M3-PN140023.603
May 2, 2019
Revision P4

ARCHITECTURE
ENGINEERING
CONSTRUCTION MANAGEMENT

Resolution Copper Project

Concentrate Pipeline Corridor Management Plan

Superior, Arizona

Prepared For:

RESOLUTION COPPER

RESOLUTION COPPER PROJECT
CONCENTRATE PIPELINE CORRIDOR MANAGEMENT PLAN

TABLE OF CONTENTS

1 INTRODUCTION

The Resolution Copper Project (RC) proposes a concentrator at the West Plant Site (WPS) near Superior, Arizona with an underground block or panel cave mine located approximately three miles east of the concentrator within the Pioneer Mining District (See Appendix Drawings; 40500-CV-600 MARRCO Route and 70390-GA-601 Project Location Map). The primary product produced by the concentrator will be copper concentrate. Molybdenum or Moly concentrate, will be a secondary product that will be produced at the concentrator site. Copper and Moly concentrate slurries will require additional processing before they may be marketed as concentrate to a smelter. Moly concentrate will be processed for shipment into super sacs at the WPS, whereas the copper concentrate slurry will be processed off site at the RC owned Skyline Road Concentrate Filtration and Load-Out.

The Skyline Site is located approximately 6 miles southwest of Florence Junction where the RCM owned Magma Arizona Railroad Company (MARRCO) railway intersects Skyline Road. Concentrate pipelines and a single water line will be maintained within the 22.6 mile MARRCO right of way corridor between the WPS and the Skyline Site. Copper concentrate slurry will be pumped through two pipelines to the Skyline Site from the WPS for filtration. Post filtration, concentrate will be loaded into hopper rail cars and transported by rail from the Concentrate Load-Out Facility at the Skyline Site (adjacent to the Filtration Facility) and sent offsite for further processing.

A water tank will be constructed at the Skyline Site to receive water from a number of sources for use at the concentrator. These sources of water feeding the tank will consist of; filtrate water from the onsite copper concentrate filtration process (about 4% of the total), with the remaining 96% supplied by water pumped from wells that are also contained within and along the MARRCO corridor. Water will then be pumped and piped within RC right of way to the water tank and then pumped in a large diameter pipeline (~36 inch) along the MARRCO corridor, through booster stations to the Concentrator at the WPS. This Pipeline Protection Plan provides a summary of engineering efforts to protect the pipelines within the corridor from potential failure.

1.1 CLIMATOLOGICAL CONDITIONS

Land surface elevation in the Superior Basin ranges from 3,100 feet above mean sea level (AMSL) near the proposed copper concentrator facilities at WPS near the Town of Superior to 1,690 feet AMSL at the Skyline Road Site.

The climate in the area is arid to semi-arid, with temperatures exceeding 100 degrees F (Fahrenheit) in the summer, and occasionally dipping below freezing in the winter. Typically, precipitation occurs in two seasons, with strong, short-duration storms during the months of July through September, and longer-duration storms of moderate intensity during the months of November through March.

2 SYSTEM DESCRIPTION

The Concentrate Pipeline Corridor and support facilities include the following;

- Concentrate Pump Station at WPS,
- Two concentrate pipelines,
- Pressure reducing stations for the concentrate pipelines
- 22.6-mile pipeline corridor,
- Concentrate Filter Plant and Load-Out Facility at Skyline Site,

- Water Tank and Pump Station at the Skyline Site,
- Booster Pump Station for water – approximately mid-point of corridor,
- Water pipeline,
- Water recovery wells

The Resolution Copper Concentrator will produce copper concentrate in the form of slurry, a mixture of solids and water. In order to distribute concentrate to market the solids must be filtered from the concentrate slurry to generate the final concentrate with a moisture content of approximately 8-10%. A first stage of water removal, termed "thickening", will be performed at the Concentrator Facility. Thickened concentrate slurry will be pumped from the underflow of the copper thickener to stock tanks on site. From the stock tanks, concentrate will be pumped from the Pump Station at WPS to the Concentrate Filter Plant at the Skyline Site. At the Filter Plant Facility, the slurry will be filtered to reduce the moisture content so that the filtered concentrate can be handled and shipped. The dewatered concentrate product will be conveyed from the Filter Plant Facility to the adjacent Load-Out Facility where it will be loaded into rail hopper cars or trucks for shipping.

The filtrate water recovered from the copper concentrate will be processed through a thickener, a polishing filter, and aeration tanks to remove and neutralize any of the remaining reagent constituents before it is pumped to the Water Tank at the Skyline Site. From the Water Tank, the filtrate and water from water wells will be pumped to the Concentrator by pipeline to be utilized as process water.

2.1 CONCENTRATE PUMP STATION

Copper concentrate slurry is produced at the concentrator, thickened and pumped to stock tanks located near the concentrate thickener. The concentrate stock tanks provide surge capacity between the Concentrator and the concentrate pumping system. Approximately 24 hours of live storage is provided in these mechanically agitated tanks. Concentrate is removed from the stock tanks and directed to concentrate pumping systems. Each pumping system includes charge pumps and concentrate slurry pumps connected to each of the two concentrate pipelines. The concentrate slurry pumps are positive displacement pumps due to the very high percent solids (~65%) of the concentrate slurry.

