style-type: none"> <li>Stronghold Guyana have avoided diversion of watercourses and watersheds.</li> </ul>
			<ul style="list-style-type: none"> <li>Conduct frequent water quality monitoring to identify and address any pollution incidents during construction, ensuring compliance with environmental regulations and reducing impacts to aquatic species.</li> </ul>
			<ul style="list-style-type: none"> <li>Establish and maintain buffer zones around waterways, and implement fish rescue and relocation efforts, to protect aquatic habitats from construction-related disturbances.</li> </ul>

#### 13.1.6.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.6.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.7 CULTURAL HERITAGE MANAGEMENT PLAN

#### 13.1.7.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.7.2 APPLICABLE STANDARDS

The IFC Performance Standard 8 – Cultural Heritage, consistently with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. The objectives of this PS are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation; and

- To promote the equitable sharing of benefits from the use of cultural heritage.

International conventions that Guyana has signed up to with applicable Cultural Heritage standards also include the Protection of the World Natural and Cultural Heritage, 1972, and the UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expression, 2005.

#### 13.1.7.3 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to cultural heritage are provided in Table 13.17 and Table 13.18 respectively. These measures will be included in the Cultural Heritage Management Plan.

TABLE 13.17 MITIGATION AND MANAGEMENT CONTROLS FOR CULTURAL HERITAGE (CONSTRUCTION)

Means of verification	Receptor	Activity / Impact	Control Description
Cultural Heritage Management Plan	Cultural Heritage	Impacts to heritage from construction activities	<ul style="list-style-type: none"> <li>Pre-commencement archaeological walkover surveys have been undertaken within the EMPL, targeted at areas of expected ground disturbance to identify receptors. This included processing plant site, WSFs, TSF, and the Mine Pits. No significant assets have been identified during the field surveys.</li> </ul>
Cultural Heritage Management Plan	Cultural Heritage	Impacts to heritage from construction activities	<ul style="list-style-type: none"> <li>To manage the possibility of discovering unknown archaeological material and remains, a Cultural Heritage Management Plan (CHMP) including a Chance Finds Procedure (CFP). This plan will also set out the procedures for subsequent phases.</li> </ul>

TABLE 13.18 MITIGATION AND MANAGEMENT CONTROLS FOR CULTURAL HERITAGE (OPERATION)

Means of verification	Receptor	Activity / Impact	Control Description
Cultural Heritage Management Plan	Cultural Heritage	Impacts to heritage from construction activities	<ul style="list-style-type: none"> <li>A CHMP will outline the approach to any Cultural Heritage receptor identified during the operation phase.</li> </ul>



#### 13.1.7.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.7.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.8 SOCIO-ECONOMIC MANAGEMENT PLAN

#### 13.1.8.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.8.2 APPLICABLE STANDARDS

##### **National Environmental Action Plan (NEAP)**

The NEAP considers the issues of environmental management, economic development, social justice, and public health to be inextricably linked. It identifies deforestation, pollution, and unregulated gold mining as growing environmental concerns and identifies private-sector investment as one of the primary opportunities to generate the necessary capacity within Guyana to (1) provide an appropriate level of public services to its citizens; (2) reduce and/or eliminate the avoidable environmental degradation from resource development that occurs in a

regulatory vacuum; and (3) reduce unsustainable uses of natural resources due to the socioeconomic pressures of widespread poverty.

### **Low Carbon Development Strategy (Lcds)**

In June 2009, the Government of Guyana announced the Low Carbon Development Strategy (LCDS). Initially, the LCDS focused on protecting and maintaining forests to reduce global carbon emissions and, at the same time, attract payments from participating developed countries for the climate services that Guyana's forests provide. In 2013, the LCDS was updated to focus on two main goals: (1) transforming the national economy to deliver greater economic and social development by following a low-carbon development path while simultaneously combating climate change; and (2) providing a model for how climate change can be addressed through low-carbon development in developing countries (Office of the President 2016). The LCDS identifies Reducing Deforestation and Forest Degradation Plus as the primary mechanism for achieving the goals of the strategy.

#### **13.1.8.3 MANAGEMENT AND MITIGATION MEASURES**

The mitigation measures for construction and operation related to social are provided in Table 13.19 and Table 13.20 respectively. These measures will be included in the plans shown in the tables.

TABLE 13.19 MITIGATION AND MANAGEMENT CONTROLS FOR SOCIAL (CONSTRUCTION)

Means of verification	Receptor	Activity / Impact	Control Description
Recruitment Records	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Develop Local Development Plan outlining a plan for local hiring and procurement with Key Performance Indicators (KPIs) for all Project phases that include focus on workforce diversity and plan for hiring Guyanese nationals and Region 8 residents, including support to obtain formal identification documents required for all paid positions.</li> </ul>
			<ul style="list-style-type: none"> <li>Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding employment and business activities.</li> </ul>
			<ul style="list-style-type: none"> <li>Develop local hiring and procurement plan with KPIs for all Project phases that include focus on workforce diversity</li> </ul>
			<ul style="list-style-type: none"> <li>Partnering with select local institutions to support workforce development programs targeted to in-demand skillsets</li> </ul>
			<ul style="list-style-type: none"> <li>Monitor percentage of workforce made up of Guyanese nationals and Region 8 workforce on quarterly basis throughout all Project phases</li> </ul>
			<ul style="list-style-type: none"> <li>Monitor percentage of Project goods and services procured locally on a quarterly basis throughout all Project phases</li> </ul>
Stakeholder Engagement Plan	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Develop and update a Stakeholder Engagement Plan to structure engagement with stakeholders in the Social AoI, including land use and land ownership/management topics.</li> </ul>
			<ul style="list-style-type: none"> <li>Continue inclusion of vulnerable and Indigenous (Amerindian) peoples in the Stakeholder Engagement Plan (SEP). Update the SEP as needed throughout the Project lifecycle to adapt to the needs of those in Amerindian communities in the Social AoI.</li> </ul>
			<ul style="list-style-type: none"> <li>Proactively messaging and communicating about Project-related employment opportunities throughout all Project phases, beginning with pre-production (e.g., job fairs)</li> </ul>
Supply Chain audit	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Procure goods and services locally (within the AoI) when available and feasible throughout all Project phases</li> </ul>
Community Grievance Mechanism	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Develop a Community Grievance Mechanism that is available and accessible to stakeholders in the Amerindian communities in the Social AoI. Monitor grievances registered by those in the Amerindian communities by theme and topic; take actions to adapt the Project, as practicable, to the needs of Amerindian peoples.</li> </ul>

Means of verification	Receptor	Activity / Impact	Control Description
	Air Quality	General AQ measures	<ul style="list-style-type: none"> <li>Record all nuisance complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken.</li> </ul>
	Air Quality	General AQ measures	<ul style="list-style-type: none"> <li>Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the logbook</li> </ul>
Community Health and Safety Management Plan	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Development of a Community Health and Safety Management Plan.</li> </ul>
			<ul style="list-style-type: none"> <li>The influx of workers to the region will be directly linked to Eagle Mountain Gold mine and will be treated onsite, but in case of an emergency will be transported to Georgetown where they are treated.</li> </ul>
			<ul style="list-style-type: none"> <li>Vendors and Contractors indirectly linked to the project and who have moved to the region will most likely be treated at Mahdia Hospital. The company will target skills development for vendors and contractors from Region 8, and therefore permanent influx from outside the region is expected to be modest.</li> </ul>
			<ul style="list-style-type: none"> <li>Develop a Project Grievance Mechanism that is available and accessible to stakeholders in the Social AoI. Monitor any grievances registered regarding community health, safety, and security.</li> </ul>
Worker Code of Conduct	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Require Project workers to adhere to a Worker Code of Conduct, which would consider workforce off-duty behaviour to mitigate impacts to community safety and security.</li> </ul>
Local Development Plan	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Develop capacity program support for hiring Guyanese nationals and Region 8 residents, including support to obtain formal identification documents required for all paid positions</li> </ul>
		Vulnerable/Indigenous Peoples	<ul style="list-style-type: none"> <li>Develop a Local Employment Plan, whereby those in Amerindian communities in the Social AoI are prioritised for Project employment, as applicable.</li> </ul>
Traffic Management Plan	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Development of a Traffic Management Plan to anticipate Project impacts to road networks in the Social AoI and implement safety measures for Project vehicles and river ferries.</li> </ul>
		Infrastructure and Transport	<ul style="list-style-type: none"> <li>The Project is proposing the construction of an overpass for public vehicles along the main access road to reduce the impacts from traffic congestion on the access road as well as for public health and safety. The selection of the public road to pass 'over' the haulage and pipeline road was made to ensure that the public road is not impacted at this crossing by heavy rains known to occur seasonally in the area and public travel will be on the higher and well-draining road, rather than through the underpass, where accumulation or buildup could occur. Rainfall will be diverted due to the slight increase in elevation at the crossing,</li> </ul>

Means of verification	Receptor	Activity / Impact	Control Description
			for the public road. Approaches from North or South and on each side of the road will include diversions and water control to reduce potential washout of either travel way.
			<ul style="list-style-type: none"> <li>There will be guard rails to prevent any public vehicles from damage or rollover if there should be any occurrence or deviation off the roadway.</li> </ul>
			<ul style="list-style-type: none"> <li>All design of the public road realignment and the underpass/overpass will be made with consultation with the proper Guyana national and regional road/highway agencies.</li> </ul>
			<ul style="list-style-type: none"> <li>Ensure warning for cars is provided with early notification of any planned disruptions to the EMPL Access Road and any planned road closures.</li> </ul>
			<ul style="list-style-type: none"> <li>Develop a comprehensive Traffic Management Plan that includes mitigation measures for both land and river-based transportation, including coordinating transport of workforce/materials/supplies to minimise disruption in local communities.</li> </ul>
			<ul style="list-style-type: none"> <li>Determine best routes for transporting the workforce/materials/equipment/supplies that would minimise disruption to local communities.</li> </ul>
			<ul style="list-style-type: none"> <li>Communicate with appropriate local authorities about the Project's anticipated use of roads and waterways.</li> </ul>
			<ul style="list-style-type: none"> <li>Implementation of speed limits (50 km/h) for trucks while travelling to and from construction sites (village roads in poor condition: 30 km/h)</li> </ul>
			<ul style="list-style-type: none"> <li>Minimise the use of old Potaro-Konawaruk road when feasible to avoid disturbing residential receptors</li> </ul>
Site Audit Reports	Socio-Economic	Infrastructure and Transport	<ul style="list-style-type: none"> <li>Commitment to maintenance and upgrades along access roads used within the Direct AoT</li> </ul>
			<ul style="list-style-type: none"> <li>Utilising the Project's own infrastructure and utilities (accommodation, power, water supply).</li> </ul>

TABLE 13.20 MITIGATION AND MANAGEMENT CONTROLS FOR SOCIAL (OPERATION)