2.2 CONCENTRATE PIPELINE CORRIDOR

The pipeline corridor will follow the MARRCO from the concentrator at WPS to the Skyline Site. The MARRCO Rail Line lies within a 200-foot-wide right of way. The concentrate pipeline consists of two parallel HDPE lined steel pipes. The right of way corridor will contain the two concentrate pipes, one water line, and an access road as well as an Arizona Water Company water line. The pipe corridor from WPS to the Skyline Site is 22.6 miles in length.

The pipelines will be buried to the extent practicable. However, due to the sweeping alignment of the MARRCO corridor, and for the purposes of this plan, it is assumed that the pipelines will be located above ground in a bermed containment between the WPS and the water Booster Pump Station location, a distance of approximately 13 miles. Pipelines will be buried beneath approximately 3-feett of cover from the Booster Pump Station to the terminus at the Skyline Site, a distance of approximately 9.6 miles.

Two pressure reducing stations will be included in the concentrate pipeline system to ensure the system stays below 500 psi. Variable choke stations are utilized to drop the pressure in the pipeline and also to prevent slack flow in the pipeline by modulating the backpressure to prevent accelerating the wear of the pipelines.

2.2.1 Road and Wash Crossings

The concentrate pipeline makes three crossings between the WPS and the Skyline Site: Queen Creek, US Highway 60 and Arizona State Route 79.

2.2.1.1 Queen Creek

This crossing occurs where the MARRCO intersects Queen Creek along Hewitt Station Road. . The pipelines will be double contained over the railroad bridge crossing of Queen Creek. The bridge will be improved as a key part of the overall project and remain outside the ordinary high water mark of Queen Creek.

2.2.1.2 US Highway 60

This crossing is located where the MARRCO intersects US Highway 60 (US 60) near the Queen Valley Road. The pipelines will be buried and encased under U.S 60 within a steel pipe sleeve that will provide containment, protect the pipelines, and allow them to be installed and/or repaired without disturbing the traffic flow on US 60.

2.2.1.3 Arizona State Route 79

This crossing along the corridor occurs where the MARRCO intersects the Arizona State Route 79 (SR 79) approximately one mile south of Florence Junction. Similar to the US 60 crossing, the pipelines will be buried and sleeved under this road crossing.

2.3 CONCENTRATE FILTER PLANT AND LOAD-OUT FACILITY (SKYLINE SITE)

The Concentrate Filter Plant and Load-Out Facility Building is located at the intersection of the MARRCO Rail Line and East Skyline Road in unincorporated Pinal County. The site is approximately 4 miles northeast of the intersection of the CAP Canal and the MARRCO Rail Line. The concentrate pipelines will terminate at a splitter box that will distribute the slurry into a number of large capacity stock tanks at the Filter Plant. The concentrate slurry will then be pumped from the stock tanks to filters in the Filter Plant where they will remove the majority of the water from the concentrate. The resulting concentrate will be stacked in a Load-Out Building where it will be transferred to rail cars for transport off site.

2.4 CONCENTRATE OPERATIONAL DESCRIPTION

The concentrate pipeline consists of pumps, piping, valves, and other control devices. The piping system is designed as two parallel HDPE lined steel pipes. The concentrate will be pumped on a campaigned basis initially with one of two pipelines operating as required based on the amount of concentrate produced. When the pipeline is between concentrate runs, the pipes will be flushed and maintained full of water until the next concentrate run. The duration of the operating time for the pumping and piping system will increase as the operation ramps up to steady state. Normal operation during operations will be two pipelines running approximately 10-12 hours a day.

The operating concentrate pipeline will be supplied with two or three pressure dissipation stations consisting of control valves, block valves, and ceramic orifice plate chokes. This control system will keep the normal pipeline operating pressure below 500 psig and will lower the pressure to an acceptable level at the Filter Plant. The uncontrolled static head with the pipe full of water is 611 psig. With concentrate the uncontrolled head will be 1,222 psig. Schedule 80 pipe has sufficient wall thickness to withstand the uncontrolled head and is rated for ~1,870 psi with a burst pressure of 6,900 psi for an 8" diameter pipe. The proper operating pressure will also be continually monitored by operations staff in the concentrator control room as well as daily visual inspections and checks.

2.4.1 System Design:

Copper Concentrate Slurry:

Solids by Weight	65%
Specific Gravity	2.0
Viscosity	20 centipoise

Piping System:

Pipeline Length	22.6 miles (37.3 km)
Normal Pumping Capacity per Pipeline	836 USGPM (190 m^3/hour)
Pipe Size	Schedule 40 HDPE lined carbon steel upper section Schedule 80 HDPE lined carbon steel lower section (higher pressure)

2.4.2 Wall Thickness

The pipeline wall thickness was calculated in accordance with ASME B31.3 Process Piping code with no corrosion allowance because of the HDPE lining and no credit is taken for the pressure capacity of the HDPE.

2.4.3 Slurry Lab Testing

The concentrate pipeline pressure and flow characteristics were determined using the slurry lab tests for particle size distribution, specific gravity and viscosity provided by Pocock Industrial, Salt Lake City, Utah. The flow calculations were performed using pipe network analysis software (Pipe-Flo).

2.5 WATER SYSTEM PUMP STATION PROTECTION SYSTEMS

2.5.1 Skyline Pump Station

The water pump station at the Skyline facility will consist of three 250 HP vertical turbine pumps, two operating, one standby, designed to supply sufficient pressure to deliver the water along the MARRCO right of way past the US 60 highway to the Booster Station mid-way to the WPS. The maximum pressure in this pipeline will be less than 200 psig. A flow meter will be installed at the exit of the Skyline Pump Station and at the entrance of the mid-way Pump Station. These two flow readings will be monitored in real time to ensure that no water is being lost which would indicate a leak. Since the pipeline is non-metallic, there is no need for corrosion prevention devices.

2.5.2 Mid-Way Booster Pump Station

The majority of the total lift required occurs between the Booster Pump Station located approximately mid-way along the MARRCO corridor and the WPS. The pump station will consist of three 1500 HP vertical turbine pumps, two operating and on standby, designed to supply sufficient pressure to deliver the water along the MARRCO right of way to the WPS facility in Superior. The pipeline from the Booster Pump Station to the WPS will be a large diameter heavy wall steel pipe. The pipeline will be installed above ground along the MARRCO right of way. The maximum pressure in this pipeline will be less than 500 psig. A flow meter will be installed at the exit of the Booster Pump Station and at the end point of the pipeline at the WPS. These two flow readings will be monitored in real time to ensure that no water is being lost which would indicate a leak. The Booster Station will be equipped with pressure and water hammer control systems to avoid any high pressure spikes during start-up and shutdown of the pumps.

3 HISTORICAL FAILURE MODES

3.1 MECHANICAL

Mechanical failures include punctures, cuts, crushing and separation. The causes of these failures are primarily accidental impact from construction or operations equipment. A small number of mechanical failures are the results of manufacturing defects or inferior materials.

3.2 OPERATIONAL

Operational failures are caused by malfunction or human error in the use of the pipeline or pumping equipment and controls. The types of failures created by operational causes are separation, collapse, accidental release or failures related to pipe movement. An overpressure event could cause ruptures or separation at joints or equipment connections. Creating a vacuum in the pipe can also cause collapse. Water hammer events can cause all of these failures by causing pipe movement.

3.3 CORROSION

Corrosion is a natural process which converts a refined metal to a different form, such as its oxide, hydroxide, or sulfate. It is the gradual destruction of metals by chemical reaction with their environment. Corrosion may be seen as pitting, weld decay, crevice corrosion and microbial corrosion. Each of these can result in leaks and potential pipe failure.

3.4 NATURAL HAZARDS

Natural hazards are events or processes in nature. In this area, this can include damage from ultraviolet light, rainfall, flooding, wind, lightning strikes, plants and animals.

3.5 THIRD PARTY DAMAGE

Third party damage can be categorized as intentional/malicious damage, accidental damage and incidental damage. Intentional/malicious damage would be the result of theft or intent to cause harm. Accidental damage can take many forms including damage from private vehicles hitting the pipeline. Incidental damage is defined as damage to a pipeline that does not cause an immediate leak or failure but results in a failure at a later time.

3.6 FREQUENCY OF FAILURE

Historical data related to causes and frequency of failure of pipelines in Western Europe were used in identifying the probability of failure.[1] Conditions causing pipe failure under given circumstances are similar around the world, and this information on failure frequency is considered suitable for use in this analysis. It has been demonstrated that overland pipeline failures occur less than 0.01% of the time, generally as a result of third-party accidental, mechanical, and operational issues. Most of the time 50% to 90% of these failures result in a leak size of 0.4 inches or less. Full-bore failure is usually caused by natural hazards but is the least frequent of the failures (0.001%).

[1] Data source – Consideration of Clean Air Water in Western Europe Report 98: Western European Cross-Country Oil Pipelines 25 Years Performance Statistics, June 1988 and European Gas Pipeline Incident Data Group.

To account for potential leaks in the RCM concentrate pipelines, the containment cells proposed in the current design provide an average storage volume of approximately 2,000 ft^3, or 15,000 gallons. In addition, a pipeline between each cell allows for drainage into the downstream cell to reduce the chance of overtopping, and thus increases the volume of storage available.

3.6.1 Copper Concentrate Lines

For a likely leak size of 0.4 inches or less, the maximum flow of concentrate at 65% solids through a 0.4" hole at 500 psi is approximately 46 gpm. The cell would take 5.4 hours to fill.

3.6.2 Water Line

For a likely leak size of 0.4 inches or less, the maximum flow of water through a 0.4" hole at 500 psi is approximately 65 gpm. The cell would take 3.8 hours to fill.