Means of verification	Receptor	Activity / Impact	Control Description
Recruitment Records	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Develop local hiring and procurement plan with KPIs for all Project phases that include focus on workforce diversity</li> </ul>
			<ul style="list-style-type: none"> <li>Monitor percentage of workforce made up of Guyanese nationals and Region 8 workforce on quarterly basis throughout all Project phases</li> </ul>
			<ul style="list-style-type: none"> <li>Monitor percentage of Project goods and services procured locally on a quarterly basis throughout all Project phases</li> </ul>
			<ul style="list-style-type: none"> <li>Employing Guyanese citizens with appropriate skills and qualifications where possible</li> </ul>
Supply Chain audit	Socio-Economic	Employment and Business Activity	<ul style="list-style-type: none"> <li>Procure goods and services locally (within Region 8) when available and feasible throughout all Project phases, provided that the skills, quality, and pricing is competitive.</li> </ul>
Community Grievance Mechanism	Socio-Economic	Vulnerable/Indigenous Peoples	<ul style="list-style-type: none"> <li>Implement a Community Grievance Mechanism that is available and accessible to stakeholders in the Amerindian communities in the Social AoI. Monitor grievances registered by those in the Amerindian communities by theme and topic; take actions to adapt the Project, as practicable, to the needs of Amerindian peoples.</li> </ul>
Stakeholder Engagement Plan	Socio-Economic	Impacts to Land Use	<ul style="list-style-type: none"> <li>Develop and update a Stakeholder Engagement Plan to structure engagement with stakeholders in the Social AoI, including land use and land ownership/management topics.</li> </ul>
Local Development Plan	Socio-Economic	Vulnerable/Indigenous Peoples	<ul style="list-style-type: none"> <li>Implement a Local Employment Plan, whereby those in Amerindian communities in the Social AoI are prioritised for Project employment, as applicable.</li> </ul>
		Employment and Business Activity	<ul style="list-style-type: none"> <li>Implement capacity program support for hiring Guyanese nationals and Region 8 residents, including support to obtain formal identification documents required for all paid positions</li> </ul>
Community Health and Safety Management Plan	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Development of a Community Health and Safety Management Plan.</li> </ul>
Worker Code of Conduct	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Require Project workers to adhere to a Worker Code of Conduct, which would consider workforce off-duty behaviour to mitigate impacts to community safety and security.</li> </ul>



Means of verification	Receptor	Activity / Impact	Control Description
Stakeholder Engagement Plan	Socio-Economic	Vulnerable/Indigenous Peoples	<ul style="list-style-type: none"> <li>Continue inclusion of vulnerable and Indigenous (Amerindian) peoples in the Stakeholder Engagement Plan (SEP). Update the SEP as needed throughout the Project lifecycle to adapt to the needs of those in Amerindian communities in the Social AoI.</li> </ul>
Traffic Management Plan	Socio-Economic	Community Health, Safety, and Wellbeing	<ul style="list-style-type: none"> <li>Implement a Traffic Management Plan to anticipate Project impacts to road networks in the Social AoI and implement safety measures for Project vehicles and river ferries.</li> </ul>
		Infrastructure and Transport	<ul style="list-style-type: none"> <li>Include the Project's commitment to maintenance and upgrades along access roads used within the Direct AoI in the Traffic Management Plan</li> </ul>
			<ul style="list-style-type: none"> <li>Determine best routes for transporting the workforce/materials/equipment/supplies that would minimise disruption to local communities.</li> </ul>
			<ul style="list-style-type: none"> <li>Communicate with appropriate local authorities about the Project's anticipated use of roads and waterways.</li> </ul>
Site Audit Reports	Socio-Economic	Infrastructure and Transport	<ul style="list-style-type: none"> <li>Commitment to maintenance and upgrades along access roads used within the Direct AoI</li> </ul>
			<ul style="list-style-type: none"> <li>Utilising the Project's own infrastructure and utilities (accommodation, power, water supply).</li> </ul>

#### 13.1.8.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.8.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.9 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PLAN (OHSMP)

#### 13.1.9.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework

#### 13.1.9.2 APPLICABLE STANDARDS

The Occupational Health and Safety Act 1997 contains provisions applicable to regulating health and safety in mines. In 2002, a draft Mining Occupational Safety and Health Regulation was proposed by the Ministry of Labour, Human Services and Social Security with the assistance of the International Labor Organisation (ILO). The mine will be required to operate under the Act.

The Act governs the regulation of industrial establishments as it relates to the safety and health of workers. The Act is the primary legislation governing workplace health and safety,

and it applies to different types of workplaces. It details the rights and duties of all parties in the workplace, and it also details procedures for addressing health and safety non-conformities at the workplace. While the Act governs and guides self-employed individuals, employers, and employees, the Occupational Safety and Health Department is mandated to conduct regular workplace inspections to ensure compliance with the Act.

#### 13.1.9.3 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to occupational health and safety are provided in Table 13.21 and Table 13.22 respectively.

TABLE 13.21 MITIGATION AND MANAGEMENT CONTROLS FOR OCCUPATIONAL HEALTH AND SAFETY (CONSTRUCTION)

Means of Verification	Receptor	Activity / Impact	Control Description
Review and approval of Policy by Contractor's Management Team.	Employee Health and Safety	Impacts to OHS from facilities construction	<ul style="list-style-type: none"> <li>Adopt Labour and Working Conditions Policy, including OHS: Review all relevant OHS and associated policies prior to the commencement of construction work and ensure all subcontractors comply with the policies in place. The policies must provide consistent directions for all managers and personnel on the management of OHS risks.</li> </ul>
Review and approval of Policy by the Contractor's Management Team.			<ul style="list-style-type: none"> <li>Prepare and adopt OHS Procedures: Ensure all OHS procedures listed in section 11.8.4 of this document are implemented by relevant employees to manage the OHS risks. The set of procedures must be updated and adapted regularly if necessary, depending on the Project situation and ongoing risks identified.</li> <li>Should the procedures be developed by an external party this will need to be reviewed and approved by the Contractor's EHSS Manager</li> </ul>
Standard set of responsibilities (job descriptions) reviewed and approved by the Contractors' Management Team.			<ul style="list-style-type: none"> <li>Avoidance/minimisation - OHS responsibilities assigned throughout the Contractors and subcontractors: Assign responsibilities throughout the Project organisational structure. All employees of the Contractors and all employees of subcontractors will have responsibilities for OHS included in their job descriptions. Specific responsibilities on OHS will also be designated to EHSS Supervisors at the sites, and at a higher-level to Construction Managers, the EHSS Manager and HR Manager for the Project. Overall responsibility for OHS performance is with the Contractor's Management Team.</li> </ul>
Monitor that procurement includes requirements in subcontracts			<ul style="list-style-type: none"> <li>Subcontractor and Supplier Contracts: Include provisions in contracts with subcontractors on compliance with OHS policy, procedures, reporting and other requirements.</li> <li>Include conditions also for some suppliers related to OHS (e.g. driver safety, vehicle specifications for delivery).</li> </ul>
Review and approval of training and awareness program by Contractor's Management Team  Training Records			<ul style="list-style-type: none"> <li>OHS Training and Awareness Program: Develop and implement an OHS Training and Awareness Program for all employees. To include induction training on OHS for all employees, more detailed technical training for specific roles (e.g. machinery use, driver safety, etc.).</li> <li>Refresher training will also be provided at regular intervals and when procedures and action plans are amended, and awareness activities carried out and information provided.</li> <li>Training will also be required for subcontractor employees.</li> <li>Develop standard OHS procedure for orientation of site visitors.</li> </ul>

Means of Verification	Receptor	Activity / Impact	Control Description
Inclusion of summary of training monthly ES reports from site EHSS Supervisors			
Inclusion of monitoring results in monthly ES reports from site EHSS Supervisors.			<ul style="list-style-type: none"> <li>Ongoing OHS monitoring and risk assessment: Carry out daily OHS monitoring at all sites, as well as regular OHS audits, identifying any poor practices and planning and implementing corrective actions. This will be part of ongoing risk identification and assessment.</li> <li>Consult with EHSS Manager on significant risks.</li> </ul>
Inclusion of summary of OHS incidents, near misses and corrective actions taken, plus KPIs, in ES reports from site EHSS Supervisors.			<ul style="list-style-type: none"> <li>OHS reporting: Ensure all employees are reporting OHS incidents and near misses. Identify corrective actions needed.</li> </ul>
Immediate reporting to EHSS Manager of any incidents resulting in significant injuries.			
Records of PPE provided to workers.			<ul style="list-style-type: none"> <li>Avoidance/ minimisation - Availability and use of OHS Equipment: Ensure availability and use of Personal Protective Equipment (PPE), first aid kits, and other OHS equipment as needed at sites. Training in the use of PPE will be provided to all relevant employees as well as first aid training for selected employees.</li> <li>Daily monitoring of use of PPE.</li> <li>Provide health checks to employees at regular intervals.</li> </ul>
Monthly reporting by EHSS Manager.			<ul style="list-style-type: none"> <li>Sharing good OHS Practices: Identify good practices, based on daily monitoring and risk assessment. Communicate with other sites to share good practices and required changes procedures and other corrective actions.</li> </ul>

TABLE 13.22 MITIGATION AND MANAGEMENT CONTROLS FOR OCCUPATIONAL HEALTH AND SAFETY (OPERATION)

Means of Verification	Receptor	Activity/Impact	Control Description
Review and approval of Policy by Contractor's Management Team.	Employee Health and Safety	Impacts to OHS from operations	<ul style="list-style-type: none"> <li>Adopt Labor and Working Conditions Policy, including OHS: Review all relevant OHS and associated policies prior to the commencement of construction work and ensure all subcontractors comply with the policies in place. The policies must provide consistent directions for all managers and personnel on the management of OHS risks.</li> </ul>
Review and approval of Policy by the Contractor's Management Team.			<ul style="list-style-type: none"> <li>Prepare and adopt OHS Procedures: Ensure all OHS procedures listed in section 11.8.4 of this document are implemented by relevant employees to manage the OHS risks. The set of procedures must be updated and adapted regularly if necessary, depending on the Project situation and ongoing risks identified.</li> <li>Should the procedures be developed by an external party this will need to be reviewed and approved by the Contractor's EHSS Manager</li> </ul>
Standard set of responsibilities (job descriptions) reviewed and approved by the Contractors' Management Team.			<ul style="list-style-type: none"> <li>Avoidance/minimisation - OHS responsibilities assigned throughout the Contractors and subcontractors: Assign responsibilities throughout the Project organisational structure. All employees of the Contractors and all employees of subcontractors will have responsibilities for OHS included in their job descriptions. Specific responsibilities on OHS will also be designated to EHSS Supervisors at the sites, and at a higher-level to Construction Managers, the EHSS Manager and HR Manager for the Project. Overall responsibility for OHS performance is with the Contractor's Management Team.</li> </ul>
Monitor that procurement includes requirements in subcontracts			<ul style="list-style-type: none"> <li>Subcontractor and Supplier Contracts: Include provisions in contracts with subcontractors on compliance with OHS policy, procedures, reporting and other requirements.</li> <li>Include conditions also for some suppliers related to OHS (e.g. driver safety, vehicle specifications for delivery).</li> </ul>
Review and approval of training and awareness program by Contractor's Management Team  Training Records  Inclusion of summary of training monthly ES reports from site EHSS Supervisors			<ul style="list-style-type: none"> <li>OHS Training and Awareness Program: Develop and implement an OHS Training and Awareness Program for all employees. To include induction training on OHS for all employees, more detailed technical training for specific roles (e.g. machinery use, driver safety, etc.).</li> <li>Refresher training will also be provided at regular intervals and when procedures and action plans are amended, and awareness activities carried out and information provided.</li> <li>Training will also be required for subcontractor employees.</li> <li>Develop standard OHS procedure for orientation of site visitors.</li> </ul>