4 PREVENTION OF PIPELINE FAILURE

Pipe failure modes as well as failure and spill prevention was incorporated into the design.

4.1 RISK ASSESSMENT

A risk matrix was developed for the pipelines running through the MARRCO corridor to better understand the potential issues associated with pipeline construction and operation. By determining how and where failures could originate, it was possible to develop preventive measures and management strategies for the pipelines. The risk matrix is shown in Table 4-A below.

Spill prevention and detection and storm water management are the most important environmental aspects of the pipelines. The proposed corridor infrastructure and operational controls take these considerations into account over the entire alignment.

Best practice environmental protection measures and controls will be implemented to prevent leaks and spills from the pipelines. Preventive measures will be put in place and procedures followed throughout the life of the facility—from design through pre-construction, construction, and operation. The proposed controls identified for each phase of work are outlined in the following section.

Quality assurance practices will help ensure the planned control measures are met during each phase. Equipment, materials, and the development of management plans will be in accordance with the international quality system requirements as well as other relevant specifications and codes, identified previously in this document, covering the following:

- Pipeline treatment and testing
- Inspection procedures during fabrication
- Identification of specific product parameters
- Fabrication and welding control
- Pipe coating inspection and testing
- Valve manufacture and testing
- Pipeline hydro testing

Table 4-A: Pipeline Risk Matrix

Category	Risk	Prevention Measures	Mechanical Fault	Operational Fault	Corrosion / Exposure	Joints & Flanges	Natural Hazard	3rd Party Accidental	3rd Party Deliberate
Environment		**During Construction and Operation**							
Geohazard	Rock fall	• slope stabilization, grade, revegetation, as required • monitoring for rock fall along sections where hi-wall exists •					X		
Storm Event	Runoff – water volume	• storm water runoff directed away from containment into drainage channels and culverts designed to 100-year discharge flow rates • overflow pipelines for containment					X		
	Sediment and erosion	• gravel surface in pipeline corridor & road • gentle grade 1% to 2.25% • road crossfall away from containment • upland runoff diverted to channels and culverts designed to 100-year discharge flow rates • revegetation as required • sediment and erosion control					X		
Design/Technical									
Pipes	Leaks – at joints / at pipe material change points / splits / holes	• Welded steel pipe with continuous HDPE lining and suitable wall thickness for concentrate as well as cathodic protection • Welded steel pipeline with cathodic protection and suitable wall thickness for water • separation of pipelines • minimum curve radius for pipes • secondary containment channel • secondary containment outer casing pipe on bridges • compliant leak detection / flow monitors/pressure measurement in place • Pressure reducing stations to prevent overpressure	X	X	X	X			
Construction and Operation	Poor installation	• QA/QC system in place	X			X			
	Security / sabotage, public access – construction / operation	• fence / gates at required locations • separation at crossings • public awareness / signage • visual inspection						X	X
	Leaks – at joints / at pipe material change points / splits / holes	• routine preventative maintenance • regular review of leak monitor data • Welded steel pipe with a minimum number of mechanical connections. • visual inspections • operational staff training / awareness • regular internal inspections • spill response	X	X	X	X			

4.2 PIPELINE ROUTING

Resolution elected to run the concentrate and water pipelines within the existing MARRCO corridor to maximize the placement of new mine facilities within existing mine disturbances. This choice addresses several design challenges.

Many natural hazards are avoided using an existing route. The MARRCO corridor is graded at a consistent low slope and width for the rail road allowing for common maintenance access. Although the section of railroad north of U.S. Highway 60 will require widening at specific locations, utilizing the corridor curtails the grading required for a new route. Road and wash crossings have already been determined. The wide and level right of way provides a safer work zone and ready-made laydown areas. There are three major crossings along the route described in Section 2 above.

The railroad requires gradual changes in direction and elevation which is advantageous to slurry pipe systems. Gradual transitions eliminate the need for drop structures and transition fittings. These features are historically locations of high wear and failure.

There is a low probability of earthquake in this area. The existing cuts through the hills along the MARRCO route have been stable for many years and slope failure would not be expected. Queen Creek frequently runs high during the annual monsoon season, but the crossing is outside the Ordinary High Water mark (OHWM) of the creek and the crossing will be designed above the 100-year water surface elevation.

These features of the pipeline route address Mechanical, Operational and Natural Hazards.

4.3 DESIGN MEASURES

The following design measures are incorporated into the conceptual design to prevent and limit hazards that could result in leaks.

4.3.1 Controlled Access

In select areas where terrain does not prevent access, the pipeline route will be fenced from the Concentrator to the Skyline Site. This will limit physical access to the pipeline. Where road or trail crossings occur, fencing will be placed to allow personnel and or vehicle passage. The MARRCO Corridor is private property and cannot be legally accessed without notification and permission. This addresses failures due to third parties. Pipelines will be monitored and inspected daily to ensure maintenance is current and operation of the pipeline is not interrupted.

Roadways and access locations will be segregated from pipeways. Berms will be placed to protect pipelines, support structures, and equipment where vehicular access is adjacent to said structures. In locations where berms will not suffice to protect a structure, controlled access structures such as; fencing, Jersey Barriers, or bollards will be placed appropriately.

4.3.2 Leakage and Spill Protection

The pipelines will be placed in a bermed containment within the MARRCO right of way north of US Highway 60. The grade will be prepared and sloped to contain any leakage within the containment berms. Containment helps address and control failures from all hazards.

The concentrate pipelines will be welded construction where possible to minimize flanged joints. The HDPE lining can be pulled through approximately 1,000 feet of pipe; therefore, a flange will be required at 1000 foot intervals. These flanges will be covered with industrial flange covers to ensure small leaks are contained and to prevent

material from spraying outside the containment berms in case of a more substantial leak. This containment measure is designed to address a variety of spill-related hazards.

The HDPE lined steel concentrate pipeline is provided with a valved 1" leak detection port at every flange to detect failure of the liner. These flanges occur every 1000 feet along the pipeline. Along the buried section of the line, these 1" detection ports will be brought 3 feet above grade so that the valve can be opened during normal pipeline inspection. Any discharge from the leak detection port will indicate a leak between the steel pipe and the liner.

Over the railroad bridge crossing of Queen Creek, the water line will be double contained utilizing a 48" pipe to encase it for the length of the crossing. Concentrate pipelines will be double contained the entire length of the pipe across the bridge. All pipelines will be cased and sleeved under all road crossings. This helps address both mechanical and operational hazards.

Gunfire presents a potential malicious hazard to the pipelines from outside the fence. However, the exposed pipelines are heavy wall steel; therefore, damage due to gunfire is unlikely. This addresses third party hazards.

4.3.3 Overpressure Protection

Overpressure events are an operational-related hazard. The static elevation difference between the pipeline source at WPS and the Skyline Site is 1,410 feet. The upper section of the concentrate pipeline will be constructed of Schedule 40 steel pipe, however, the lower section will require thicker Schedule 80 steel pipe due to the higher pressure.

The operating concentrate pipeline will be supplied with two or three pressure dissipation stations consisting of control valves, block valves, and ceramic orifice plate chokes. This control system will keep the normal pipeline operating pressure below 500 psig and will lower the pressure to an acceptable level at the Filter Plant. The uncontrolled static head with the pipe full of water is 611 psig. With concentrate the uncontrolled head will be 1,222 psig. Schedule 80 pipe has sufficient capacity to withstand the uncontrolled head. The proper operating pressure will also be continually monitored by operations staff in the concentrator control room as well as daily inspections and checks.

The water from the Water Tank is pumped with an initial pressure of 187 psig and decreases as the elevation increases toward the mid-way Booster Pump Station. The pump station will be equipped with pressure relief valves and pipeline surge control equipment. The pipeline pressure is low enough to use HDPE pipe for the whole system to the mid-way Pump Station.

The initial pressure leaving the mid-way Booster Pump Station is 478 psig and decreases as the elevation increases toward the West Plant location. These pump stations will be equipped with pressure relief valves and pipeline surge control equipment to eliminate any water hammer condition at start-up and shutdown. The first 7 miles leaving the pump station, the pipeline will be Schedule 80 welded steel and then the wall thickness changes to Schedule 40 where the pressure drops to an acceptable level.

4.3.4 Corrosion and Erosion Protection

The concentrate pipelines will be welded construction with a pulled-in HDPE liner that will protect the pipe from internal corrosion as well as erosion wear from the concentrate slurry. The above grade piping will be coated with an industrial grade epoxy coating system. Cathodic protection in the form of sacrificial magnesium anodes will be bonded to the pipelines at determined intervals. Regularly spaced inspection ports will be incorporated into the cathodic protection system for monitoring and maintenance.

4.3.5 Buried Sections

The entire southern half of all of the pipelines, 9.6 miles in length, will be buried. This will protect the pipe from damage due to various hazards including operational, natural, and third party hazards.

The buried sections of the concentrate pipelines will be coated and wrapped in accordance with AWWA C203. The buried section of the water pipeline will be HDPE pipe with fusion welded joints. The HDPE plastic material is not subject to corrosion.

4.3.6 Expansion and Contraction

Any potential movement due to expansion and contraction of the pipelines on grade will be controlled by welded expansion loops at designated locations along the route. This will minimize leakage due to stressed joints or pipe breakage from expansion and contraction.

4.3.7 Construction Testing and Quality Control

The entire length of the pipelines will be constructed and tested in accordance with the requirements of ASME B31.3 Process Piping code. This will include a hydrostatic pressure test at 1.5 times the operating pressure. Welds will be tested using radiography and ultrasonic methods. Coatings will be tested for integrity using holiday spark testing equipment. Quality control will help avoid mechanical and operational failures.

4.3.8 Intelligent Inspection Pigging

Pigging as it relates to pipelines refers to the method of using devices known as “Pigs” to perform various maintenance operations. Pigs are devices that are placed inside the feed end of a pipe allowing the pig to traverse the pipeline with the flow of the line. This practice is performed with product flowing in the pipeline to allow operations to continue.