Means of Verification	Receptor	Activity/Impact	Control Description
Inclusion of monitoring results in monthly ES reports from site EHSS Supervisors.			<ul style="list-style-type: none"> <li>Ongoing OHS monitoring and risk assessment: Carry out daily OHS monitoring at all sites, as well as regular OHS audits, identifying any poor practices and planning and implementing corrective actions. This will be part of ongoing risk identification and assessment.</li> <li>Consult with EHSS Manager on significant risks.</li> </ul>
Inclusion of summary of OHS incidents, near misses and corrective actions taken, plus KPIs, in ES reports from site EHSS Supervisors.			<ul style="list-style-type: none"> <li>OHS reporting: Ensure all employees are reporting OHS incidents and near misses. Identify corrective actions needed.</li> </ul>
Immediate reporting to EHSS Manager of any incidents resulting in significant injuries.			
Records of PPE provided to workers.			<ul style="list-style-type: none"> <li>Avoidance/ minimisation - Availability and use of OHS Equipment: Ensure availability and use of Personal Protective Equipment (PPE), first aid kits, and other OHS equipment as needed at sites. Training in the use of PPE will be provided to all relevant employees as well as first aid training for selected employees.</li> <li>Daily monitoring of use of PPE.</li> <li>Provide health checks to employees at regular intervals.</li> </ul>
Monthly reporting by EHSS Manager.			<ul style="list-style-type: none"> <li>Sharing good OHS Practices: Identify good practices, based on daily monitoring and risk assessment. Communicate with other sites to share good practices and required changes procedures and other corrective actions.</li> </ul>
Regular checks of equipment		Impacts to OHS from nuclear gauges	<ul style="list-style-type: none"> <li>There is no potential for impacts to environment or people from the use of these gauges. In terms of occupational health and safety, the manual for the gauges will be followed by the contractors including measures to limit exposure. It is noted that in many counties, the limit of exposure is 5,000 millirem (mrem) per year. An employee working full time with the gauges is exposed to less than 200 mrem per year. By comparison, an average person living in the US is exposed to around 360 mrem of radiation from natural background sources. As such, there is no significant impact to workers from the use of these gauges.</li> </ul>

#### 13.1.9.4 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

#### 13.1.9.5 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

### 13.1.10 UNPLANNED EVENTS MANAGEMENT PLAN

#### 13.1.10.1 INTRODUCTION

The purpose of this management plan is to:

- Define roles and responsibilities for implementation of the management plan;
- Outline the Project and finance standards applicable to this Management plan;
- Define corporate and Project commitments, standard operational procedures and guidance relevant to this management plan;
- Define monitoring and reporting procedures, including Key Performance Indicators;
- Define training requirements; and
- Articulate next steps in the development and implementation of this management framework and the full management plan.

The objectives, commitments, and requirements in this plan will be further developed in a detailed management plan with supporting standard operating procedures (SOPs). Once approved, the air emissions management plan will supersede and replace this framework.

#### 13.1.10.2 MANAGEMENT AND MITIGATION MEASURES

The mitigation measures for construction and operation related to social are provided in Table 13.23. These measures will be included in the Emergency Response Plan.

TABLE 13.23 MITIGATION AND MANAGEMENT CONTROLS FOR UNPLANNED EVENTS (CONSTRUCTION AND OPERATION)

Means of verification	Receptor	Activity / Impact	Control Description
Emergency Response Plan		Tidal Flooding and Extreme Rainfall	An Emergency Response Plan (ERP) will be prepared which: <ul style="list-style-type: none"> <li>Clearly identifies possible emergency scenarios;</li> <li>Sets out actions to be undertaken in the event of an emergency;</li> <li>Defines resources that will be made available to respond to an emergency;</li> <li>Include management plans and procedures (e.g. a Contamination Management and Response Plan (CMRP) and a Health, Safety and Security Plan (HSSP))</li> </ul>
			<ul style="list-style-type: none"> <li>Routine on- and off-site inspections, to monitor infrastructure conditions (e.g. floodwalls and levees) and compliance with permit requirements. Inspection results would be recorded and made available to local authorities upon request.</li> </ul>
			<ul style="list-style-type: none"> <li>Ensure facilities near riverbanks are protected against frequent flooding events predicted to increase with climate change.</li> </ul>
			<ul style="list-style-type: none"> <li>Erect adequate barriers around ancillary facilities or at the Site Boundary at sufficient and effective heights.</li> </ul>
Emergency Response Plan		Slope Instability and Landslides	<ul style="list-style-type: none"> <li>Routine on- and off-site inspections, to monitor infrastructure conditions (e.g. floodwalls and levees) and compliance with permit requirements. Inspection results would be recorded and made available to local authorities upon request.</li> </ul>
			<ul style="list-style-type: none"> <li>Revegetation of land cleared for construction to increase soil stability.</li> </ul>
Emergency Response Plan		Accidental Pollution – Lakes and Spills	<ul style="list-style-type: none"> <li>All hazardous material and waste storage areas, as well as fuel storage and dispensing areas, should be constructed and equipped with secondary containment systems with bund capacity in excess of 110% of the liquid volume stored there. Floors should be sealed and all areas roofed to prevent the bunds filling with rain.</li> </ul>
			<ul style="list-style-type: none"> <li>Provision of secondary containment for components (tanks) of the hazardous material storage system, where possible.</li> </ul>
			<ul style="list-style-type: none"> <li>Develop and maintain comprehensive emergency response plans that include spill response protocols.</li> </ul>
			<ul style="list-style-type: none"> <li>Conduct regular training programs for employees to ensure they are familiar with spill response procedures.</li> </ul>
			<ul style="list-style-type: none"> <li>Emergency response kits to control any fuel and/or oil spills should be readily available throughout the Project area.</li> </ul>

Means of verification	Receptor	Activity / Impact	Control Description
			<ul style="list-style-type: none"> <li>Ensure equipment is readily available on site to clean any spillages, and clean up spillages as soon as reasonably practicable after the event.</li> </ul>
			<ul style="list-style-type: none"> <li>Clean up and dispose of the contaminated materials in accordance with local regulations and guidelines.</li> </ul>
			<ul style="list-style-type: none"> <li>Immediately notify relevant authorities, emergency responders, and anyone else who may be affected by the spill.</li> </ul>
			<ul style="list-style-type: none"> <li>Cyanide use should be consistent with the principles and standards of practice of the International Cyanide Management Code.</li> </ul>
Emergency Response Plan	Socio-Economic	Traffic Accidents	<ul style="list-style-type: none"> <li>Continue to survey the current use and traffic along the access road.</li> </ul>
			<ul style="list-style-type: none"> <li>Prepare a Traffic Management Plan.</li> </ul>
			<ul style="list-style-type: none"> <li>Reinforce the existing access road to ensure it is suitable to support both haulage vehicles and is still accessible for community use.</li> </ul>
Emergency Response Plan	Socio-Economic	Fire and Explosions	<ul style="list-style-type: none"> <li>An emergency response plan will be developed for the Project and implemented during the construction phase.</li> </ul>
			<ul style="list-style-type: none"> <li>Storage of incompatible materials (acids, bases, flammables, oxidisers, reactive chemicals) in separate areas, and with containment facilities separating material storage areas.</li> </ul>
			<ul style="list-style-type: none"> <li>Storage of hazardous materials in an area of the facility separated from the main production works.</li> </ul>
			<ul style="list-style-type: none"> <li>Avoid burning of waste materials by open fires - only use approved incineration methods.</li> </ul>
			<ul style="list-style-type: none"> <li>An appropriate firefighting system will be provided at the construction site. The fire extinguishers are placed at strategic locations such as site offices, laydown areas, etc.</li> </ul>

### 13.1.10.3 TRAINING

All direct and contractor employees will undergo induction training that will include Company and Project policies and procedures. Training will include:

- All employees of Stronghold Guyana and contractors working at the Eagle Mountain Gold Project sites will be provided with general induction, site specific induction and a broad range of health, safety and environmental awareness training.
- Appropriate personal protective equipment (PPE) will be made available to personnel if required. All relevant personnel will be trained in the use and maintenance of protective equipment.
- Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance, construction or materials handling activities.
- General aspects of environmental management will be included in induction training to be provided to all employees.
- Any monitoring contractor shall hold appropriate qualifications and show suitable experience for undertaking the specific service.

### 13.1.10.4 SCHEDULE

The management plans will be implemented during the construction, operation, and closure phases.

## 13.2 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Monitoring will need to be conducted during Construction and Operational Phases in order to assess the mitigation measures and residual impacts on the environment and people. The monitoring plan for the Project is provided in Table 13.24. The locations for monitoring are provided in Figure 13.2.

TABLE 13.24 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Topic	Potential Impact	Locations	Parameters	Frequency	Responsibility
Air Quality	Ambient air quality	<ul style="list-style-type: none"> <li>Mine Site: 265,346; 575,663</li> </ul>	PM <sub>10</sub> / PM <sub>2.5</sub>	Quarterly during construction Monthly monitoring for 24-hr duration of all phases at 2 locations. Continuously monitoring for 4 locations. Monthly monitoring for dust fallout for 30 days duration;	Stronghold Guyana EHS Manager
Noise and Vibration	Ambient noise	Monitoring during construction to be undertaken at two locations around construction activities	Monitoring to be undertaken for 24-hour durations (monitoring LA <sub>eq</sub> , L <sub>10</sub> , L <sub>max</sub> , L <sub>90</sub> , and L <sub>min</sub> . statistical parameters). For blasting events, air blast overpressure, and ground-borne vibration to be measured.	Quarterly during construction Monthly monitoring for 24-hr duration. Per blasting event.	Stronghold Guyana EHS Manager
Hydrology	Impacts to water flow	Conduct a surface water hydrology monitoring program that entails:  Continuous (10-minute interval) monitoring of surface water using level loggers installed in standpipes. Surface water level data are downloaded on a quarterly basis and controlled by taking discharge and water level surveys of the river, with emphasis on high flow periods.		The results from the quarterly monitoring are analysed and interpreted. Time series trends are identified and sources of impacts on the groundwater levels and qualities are identified. Recommendations on impact mitigation measures are made.  The monitoring program should be dynamic, with changes made (additional/removal of stations) as required to adapt to the evolving mining operations.	Stronghold Guyana EHS Manager

Topic	Potential Impact	Locations	Parameters	Frequency	Responsibility
Surface Water	Surface water quality	<ul style="list-style-type: none"> <li>Monitor short-term surface water discharge and quality around active construction areas to detect unexpected changes.</li> </ul>	Surface water flow volumes	Surface water flow volumes – continuously at all phases. Quarterly and continuous monitoring	Stronghold Guyana EHS Manager
		<ul style="list-style-type: none"> <li>Targeted surface water monitoring locations maintained around Mahdia River and Minnehaha Creek and local streams.</li> </ul>	Surface water quality. General parameters including pH, EC, TDS, and alkalinity. Major cations and anions including Ca, Mg, Na, K, SO <sub>4</sub> , Cl, NO <sub>3</sub> , PO <sub>4</sub> , and F.	Surface water quality – quarterly for first 2 years during construction, year 2 by semester all the way up to 5 years post-closure).	Stronghold Guyana EHS Manager
Groundwater	Groundwater quality / quantity	<ul style="list-style-type: none"> <li>Monitor at all existing groundwater monitoring boreholes.</li> <li>Short-term groundwater level and quality monitoring around active construction areas to detect unexpected changes.</li> </ul>	Groundwater levels, pit discharge rates, mine water use, stream baseflow (to correlate with groundwater drawdown data).	Monthly for first 12 months during construction.	Stronghold Guyana EHS Manager
		<ul style="list-style-type: none"> <li>Recommendation for additional monitoring areas to be located downstream of the TSF, waste storage facilities, and additional plant areas such as stockpiles and surface facilities.</li> <li>Targeted groundwater monitoring locations maintained around Mahdia River and Minnehaha Creek and local streams.</li> </ul>	Groundwater quality. General parameters including pH, EC, TDS, and alkalinity. Major cations and anions including Ca, Mg, Na, K, SO <sub>4</sub> , Cl, NO <sub>3</sub> , PO <sub>4</sub> , and metals.	Quarterly from year 2 up to 5 years post-closure. Quarterly for Lab analysis from construction phase to post closure.	Stronghold Guyana EHS Manager
Soil	Soil quality	N/A – It is not recommended regular soil monitoring is undertaken except in response to spills. If spillages occur it would be recommended that	N/A	During spill events	Stronghold Guyana EHS Manager