Internal inspection of pigging is commonly used for defect monitoring, which enables potential problems to be identified and rectified well before leaks occur. Intelligent Pigging is a method used for leak prevention by utilizing an intelligent pig that will provide an assessment of the pipeline integrity with every run.

Intelligent pigging is initiated during the early period of the pipeline operation to provide a baseline record of the pipe wall thickness and any anomalies that are present. The intent is to locate and repair anomalies before they become a problem. Subsequent pig runs will identify any changes in the wall thickness which is then assessed as it relates to the integrity of the pipelines and potential need for repairs.

4.4 OPERATIONAL MEASURES

4.4.1 Daily Patrol Schedule

The pipeline will be patrolled every day to ensure the security of the pipeline and to check for leaks and hazards. This will help avoid third party hazards.

4.4.2 Regular Maintenance Schedule

A regular inspection and preventative maintenance program and schedule for leaks and wear will be part of operations. Worn parts will be identified and replaced before failure. This will help avoid third party hazards, corrosion and wear and tear through operations.

4.4.3 Concentrate Storage Capacity

The concentrate handling system has additional storage or surge capacity at both WPS and Skyline Sites. Concentrate slurry will be retained in a number of agitated stock tanks at the WPS and at the Skyline Site. Filtered Concentrate will be stockpiled in the Skyline Site. This excess in capacity will allow for repairs between operating campaigns.

4.4.4 Continuous Flow Monitoring

The operators will remotely monitor flow at increments along the pipeline and at both ends of the pipeline using inline flow meters. The inline flow meters will report a change in flow back to the concentrator operations control room in real time. A difference in the flow rate will indicate a potential leak. In the event a possible leak is detected, the maintenance response team will be dispatched to visually inspect and confirm as well as remedy the leak and implement spill response.

5 SPILL RESPONSE

The Resolution Copper Mine Concentrator will have operators and staff working 24 hours per day throughout the life of the mine. Any suspected leak will be immediately investigated by a team of operators. Some leaks may be temporarily repaired safely without taking the pipe out of service. Any such temporary repair would be formally addressed during the next scheduled shut down of the pipeline. Pipeline shut downs are anticipated to be daily events due to the schedule of the copper concentrate production.

Additional staff will be available on an emergency basis if needed during night shifts. In the event of an emergency, such as a leak or spill the maintenance spill response team will be dispatched to remedy the leak and implement remedial measures. The pipeline access road will provide reliable and immediate access to the full length of the pipelines. If the situation requires additional resources or heavy equipment they are readily available from numerous locations within a 45 mile radius of the project.

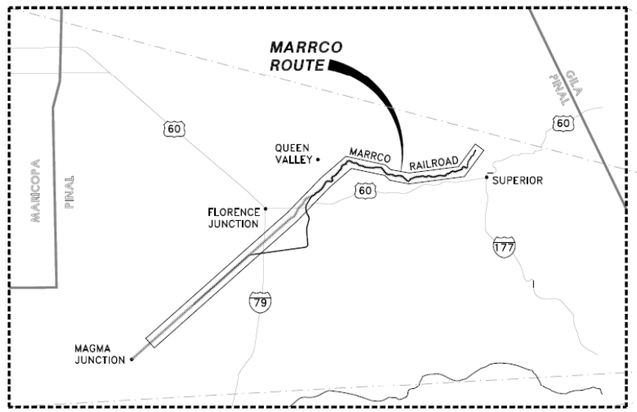
6 APPENDIX

The appendix to this report contains the following drawings and details:

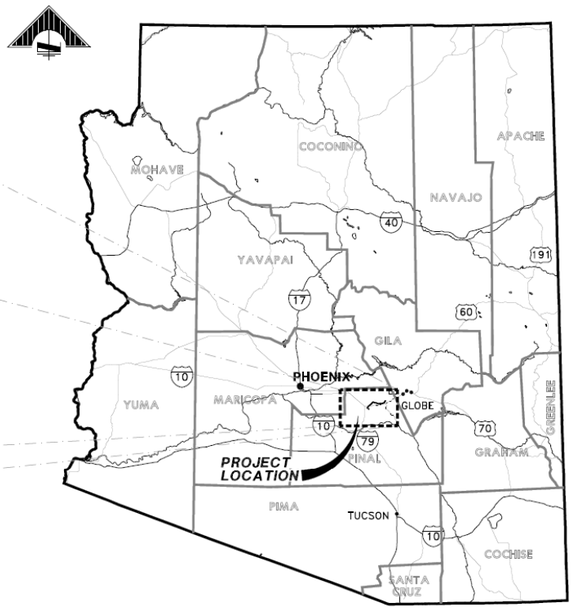
1) 40500-CV-600 MARRCO ROUTE - PROJECT LOCATION
2) 70390-GA-601 PROJECT LOCATION MAP
3) 40500-CV-601 MARRCO ROUTE - OVERALL PLAN & PROFILE

40500-CV-600 MARRCO ROUTE – MAP

RESOLUTION COPPER
MARRCO ROUTE



PROJECT VICINITY MAP
N.T.S.



STATE OF ARIZONA
N.T.S.

SHEET INDEX

	VOLUME OF EARTHWORK		
	EXCAVATION	BACKFILL	NET
MARRCO ROUTE	319,735 CU. M.	353,857 CU. M.	34,122 CU. M.<FILL>

DO NOT SCALE 11x17 DRAWINGS

PRELIMINARY
NOT FOR CONSTRUCTION

Resolution Copper Mining

REFERENCES		REFERENCES		REVISIONS						REVISIONS							
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	SCALE: N.T.S.	DATE
																DESIGNED BY MWO	DEC 12
																DRAWN BY ARM	DEC 12
																CHECKED BY	
																PROJECT MGR	
																CLIENT APPR.	

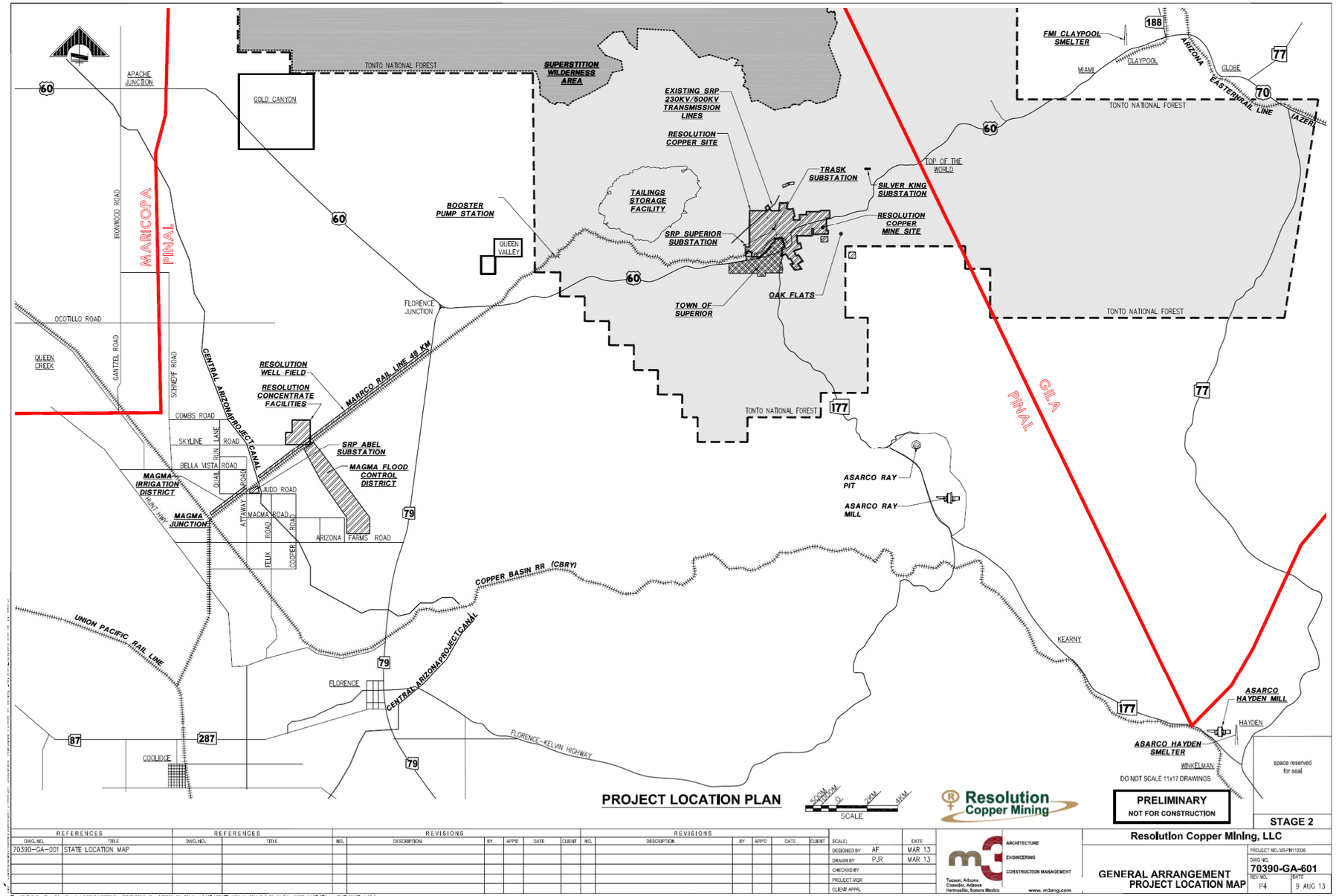
m3 engineering — ARCHITECTURE, ENGINEERING, CONSTRUCTION MANAGEMENT
Tucson, Arizona · Chandler, Arizona · Hermosillo, Sonora Mexico
www. m3eng.com