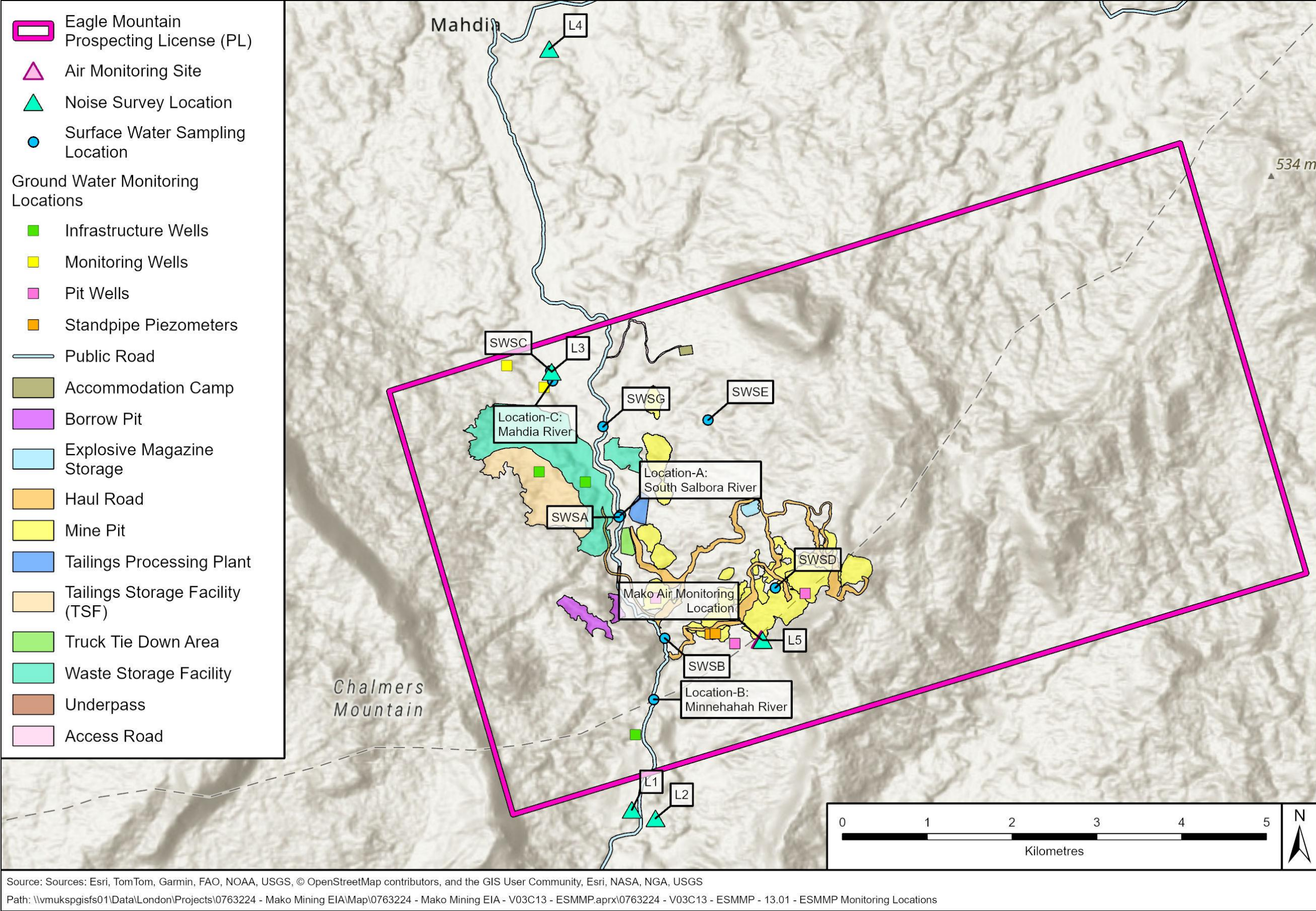


Topic	Potential Impact	Locations	Parameters	Frequency	Responsibility
		monitoring be undertaken in closure, or along the way with progressive closure where there would be site investigation and remediation to the extent required.			
Biodiversity and ESS	Impacts to flora and fauna	Within the Biodiversity Baseline AoI, directly and indirectly affected protected areas. Exact monitoring locations and detail to be confirmed in the Biodiversity Management Plan (BMP).	Parameters will be specific to the high value habitats (natural and critical habitat), high value flora and fauna, priority ecosystem services, protected areas, and offsetting activities. Monitoring parameters will be confirmed in the BAP.	Frequency of surveys will be biodiversity feature-specific and will be required throughout construction, operation and decommissioning periods. The frequency of monitoring surveys will be confirmed in the BAP.	Stronghold Guyana and relevant organisations.
Social	Stakeholder Engagement	Villages within the AoI	Number or frequency of engagement	Every 3 months.	Stronghold Guyana EHS Manager
	Grievance Mechanism	Neighbouring communities around the Project activity areas	Number and resolution of grievances	Weekly review of grievances	Stronghold Guyana EHS Manager
	Impact to traffic	Construction area and roads used for transport of workers and construction material	Permit and code of conduct	Every 3 months. During large mobilisation of vehicles or equipment.	Stronghold Guyana EHS Manager
	Impacts to health and safety of the community	Project activity areas	Worker training, grievances, accident log, implementation of Community H&S monitoring and surveillance program, implementation of worker code of conduct, implementation of Local Content and Influx Management Plan	Bimonthly review of training log; Monitoring and review of accidents due to construction (daily monitoring and monthly review). Community health and safety monitoring and surveillance program.	Stronghold Guyana EHS Manager

Topic	Potential Impact	Locations	Parameters	Frequency	Responsibility
				Daily monitoring of construction area, worker camp and surrounding; Regular unplanned audit on worker code conduct; Monthly visual inspection of first aid facilities and records. Weekly review of grievance log.	



FIGURE 13.2 MONITORING LOCATIONS





## 13.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

### 13.3.1 INTRODUCTION

#### 13.3.1.1 SCOPE OF THE ESMS

The Project will establish the Environmental and Social Management System (ESMS) to systematically address and manage the environmental and social aspects and impacts of its activities during the Project lifecycle.

The ESMS defines the environmental and social objectives and principles that guide the Project to achieve sound performance by minimising any identified key environmental and social (E&S) risk impacts, as well as tracking the execution of the plan during the Project construction and operation.

In addition, the ESMS is a “roadmap”, which is complementary to and interrelated with the other components of the ESMS, and indicate who, within the Project, will be responsible for its execution.

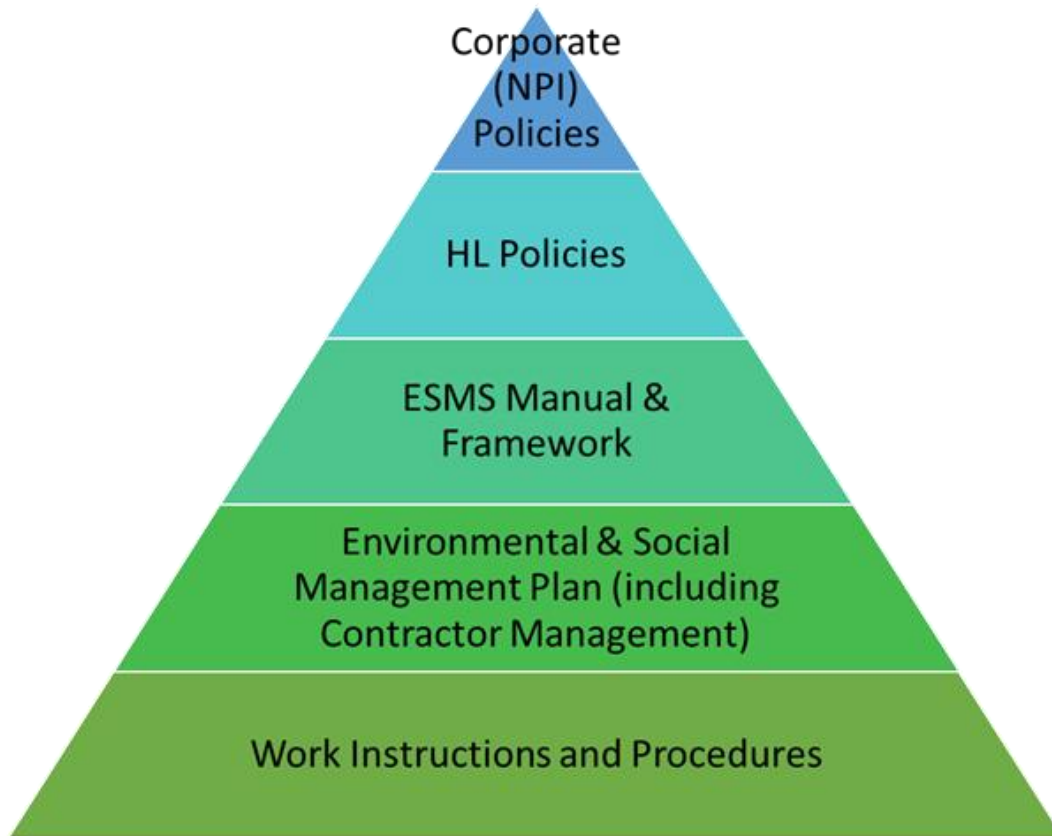
This ESMS is applicable to all the subprojects under Eagle Mountain Gold Mine throughout the construction and operation phases of the Project and designed to integrate environmental and social considerations into the Project's development, construction, operation, decision-making processes and overall management approach.

The scope of the ESMS includes:

- E&S Policy: All E&S related policies to defining the E&S objectives and principles that guide the Project, including roles and responsibilities for its execution during the Project life cycle;
- Legal and Regulatory Requirements: Relevant environmental and social laws, regulations, permits, and standards that the Project must comply with;
- Identification of Risks and Impacts: Identifying and evaluating potential environmental and social risks and impacts associated with the Project's activities, products, and services;
- Management Plans: Develop corresponding E&S management plans and actions for identified risks to reduce and control the impacts for environmental and social aspects;
- Organisational Capacity and Competency: Establishing and maintaining an organisational structure that defines roles, responsibilities, and authority to implement the ESMS;
- Review and Monitoring Mechanism: Periodically measuring and monitoring environmental and social management performance and improve/update the ESMS Framework and related management plans; and
- Stakeholder Engagement: Input and expectations from the stakeholders affected by the Project, such as employees (including both internal and external, i.e., suppliers and contractors), local communities, NGOs, and investors regarding environmental and social performance. The stakeholder engagement is a continuous and iterative process whereby the Project continues to facilitate two-way interaction with the identified stakeholders.

The overall hierarchy of the ESMS is presented in Figure 13.3.

FIGURE 13.3 HIERARCHY OF THE PROJECT ESMS



The ESMS shall be updated based on the review and monitoring results on the implementation of the ESMS and its sub-plans, so the effectiveness of the ESMS Framework can be ensured, and the Project's latest development could be included and considered accordingly throughout the whole Project life cycle. The ESMS Framework shall be updated with the frequency of at least quarterly per year during the first year, and subsequently at least once a year, and when there are any major events or findings.

#### 13.3.1.2 APPLICABILITY OF THE ESMS

The ESMS will apply to various activities and stakeholders involved in the development, construction, operation, and decommissioning phases throughout the Project lifecycle.

- **Construction Phase:** The ESMS will cover construction phase activities such as site excavation, and construction of facilities and associated infrastructure. Environmental aspects to be managed includes, but not limited to, noise and vibration impacts, management of waste materials, and protection of sensitive habitats. Social aspects will involve managing potential disruptions to local communities, ensuring worker health and safety, and engaging with stakeholders throughout the construction process.
- **Operation and Maintenance Phase:** During mine operations, the ESMS Framework will focus on activities related to regular maintenance, monitoring, and ongoing operations. Environmental aspects to be addressed may include noise and visual impacts during maintenance, biodiversity monitoring, waste management, and emergency response planning. Social aspects would involve ongoing community engagement, addressing any social impacts arising from the operation of the Project, and ensuring the well-being of employees working on-site.

- **Closure and Rehabilitation Phase:** During the closure phase, the ESMS would cover the activities related to removal and management of the mine infrastructure and rehabilitation of the area.
- **Stakeholders:** The ESMS encompass various stakeholders, including the Project teams, contractors, suppliers, local communities, regulatory authorities, environmental agencies, NGOs, and relevant government bodies. Effective stakeholder engagement is crucial in addressing concerns, ensuring transparency, and fostering positive relationships throughout the Project lifecycle.
- **Compliance and Regulations:** The ESMS would ensure compliance with applicable environmental regulations and permits, health and safety standards, and social responsibility guidelines. It would include monitoring and reporting on key environmental and social performance indicators, conducting regular audits, and maintaining records to demonstrate compliance.

The requirements of this ESMS Framework are applicable to all Stronghold Guyana employees and the individuals working or present in the Stronghold Guyana construction field.

### 13.3.1.3 OBJECTIVES OF THE ESMS

The objectives of the ESMS are to:

- Establish guidelines and procedures to ensure that environmental and social considerations are integrated into the Project development and decision-making processes to ensure Stronghold Guyana's visions and values are met;
- Ensures that Project adheres to all applicable laws, regulations, and contractual obligations related to environmental and social aspects;
- Establishes a mechanism to monitor and evaluate the environmental and social performance by defining the performance indicators, targets, and reporting procedures to track progress and ensure continuous improvement;
- Provides guidelines for identifying, assessing, and mitigating potential risks and impacts to minimise adverse effects on the environment, communities, and stakeholders; and
- Outlines procedures for training, resource allocation, and performance evaluation to ensure that the necessary skills, competencies, and resources are available to meet the objectives outlined in this ESMS.

This ESMS is applicable to the construction, operational and decommissioning phases of the Project and to all personnel (including contractors and suppliers) employed by the Project in accordance with their tasks and responsibilities. This ESMS will be shared with all suppliers and contractors responsible for engineering, procurement, construction and installation (EPCI) of the Project to ensure consistency and compliance. This action also aims to align their methodological approach with the ESMS Framework and effectively address any environmental and social gaps that may exist within the specific project.

This ESMS, along with the Project's respective environmental and social management plans, shall be subjected to regular review and updates as the Project progresses.

By addressing these objectives, this ESMS helps the Project establish a systematic and proactive approach to environmental and social management, promoting sustainable practices and responsible business conduct.

### 13.3.1.4 STRUCTURE OF THE ESMS FRAMEWORK

The ESMS is designed based on the Plan-Do-Check-Act (PDCA) framework, which promotes continuous improvement. This framework is a fundamental element of successful management systems standards, including the ISO Management System standard.

Additionally, the structure of the ESMS is designed to align with the model outlined in the IFC (International Finance Corporation) guidance on ESMS implementation, specifically described in the IFC ESMS System Implementation Handbook (published in 2015). The IFC guidance provides valuable insights and recommendations for implementing an effective ESMS.

By integrating the PDCA framework and following the IFC guidance model, the ESMS aims to establish a robust and systematic approach to environmental and social management, fostering continual improvement and aligning with recognised international practices.

A simple process flow diagram is shown in Figure 13.4 to illustrate how the elements in this ESMS were established and linked to each other.

FIGURE 13.4 ESMS STRUCTURE



Stronghold Guyana shall adopt the ESMS Structure show in Figure 13.4 to achieve a sound environmental and social performance. This will include:

- **Plan:**
  - Establish the policy defining the environmental and social objectives and principles that guide the Project throughout the Project's lifecycle.
  - Establish and maintain a risk identification process for identifying the environmental and social risks and impact.
- **Do:**
  - Following the identification of risk and impacts, Stronghold Guyana must establish respective management plans in line with the Corporate and Stronghold Guyana



Policies, where each management plan will describe mitigation and performance improvement measures and actions that address the identified risks and impacts.

- Ensure that personnel who have direct responsibility for the Project's environmental and social performance possess the knowledge, skills, and experience to implement the specific measures and actions required under the ESMS. Stronghold Guyana shall ensure adequate resources are available for personnel with these responsibilities to conduct their role effectively.
- **Check:**
  - Following the establishment of management program (Environmental and Social Management Plans), Stronghold Guyana shall establish procedures to monitor and measure the effectiveness of the management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements.
- **Act:**
  - Stronghold Guyana shall also implement continuous improvement methodologies to ensure more efficient and effective resource use as the technologies evolve. This shall be achieved through inspections, audits, and third-party monitoring. Stronghold Guyana shall action any gaps and implement improvement measures identified during this monitoring process.

### 13.3.2 PROJECT ORGANISATION

To ensure smooth implementation and management of E&S policies and issues during the Project construction and operation, Stronghold Guyana will establish a team across various professionals in development, permitting, engineering, operation and maintenance, health, safety and environment (HSE), etc., to participate in environmental and social risks and impacts plan.

The ESMS Lead will be responsible to execute and oversee the E&S related matters of the Project and to be supported by the ESMS Manager. The ESMS Manager will support the ESMS Lead in both internal and external communication, as well as to report and discuss the E&S issues. The ESMS Manager will collaborate with the team leads of each division (Environment, Social, and HSSE) as well as the Contractor Management Team Lead to ensure the successful execution and effective management of all environmental and social issues.

#### 13.3.2.1 ROLES AND RESPONSIBILITIES

The expected construct of the Project E&S team, including positions, roles and responsibilities – as well as contractor or consultant positions – is presented in Table 13.25. Exact position titles may be different to what is presented herein. All Project workers including contractors and suppliers working on the Project have the right to stop work if they perceive the work to be undertaken unsafe or harmful to the environment. The workers will be responsible for assessing its own work tasks and areas, reporting previously unidentified hazards, participating in the development of mitigation measures, and caring for the wellbeing of its fellow workers and the integrity of the surrounding environment.

Where any changes are made to this ESMS that have the potential to impact the health and safety of the workforce, the environment or the work's quality, the E&S Management Team with the support from the team members shall communicate such changes to the contractors and/ or suppliers. Updated copies of the ESMS will be provided to each party involved.

TABLE 13.25 PROJECT E&amp;S TEAM ROLES AND RESPONSIBILITIES

Role	Scope of Work
<b>Environmental, Health, and Social</b>	
Environmental and Safety Manager (HSE)	<ul style="list-style-type: none"> <li>Responsibilities: Oversee and ensure compliance with environmental, health, and safety regulations. Develop and implement HSE policies and procedures. Lead safety training and risk assessment programs.</li> <li>Qualifications: Bachelor's degree in environmental science, Safety Management, or related field. 7+ years of HSE management experience.</li> <li>Skills: Strong leadership, knowledge of environmental and safety regulations, effective communication.</li> </ul>
H&S Coordinator	<ul style="list-style-type: none"> <li>Responsibilities: Coordinate health and safety activities, conduct regular safety inspections, assist in incident investigations, and maintain safety records.</li> <li>Qualifications: Certification in occupational safety or related field. 3+ years of relevant experience.</li> <li>Skills: Attention to detail, organisational skills, knowledge of safety protocols.</li> </ul>
H&S Technicians	<ul style="list-style-type: none"> <li>Responsibilities: Assist in the implementation of health and safety measures, monitor workplace conditions, and report hazards.</li> <li>Qualifications: High school diploma or equivalent; relevant technical training preferred.</li> <li>Skills: Observation skills, report writing, technical understanding of safety equipment.</li> </ul>
Environmental Coordinator	<ul style="list-style-type: none"> <li>Responsibilities: Plan and coordinate environmental protection programs, ensure compliance with environmental laws, and oversee waste management activities.</li> <li>Qualifications: Bachelor's degree in environmental science or related field. 5+ years of experience.</li> <li>Skills: Project management, environmental regulations knowledge, analytical skills.</li> </ul>
Environmental Technicians	<ul style="list-style-type: none"> <li>Responsibilities: Collect samples, monitor environmental conditions, and assist in the implementation of environmental policies.</li> <li>Qualifications: Associate degree in Environmental Science or relevant experience.</li> <li>Skills: Fieldwork proficiency, technical knowledge, attention to detail.</li> </ul>
Sr. Forest Engineer	<ul style="list-style-type: none"> <li>Responsibilities: Develop and manage sustainable forestry projects, oversee forest conservation efforts, and provide technical guidance.</li> <li>Qualifications: Bachelor's or Master's degree in forestry or related field. 7+ years of experience.</li> <li>Skills: Project management, sustainability knowledge, leadership.</li> </ul>
Forest Technician	<ul style="list-style-type: none"> <li>Responsibilities: Support the forest engineer in implementing conservation strategies and managing forest resources.</li> <li>Qualifications: Associate degree in Forestry or relevant field.</li> <li>Skills: Fieldwork capability, attention to detail, knowledge of forest management practices.</li> </ul>
Vet or Biologist	<ul style="list-style-type: none"> <li>Responsibilities: Conduct wildlife assessments, develop biodiversity plans, and provide veterinary support to local fauna.</li> <li>Qualifications: Degree in Veterinary Medicine or Biology. Experience in environmental or conservation projects preferred.</li> <li>Skills: Research skills, fieldwork experience, animal care expertise.</li> </ul>
<b>Institutional Affairs and Communications</b>	
Country Manager	<ul style="list-style-type: none"> <li>Responsibilities: Oversee operations within the country, ensure adherence to corporate policies, and build relationships with stakeholders.</li> </ul>

Role	Scope of Work
	<ul style="list-style-type: none"> <li>Qualifications: Bachelor's or master's degree in business administration or related field. 10+ years of leadership experience.</li> <li>Skills: Leadership, strategic planning, stakeholder management.</li> </ul>
Community Business Development Coordinator	<ul style="list-style-type: none"> <li>Responsibilities: Foster relationships with local communities, coordinate community development programs, and act as a liaison between the company and community leaders.</li> <li>Qualifications: Degree in Social Work, Community Development, or related field. 5+ years of experience.</li> <li>Skills: Relationship building, cultural awareness, project coordination.</li> </ul>
Community Relations Officer	<ul style="list-style-type: none"> <li>Responsibilities: Implement community programs and communication plans, manage grievance reporting, monitor key performance indicators, analyse social data, assess the impact of company activities on communities, and provide recommendations for community engagement.</li> <li>Qualifications: Bachelor's degree in Sociology, Social Sciences, or related field. 3+ years of experience.</li> <li>Skills: Data analysis, report writing, communication.</li> </ul>

### 13.3.2.2 COMPETENCY

Any individual with a role concerning Environmental and Social Risk Management must possess the necessary knowledge and skills to be competent to assess and manage the respective E&S risks, as well as define and implement the associated control measures.

For the Project's personnel, their competency (including minimum qualifications) shall be evaluated and documented by Hiring and/or Line Managers. The HR Function is responsible for maintaining records of these assessments, such as in job descriptions and performance reviews. This assessment process applies to the individuals at managerial and executive level. Verification of competency shall be demonstrated during onboarding and provided upon request thereafter.

Furthermore, all employees and contracted workers of the Company who perform activities or tasks requiring statutory licenses or certificates of competency shall submit a current copy of these documents to the local HR Function or Site Manager before commencing work on site. The employer of each individual has to document the details of their licenses and certificates of competency.

Project will conduct a review of records and competency every two years. HR will be responsible for completing these checks.

Additionally, Project needs to ensure that the organisation clearly identifies and fills internal gaps in capabilities and knowledge. The process of clearly determining and setting external expertise requirements are set out in the ESMS framework.

- Identify internal experience and capacity gaps: HR team should conduct a comprehensive internal assessment to identify gaps in experience and capacity within specific domains or tasks. This may involve skill assessments of employees, reviews of existing knowledge and resources, and analysis of organisational goals and requirements.
- Determine the need for external expertise: Once internal gaps are identified, organisations need to clearly determine the need for external expertise. This includes identifying the required areas of expertise, specific skills or knowledge, and assessing the importance of these requirements within Stronghold Guyana's goals and business environment.

- Seek appropriate external resources: Project may acquire external expertise through various means, such as hiring expert consultants, establishing partnerships with external entities, participating in industry associations and seminars, among others. Selecting suitable external resources requires considering the reliability of expertise, alignment of experience and capabilities, and the mode of collaboration with the organisation.
- Set clear requirements: Once external resources are identified, organisations should have clear communication with these resources to ensure a precise understanding and fulfilment of the need for external expertise. This may involve establishing clear contracts or agreements to ensure that external resources can provide the required knowledge, skills, and support.

### 13.3.3 E&S POLICIES

Stronghold Guyana has a number of existing policies that would be relevant for the Project:

- Anti-Bribery & Anti-Corruption Policy
- Code of Business Conduct & Ethics
- Workplace Bullying and Harassment Policy
- Diversity Principles Policy
- Timely Disclosure, Confidentiality, and Insider Trading Policy
- Occupational Health and Safety Policy
- Whistleblower Policy
- Anti-Child & Forced Labor Policy

### 13.3.4 IDENTIFICATION OF KEY E&S RISKS AND IMPACTS

#### 13.3.4.1 RISK IDENTIFICATION

In line with the international standards/guidelines and local regulations, the Project has conducted a series of risk identification studies to determine the potential environmental and social impacts that may arise during the Project life cycle.

Typical activities of mine developments with potential environmental and social impacts include land clearing for site preparation and access routes, excavation, construction activities, and transportation of materials. The summary of Project Key E&S Risks and Impacts is listed in the impact assessment chapters (Volume 3).

#### 13.3.4.2 RISK MANAGEMENT PROCESS

Where the Project involves specifically identified physical elements, aspects and facilities that are likely to generate environmental and social impacts, the identification of risks and impacts will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the Project and its area of influence.

The risks and impacts identification will then take account of the outcome of the engagement process with Affected Communities as appropriate.

Whereas when the Project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, and as part of the process of identifying risks and impacts, Stronghold Guyana will identify individuals and groups that may be directly and

differentially or disproportionately affected by the Project due to their disadvantaged or vulnerable status.

Where individuals or groups are identified as disadvantaged or vulnerable, Stronghold Guyana will propose and implement differentiated measures so that adverse impacts do not fall disproportionately on them, and they are not disadvantaged in sharing development benefits and opportunities.

This ESMS is developed with reference to IFC PS1 and recognises the importance of maintaining a flexible approach to mitigate all identified risks through effective risk management as far as practicably possible. Several management plans have been established to support the risk management processes throughout the Project development, and covering the activities during planning, construction, and operation phases.

Risk management process is implemented through a systematic method of identifying E&S risks. The risks are then assessed (either quantitatively or qualitatively) to evaluate their severity and to determine the best mitigation method to manage or eliminate the risks to the acceptable levels. Figure 13.5 outlines the risk management process as a part of the ESMS.

**FIGURE 13.5 RISK MANAGEMENT PROCESS**



In the event of risks and impacts in the Project's area of influence resulting from non-Project related party's (such as other operators and infrastructure developers/ contractors) actions, Stronghold Guyana will address those risks and impacts in a manner commensurate with Stronghold Guyana's control and influence over the non-Project related parties, and with due regard to conflict of interest.

Stronghold Guyana will aim to apply a hierarchy of risk avoidance over risk minimisation. Where identified risks and impacts cannot be avoided, Stronghold Guyana will identify mitigation and performance measures and establish corresponding actions to ensure the project will operate in compliance with applicable laws and regulations.

This risk mitigation process will be achieved through the development and implementation of Environmental and Social Management Plans, which are described in Section 13.1.

When a potential new risk is identified, the risk shall be defined and assessed. Depending on the type of risk, the risk shall be reported to the respective managers and the ESMS Lead. The ESMS Lead shall collaborate with the ESMS Manager and E&S team to develop mitigation measures. The proposed changes are then presented to the Company Management/Project Director for approval. Prior to final approval, the Project team shall inform regulators and key stakeholders, including lenders, about the proposed change to actively seek their input and consent. Once approved, the changes are implemented, and regulators, as well as key stakeholders like lenders, are notified in accordance with regulations, commitments, or agreements. This ensures a systematic approach to risk management and compliance with relevant stakeholders.

### 13.3.5 TRAINING PLANS FOR THE E&S TEAM

All personnel engaged in the Project, performing tasks for Stronghold Guyana or on its behalf, which have the potential to cause a significant impact, are competent based on appropriate education, training or experience, and retain associated training records. Training and awareness ensure the capability of personnel, especially those carrying out specialised E&S management functions.

The Project has established several ESMMP as outlined in this ESMS. The Project shall conduct training to ensure all Project personnel:

- Be aware of the ESMS requirements;
- Be aware of the goals and objectives of the ESMS; and
- Be aware of their responsibilities in adhere to the requirements of the ESMS.

The training plans aim to inform all Project personnel about the importance of the ESMS and make sure the ESMMP is up to date as well as the competency to manage and implement the ESMMP. The training plans shall include but not limited to:

- Introduction training on ESMMP
- Updated trainings on ESMMP
- Training required in ESMMP
- Training on the review and monitoring mechanisms
- Other training

The training will be provided by the staff with the respective implementation responsibility. All training materials and list of participants of each training as well as training dates shall be recorded properly on the Project's document management site, according to the Project's documentation procedure for future reference and monitoring purpose.

General E&S education through training, publications, and other educational media, is arranged to minimise the adverse E&S impacts associated with the Project works. In addition, general Project related E&S awareness, will be promoted through distribution and/or publication in public areas of policy statement, contact details of Project representatives, reminder, and alert notifications.

In addition, the Project will require an Environmental and Social Training Plan, which outlines the necessary trainings and their implementation considerations as relevant to the most critical



E&S aspects of the Project, who will be trained, timeline of the training will be given, and detailing the content of training packages and evaluation of training outcome. This Environmental and Social Training Plan ensures that different project personnel or parties, including employees, contractors, subcontractors, and visitors, would undergo the appropriate training to have the knowledge and skills necessary for the success of the Project. These critical trainings include but not limited to:

- Site induction
- Code of Conduct (CoC)
- Environmental and Social Management System (ESMS)
- Environmental and Social Management Plan (ESMMP)
- Local Recruitment Policy
- Stakeholder Engagement Plan (SEP)
- Grievance Mechanism (GM)

All the training shall follow local and international laws, regulations, and practices.

Task specific training and specific toolbox meetings will be held prior to commencement of the activities to maintain a high level of preparedness to deal with any potential incident and/ or accident. Specific training will also be given to personnel that could come into contact with a high-risk activity.

Records will be maintained of all inductions, trainings and toolbox meetings, and will include details of the attendees, content, trainer and dates of the induction/ training.

#### 13.3.5.1 INTRODUCTION TRAININGS ON ESMMP

An introduction training of each ESMMP shall be given to the team/workstream in the beginning of the implementation (within one month from the starting date of implementation) to ensure the team/workstream understands the purpose, importance, procedure, reporting line, and actions required for each ESMMP.

All the members of the responsible team/work stream shall receive this training for the respective ESMMP.

#### 13.3.5.2 UPDATED TRAINING ON ESMMP

ESMMP are updated either with fixed frequency or per need based on the latest development of the Project. When there is an update of the ESMMP, respective training shall be given to the relevant teams/workstreams, so the correct measures and actions are executed.

#### 13.3.5.3 TRAINING REQUIRED IN ESMMP

If ESMMP state their own specific training, that training shall be conducted according to the requirements and procedure of the respective ESMMP (e.g., training for work at height as stated in Health, Safety and Environmental Management Plan).

#### 13.3.5.4 TRAINING ON THE REVIEW AND MONITORING MECHANISMS

Review and monitoring mechanisms are the basis for ensuring compliance, correct actions and continuous improvements. The members of the responsible team/work stream shall receive training on the review and monitoring mechanisms of respective ESMMP as part of the

introduction training. Members responsible for the review and monitoring mechanisms shall receive additional training to ensure correct execution.

#### 13.3.5.5 OTHER TRAINING

Any training not listed above but being defined/regarded as needed during the Project life cycle shall also be provided to the members of corresponding team/workstreams with reference to Environmental and Social Training Plan. If the members of corresponding team/workstreams find any additional training is required for their work, it shall be provided to the relevant members after receiving approval from the management.

#### 13.3.5.6 TRAINING ON ESMS

The ESMS Manager shall prepare a presentation and supporting materials to educate the E&S Team of the following matters once ESMS is ready for implementation:

- The overall ESMS Framework and ESMS Manual, with its sub-plans (ESMMP);
- The importance of compliance with E&S Policies, ESMS and its sub-plans (ESMMP);
- The responsibilities of each member and reporting line;
- The internal and external review process and requirements; and
- Requirements of the Project's ESMS and ESMMP in terms of contractors' and subcontractors' implementation and reporting.

Another general training of ESMS shall also be prepared by the ESMS Manager together with Human Resources (HR) Manager to the whole Project Team so not only the E&S Team members are aware of the ESMS and sub-plans (ESMMP) but the whole Project Team. The main focuses of this general training shall include but are not limited to:

- The overall ESMS Framework and ESMS Manual, with its sub-plans (ESMMP);
- The importance of compliance with E&S Policies, ESMS and its sub-plans (ESMMP);
- Code of Conduct;
- Grievance Mechanism; and
- Main contact point regarding ESMS matters for the general Project Team.

Training shall be provided to team members when there are updates on ESMS Framework or ESMS Manual as well. In addition, an awareness training/ alert will be provided to the Project personnel upon approval on the changes of the ESMS.

All the training materials and the list of participants shall be properly recorded according to the Project's document management system.

### 13.3.6 AUDIT AND REPORTING

#### Internal Auditing

Internal compliance auditing will be carried out monthly during construction, and annually by Stronghold Guyana and controlled by the environmental manager.

#### External Auditing

Stronghold Guyana will submit environmental and social monitoring reports to the EPA & GGMC in the frequency described in the mining license and Environmental Authorisation

(certificate). ERM recommends that external audits for the Project are also conducted by a designated third party on an annual basis.

### 13.3.7 PROJECT COMMITMENT

As part of the Plan-Do-Check-Act cycle of continual improvement described in Figure 13.4, Stronghold Guyana will establish processes to monitor and review the effectiveness of the ESMS and ensure that the commitments detailed in the EIA and various management plans are being achieved, as well as to monitor and respond to any unanticipated environmental and/ or social issues and impacts which arise during the construction Project and/ or operation.

The objectives of the monitoring program include the following:

- Verification that the elements of the ESMS are implemented;
- Routine monitor and audit compliance with the prescriptive and procedural terms as detailed in the EIA and respective management plans;
- Review progress on the mitigation and monitoring, including pending/ on-going action items;
- Review overall compliance with the Applicable Standards;
- Ensure adequate and appropriate interventions to address non-compliance;
- Provide a mechanism for the follow-up and resolution of complaints by the PAPs, including Stronghold Guyana internal employees;
- Ensure appropriate and adequate record keeping related to compliance;
- Determine the effectiveness of the mitigation measures and recommend necessary changes and updates based on the monitoring findings, in order to enhance the effectiveness of the Project E&S management; and
- Aid communication and feedback to the authorities and stakeholders.

The Project contractors and suppliers shall be responsible for ensuring compliance within this ESMS. In addition, if applicable, the Project contractors and suppliers are expected to apply appropriate due diligence measures to ensure that its contractors, and suppliers comply with this ESMS.

#### 13.3.7.1 COMMITMENT MANAGEMENT

The Project E&S team, with the support from the Project contractors and suppliers, will ensure the plans and mitigation measures are implemented and the monitoring are conducted as per commitment throughout the Project lifecycle. Both the Project and the Project contractors and suppliers are committed to applicable standards and project policies, and responsible to execute and fulfil these commitments throughout the Project lifecycle. The basic process flow of the Project management program is shown in Figure 13.6.

FIGURE 13.6 BASIC PROCESS FLOW OF THE MANAGEMENT PROGRAM



Detailed responsibilities and actions are shown in Table 13.25. In the event where the local regulatory requirements differ from the levels and measures presented in the IFC PS and Guidelines, the Project and the Project contractors and suppliers shall then achieve whichever is more stringent of the two.

The commitments will drive the implementation of robust ESMMP, where all suppliers and contractors responsible for engineering, procurement, construction, and installation (EPCI) contractor shall also manage their commitment as aligned with the Project's ESMS. They shall refer to the ESMMP established and scoped within the ESMS.

All the environmental and social commitments of the Project will be properly recorded, allocated, implemented, monitored, and evaluated. Following steps and diagram shows the basic process flow of the commitment management:

- **Identify Commitments:** Environmental and social commitments related to risk/impact identification and related mitigations are identified from EIA and supplemental assessments.
- **Record Commitments:** Commitments mentioned above are documented in various environmental and social management plans.

- **Allocate Responsibility:** Responsible parties or departments are assigned to oversee the implementation of each commitment/management plan. Clear role descriptions and job assignments are as Section 13.2.
- **Implement Measures:** Responsible parties' initiate actions to implement the commitments.
- **Monitor Progress:** Regular monitoring is conducted to assess the progress of implementation and identify any deviations or issues.
- **Evaluate Performance:** The performance of the implemented measures is evaluated against predetermined goals and targets. This evaluation may include assessing environmental metrics, social impact assessments, or stakeholder feedback.
- **Adjust and Improve:** Based on the evaluation, necessary adjustments and improvements are identified and implemented. This can involve corrective actions, process refinements, or policy revisions.
- **Communicate Results:** The results of monitoring and evaluation are communicated to relevant stakeholders, including employees, customers, investors, and regulatory authorities. This can be done through reports, presentations, or public disclosures.
- **Review and Update:** Periodic reviews of the environmental and social management system are conducted to ensure its effectiveness and relevance. This may involve revisiting commitments, realigning responsibilities, or incorporating emerging best practices.

#### 13.3.7.2 PROJECT REVIEW AND MONITORING MECHANISMS

Stronghold Guyana will define the key performance indicators to be monitored as part of the EIA and management plans. The Project team will collect, verify, and review this data to assess the extent of Project impacts and effectiveness of the mitigation measures. Corrective action plan will then be prepared to address any significant E&S issues identified.

In addition, the occupational health and safety (OHS) monitoring program shall include safety inspections, testing, and calibration of critical OHS equipment, such as lifts and cranes. The program shall cover all safety features and hazard control measures, from engineering controls to personal protective equipment (PPE).

The Project team shall ensure that the following requirements are included:

- Monitoring parameters/ indicators appropriate to the Project's needs and commitments to ensure effectiveness of the control implemented;
- A process to monitor and review the E&S performance; and
- A database to collect, analyse and document the records.

The effectiveness of the monitoring program for the various E&S aspects covered under this ESMS can be achieved through:

- Regular inspections and monitoring of all site activities by Stronghold Guyana and Project contractor(s);
- Development of a monitoring schedule of all site activities in accordance with the EIA and respective management plans;
- Routine review of the documents produced;
- A reporting process to ensure Stronghold Guyana's senior management are informed of the effectiveness of the ESMS;
- Management plans for addressing and implementing the E&S actions; and

- Monitoring of the implementation of any preventive actions identified as a result of any incident, complaint, or non-conformance to ensure the effectiveness of any changed procedure(s).
- Suppliers and contractors shall measure and analyse their performance using key performance indicators appropriate to the aspects and impacts of their work. They shall carry out E&S monitoring and recording, internal audits, drills, and inspections regularly. An internal evaluation system such as an assessment matrix is preferred. Subsequent reviews and improvements based on the performance evaluation will be periodically implemented and reported to Project Team. The Contractor Management Team will be responsible for communicating the E&S requirements as well as monitoring the performance of the contractors and suppliers. The monitoring requirements shall follow the requirements as set out in the ESMS. It is the responsibility of the HSSE Manager to collect, organise, and review the monitored data and performance monitoring reports provided by the suppliers and contractors. The results of this monitoring shall be included in the routine reporting to Company Management/Project Director and Stakeholders, as required.
- Stronghold Guyana's Company Management/Project Director will take the necessary steps to ensure the intent of the ESMS is met and that procedures, practices, and plans are implemented and effective.
- In addition to recording information to track performance and establishing relevant operational controls, Stronghold Guyana will use dynamic mechanisms, such as internal inspections and audits, where relevant, to verify compliance and progress against the objectives of the ESMS and associated management plans.

### Internal Monitoring

Internal monitoring focuses on the adequacy and effectiveness of Stronghold Guyana's internal control processes and risk managements in accordance with this ESMS. The monitoring results will be evaluated and presented in the internal monitoring report.

There will be internal review of the Project's environmental and social performance led by the ESMS Lead. The purpose of the ESMS review is to routinely involve senior management in evaluating the development and implementation of the ESMS and the performance.

The frequency of the ESMS review is shown in Table 13.26. Minutes of Meeting of the ESMS review shall be prepared and kept in a central log according to the Project's document management system.

**TABLE 13.26 FREQUENCY OF ESMS REVIEW MEETING OF THE PROJECT**

Phase of Project	Frequency of ESMS review
Before operation	Quarterly
Operation	The first year quarterly, then annually

### External Monitoring

Stronghold Guyana may engage an independent party to carry out external monitoring and evaluation on the effectiveness and implementation of actions stated in this ESMS. The



independent party will monitor and evaluate the implementation of the respective commitments and submit the monitoring and evaluation report to Stronghold Guyana.

#### 13.3.7.3 CONTINUOUS IMPROVEMENT

By monitoring and reviewing the project, the ESMS aims to continually improve throughout the lifecycle. For the effective management and implementation of the ESMS, the company shall adhere to continuous improvement strategies in executing the E&S management plans to align with the objectives and targets.

With the target sets in the environmental and social action plan, Stronghold Guyana shall commit to the deadlines, measure of the results, and adjust the plans if necessary. The responsibilities for each action shall be assigned to involve the right Project people and departments.

Stronghold Guyana will conduct regular reviews of the ESMS and respective management plans to track the progress of managing the Project's environmental, social, health and safety performance. Such reviews are critical to ensuring that the ESMS and respective management plans are effective, adequate, and applicable for the Project throughout the Project lifecycle.

The ESMS and respective management plans will be reviewed and updated as required under the following situations:

- Where there are changes to the Project circumstances (e.g., changes to the planned Project activities, amendments to the legal requirements, availability of new research/ monitoring data which may have implications to the Project impacts and mitigations); and/or
- Periodic internal reviews of the ESMS and respective management plans, as supported by the findings of the monitoring program, to be undertaken at least annually.
- Stronghold Guyana shall communicate E&S performance with employees, contractors, visitors, and other interested parties. This will demonstrate ongoing progress towards the E&S commitments and enable continuous improvement process.
- Whenever feasible, immediate corrective actions are implemented in response to identified deficiencies or opportunities for improvement. These actions aim to mitigate hazards, control risks, address non-compliance or nonconformance, or achieve improvements.
- In cases of grievances, the Project team and the aggrieved party will collaborate to determine appropriate corrective actions as per the grievance mechanism, as described in Appendix D (SEP).

#### 13.3.7.4 CONTROL OF RECORDS

Stronghold Guyana is required to maintain and archive the monitoring records, under the responsibility of the ESMS Manager, which demonstrate ESMS performance and compliance to the local, international and ESMS requirements.

The documents to be kept, but not limited to, include the following:

- Reports of internal audits and reports of third parties' audits, as well as the detected non-conformities and associated corrective/ preventive actions forms;
- Records of incidents reporting and investigations;
- Reports of the monitoring and measurement activities;
- Training records;

- Records of grievances submitted to Stronghold Guyana;
- Communication material addressed to Stakeholders;
- Communication to and from the authorities;
- Records of Stakeholder engagement activities;
- Minutes of the meetings; and
- Any other relevant document demonstrating the ESMS performance.
- Contractors must also report and retain the following, but not limited to:
  - Monitoring results;
  - Inspection results, audits and assessment results;
  - Monthly HSE reports;
  - Incidents reports;
  - Other forms and reports required in the ESMMP; and
  - E&S reports (monthly or quarterly) on project performance.

#### 13.3.7.5 MANAGEMENT OF CHANGE

Any changes that occur within the Project lifecycle may have an impact on HSSE and Social performance. It is crucial to thoroughly assess changes, whether initiated by employees or contractors, and effectively manage their potential effects on the stakeholders.

The Project team shall establish the process of planning, implementing, and controlling changes within an organisation's E&S management system and its processes. This process to be documented in the ESMS.

The management of change requires, as appropriate to the significance of the change, the following:

- Stakeholder involvement and notification - direct involvement of knowledgeable persons to evaluate the potential impacts of the change (may include others affected by the change). After the change has been approved, all stakeholders need to receive proper communication or notification, ensuring that everyone involved understands the rationale behind the change, their roles and responsibilities, and any training or retraining requirements.
- Risk assessment - before the change is implemented.
- Formal documentation of changes, including rationale and authorisation for their execution, in-line with the change management procedure. Update relevant project documentation, procedures, and guidelines to reflect the implemented change.
- Follow-up monitoring to closely track progress, address any issues or challenges that arise, and ensure effective and safe execution of the change.
- Continuous improvement: Incorporate the lessons learned from the change management process into future projects or iterations of the Project development life cycle. Continuously review and improve the change management procedure based on feedback and evolving industry practices.

## 14. CONCLUSIONS AND RECOMMENDATIONS

### 14.1 CONCLUSIONS

The impact assessment of the potential environmental and social impacts attributable to the Project included qualitative and quantitative (where relevant) assessments. The significance of each potential impact was identified, and mitigation measures to minimise and reduce the impacts are recommended. Cumulative impacts, particularly on communities' health and safety and on biodiversity, were assessed.

Table 14.1 presents a summary of residual impacts' significance. Refer to Volume 3 of the EIA for full impact assessments.

The Project baseline collected shows that the area in which the Eagle Mountain Prospecting License (EMPL) is located has been historically impacted by artisanal mining activities. The natural habitat is not considered to be pristine, and watercourses have been altered and degraded by existing artisanal mining ponds in the area. There are no villages immediately neighbouring the EMPL, except for the Minnehaha settlement located to the south of the EMPL. Of the impacts, most are assessed to be Minor to Moderate that can be managed through the implementation of the robust and various mitigation measures proposed. These should be included in the Environmental Permit and will form the basis of the Environmental and Social Management and Monitoring Plans to be prepared prior to Construction.

There is one major impact identified, which is from dust depression to the north of the EMPL during operations. This could impact on the small settlements in this area (this will not impact Mahdia). However, this would be during the dry season and can be managed through the recommended dust suppression mitigations.

### 14.2 RECOMMENDATIONS

This EIA covers the Eagle Mountain Gold Mine Project in Guyana and Volume 3: Chapter 13 (ESMMP) outlines all the mitigation and monitoring measures to be adopted for the Project.

In addition to this, the following sections outline additional recommendations for the Project.

#### 14.2.1 ADDITIONAL STUDIES REQUIRED

Additional studies recommended to improve understanding of groundwater behaviour and to support future predictions and impact assessments include:

- Review of the model layouts indicates that part of the eastern section of the Eagle Pit lies within an inactive zone, for which no numerical simulations have been undertaken. This area effectively acts as a no-flow boundary, limiting the model's ability to estimate groundwater drawdown and the radius of influence in this part of the Project area. It is therefore recommended that the model domain be refined and extended to ensure that the open pits are located at a sufficient distance from model boundaries, allowing more representative simulation of groundwater flow and drawdown.
- The existing groundwater model does not simulate pit lake formation processes, and consequently the recovery of groundwater levels during the post-closure period remains uncertain. ERM recommends incorporating pit lake formation into the numerical model and undertaking a dedicated water balance assessment for the pits. This would provide

improved understanding of long-term groundwater recovery, pit lake water levels, and post-closure hydraulic conditions.

- Transport modelling is recommended to assess potential contaminant pathways, estimate travel times, and evaluate risks to downgradient receptors under both operational and post-closure scenarios.
- Based on GRE's geochemical characterisation and kinetic testing results, the mining lithologies associated with the project do not currently indicate a risk for ARD generation or significant metal leaching. The results suggest that potential water quality risks are primarily associated with the discharge of excess mine water and are considered manageable under appropriate operational controls. In addition, no degraded pit lake water quality is anticipated based on the geochemical evidence available at this stage of the project.

#### 14.2.2 MANAGEMENT PLANS TO BE PREPARED

The following management plans will be prepared for the Project:

- Construction and Pre-Construction Management Plan covering:
  - Air and dust
  - Noise
  - Hydrology
  - Groundwater
  - Surface water and sediments
  - Soil erosion and control
  - Community health and safety
  - Occupational health and safety
  - Cultural Heritage (including Chance Finds Procedure)
- Operational Management Plan covering:
  - Air and dust
  - Noise
  - Hydrology
  - Groundwater
  - Surface water and sediments
  - Soil erosion and control
  - Community health and safety
  - Occupational health and safety
  - Cultural Heritage (including Chance Finds Procedure)
- Plans covering all Project Phases:
  - Waste Management Plan (including Hazardous Materials Plan)
  - Sustainable Water Resources Management Plan
  - Cyanide Management Plan
  - Emergency Response Plan (including Spill Control Plan)

- Biodiversity Management Plan
- Stakeholder Engagement Plan (including Community Grievance Mechanism)
- Rehabilitation and Closure Plan
- Local Development Plan
- Influx Management Plan

TABLE 14.1 SUMMARY OF RESIDUAL IMPACT ASSESSMENT SIGNIFICANCE

Resource / recipient	Summary of Impacts	Residual Impact (Pre-Construction)	Residual Impact (Construction)	Residual Impact (Operation)	Residual Impact (Closure / Post-Closure)
Air	<ul style="list-style-type: none"> <li>Fugitive dust emissions and exhaust combustion emissions impacting sensitive human and ecological receptors close to construction activities and roads used to access the project and during operation of the mine.</li> </ul>	Negligible	Negligible to Minor	Major (during dry season)	Negligible
Noise and vibration	<ul style="list-style-type: none"> <li>Disturbance due to noise, vibration on sensitive receptors including nearby settlements located more than 300m away from the Project's associated infrastructure.</li> </ul>	Negligible	Negligible	Negligible	Negligible
Soil and Geology	<ul style="list-style-type: none"> <li>Increase of soil erosion and sedimentation and topsoil loss during construction activities resulting in the removal, displacement, covering or erosion.</li> <li>Rutting and soil compaction due to increased vehicular movement during construction.</li> <li>Soil contamination primarily from fuel storage and dispensing, hazardous materials and waste, accidental spills and chemical releases, and plant maintenance during construction and operational phases.</li> </ul>	Negligible to Minor	Negligible to Minor	Negligible to Minor	Negligible to Minor
Landscape and Visual	<ul style="list-style-type: none"> <li>Landscape alteration and visual intrusion</li> </ul>	Minor	Minor	Minor	Minor
Hydrology and surface water	<ul style="list-style-type: none"> <li>Impacts due to Short-term elevation in suspended solids (TSS) and turbidity at construction outfalls.</li> <li>Impacts due to potential contamination of site drains from fuels, oils and construction chemicals.</li> <li>Impacts on surface waters due to baseflow reduction as a result of pit dewatering.</li> <li>Impacts due to erosion and sedimentation.</li> <li>Impacts due to uncontrolled discharge of mining effluents.</li> <li>Impacts due to potential seepages from Waste Storage Facility (WSF) and Tailings Storage Facility (TSF).</li> <li>Impacts due to potential spills from fuels, oils and construction chemicals.</li> </ul>	Negligible	Negligible	Negligible	Negligible
Groundwater	<ul style="list-style-type: none"> <li>Disturbance of shallow groundwater due to construction activities.</li> <li>Localised changes to groundwater recharge pattern.</li> <li>Contamination during the handling of fuel, oil and chemicals.</li> <li>Impacts on groundwater volumes and flow patterns</li> <li>Impacts on surrounding groundwater users</li> <li>Impacts on stream flow volumes</li> <li>Impacts on groundwater quality due to potential seepages from Waste Storage Facility (WSF) and Tailings Storage Facility (TSF)</li> <li>Recovery of Groundwater Levels and Pit Lake Formation during closure phase.</li> <li>Seepages from WSF and TSF during closure phase</li> </ul>	Negligible	Negligible	Negligible to Minor	Negligible
Terrestrial Ecology	<ul style="list-style-type: none"> <li>Loss and Degradation of Vegetation/Wildlife Habitat</li> <li>Vegetative metabolic distress</li> <li>Sensory disturbance of wildlife</li> <li>Injury and mortality of wildlife</li> </ul>	Minor to Moderate	Minor	Negligible to Moderate	Negligible to Moderate
Aquatic Ecology	<ul style="list-style-type: none"> <li>Loss of aquatic habitat throughout the Project lifecycle</li> <li>Degradation of aquatic habitats</li> <li>Aquatic species injury and mortality</li> <li>Disturbance of aquatic species</li> </ul>	Negligible to Minor	Negligible to Minor	Negligible	Negligible
Socioeconomic Conditions	<ul style="list-style-type: none"> <li>Increased employment and direct hiring of Guyanese nationals.</li> <li>Increased capacity and skills of local workers and subcontractors.</li> <li>Increased local business activity and growth.</li> </ul>	Negligible	Negligible	Negligible	Negligible
Land Use	<ul style="list-style-type: none"> <li>Changes in Land Use and Governance</li> <li>Impacts to Ecosystem Services</li> </ul>	Minor	Minor	Minor	Minor
Community Health and Safety	<ul style="list-style-type: none"> <li>Impacts to Community Health, Safety, and Wellbeing</li> <li>Impacts to Vulnerable/Indigenous Peoples.</li> </ul>	Negligible to Moderate	Negligible to Moderate	Negligible	Negligible to Moderate
Social Infrastructure	<ul style="list-style-type: none"> <li>Impacts to transportation networks, including increased congestion, strain on access roads and movement of workers, materials, equipment, and supplies</li> </ul>	Negligible to Moderate	Negligible to Moderate	Negligible to Moderate	Negligible to Moderate



Resource / recipient	Summary of Impacts	Residual Impact (Pre-Construction)	Residual Impact (Construction)	Residual Impact (Operation)	Residual Impact (Closure / Post-Closure)
Tangible and Intangible Cultural Heritage	<ul style="list-style-type: none"><li>Direct: ground disturbance due to earthworks is the most likely source of direct, physical impacts to known and unknown cultural heritage resources, with the potential to partially or wholly remove these resources. Direct impacts have the potential to be once-off, non-reversible and permanent.</li><li>Indirect: cultural heritage resources are susceptible to indirect impacts by introducing increased noise, vibration, hydrological and geochemical change, and soil stability to their physical setting. Such indirect effects have no physical impact upon the receptor but impact the value through the way in may be experienced or adversely impacting the conservation environment.</li></ul>	Minor	Minor	N/A	N/A
Tidal flooding and extreme rainfall	<ul style="list-style-type: none"><li>There are two rainy seasons in the region, with periods of heavy and intense rainfall. Heavy seasonal rain can lead to rapid water runoff and ponding of surface water, resulting in extreme rainfall flooding. During the wet season the Mahdia River to the northeast of the Project site, has the potential to flood if the channel capacity is exceeded.</li><li>The mine site has many watercourses that can flood, and access roads are liable to impacts from flash floods after heavy rainfall.</li></ul>	Moderate	Moderate	Moderate	Moderate
Slope instability and landslides	<ul style="list-style-type: none"><li>Increased risk of landslide events due to the potential for extreme rainfall flooding, as well as deforestation resulting in slope instability from nearby logging activities in the areas adjacent to the project mine site and ancillary facilities.</li></ul>	Moderate	Moderate	Moderate	Moderate
Earthquakes	<ul style="list-style-type: none"><li>The Project is located in an area of low seismic activity with eight earthquake events within 300 km of the EMPL in recorded history with magnitudes ranging from 4.1 to 5.5.</li></ul>	Negligible	Negligible	Negligible	Negligible
Accidental pollution, spills and leaks	<ul style="list-style-type: none"><li>There is a potential for an accidental pollution event to occur from the diesel generators used during the pre-production and operational phases of the Project. The release of fuel and other contaminants may negatively impact soil and water quality, the ecological habitats that they support, and the people who rely on these habitats as a source of food and / or income.</li></ul>	Minor	Minor	Minor	Minor
Traffic accidents	<ul style="list-style-type: none"><li>Increased traffic from transportation for the Project may lead to increased vehicle collisions in the area.</li></ul>	Moderate	Moderate	Moderate	Moderate
Fire and explosions	<ul style="list-style-type: none"><li>Fire and explosions from the Project’s activities could cause serious or catastrophic accidents. The potential sources of major fire and explosion during construction and operation phases are due to flammable materials, hot works, smoking, and failure in electrical installations, electric shocks, and explosion of transformers. The local community and workers have the potential to be affected, for example, through temporary or permanent physical and economic displacement. Environmental and ecological receptors, such as air, flora and fauna also have the potential to be affected by a fire or explosion.</li></ul>	Moderate	Moderate	Moderate	Moderate

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