Resolution Copper Mining, LLC

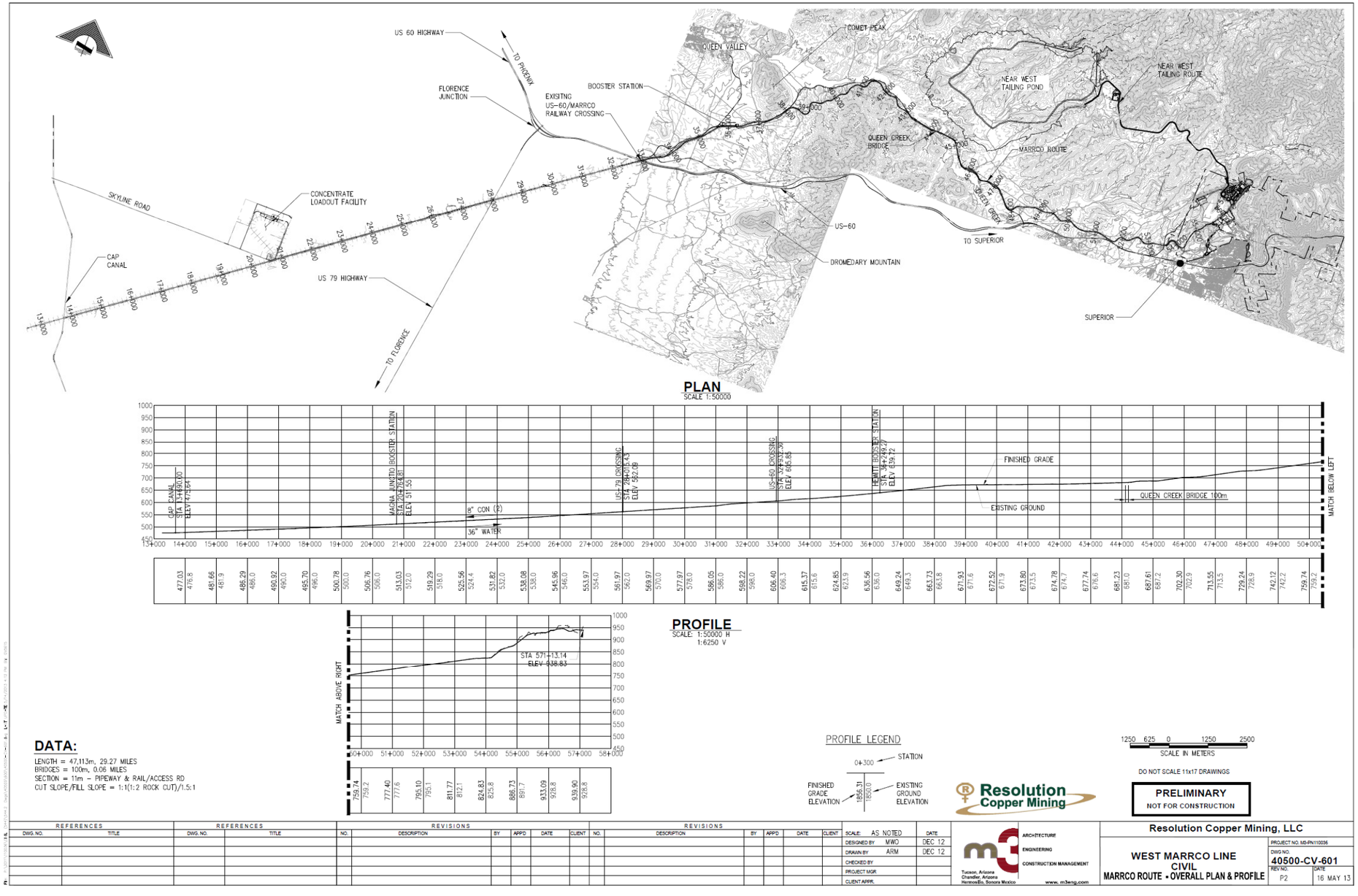
WEST MARRCO LINE
CIVIL
MARRCO ROUTE - COVER

PROJECT NO. M3-PN110036
DWG NO. **40500-CV-600**
REV NO. P2 · DATE 16 MAY 13

70390-GA-601- PROJECT LOCATION MAP



40500-CV-601 MARRCO ROUTE - OVERALL PLAN & PROFILE



DATA:

LENGTH = 47,113m, 29.27 MILES
BRIDGES = 100m, 0.06 MILES
SECTION = 11m – PIPEWAY & RAIL/ACCESS RD
CUT SLOPE/FILL SLOPE = 1:1(1: 2 ROCK CUT)/1.5:1

PROFILE LEGEND
0+300 STATION
FINISHED GRADE ELEVATION 1856.31
EXISTING GROUND ELEVATION 1850.0

1250 625 0 1250 2500
SCALE IN METERS

DO NOT SCALE 11x17 DRAWINGS

PRELIMINARY
NOT FOR CONSTRUCTION

Resolution Copper Mining

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE:	AS NOTED	DATE
DESIGNED BY	MWO	DEC 12
DRAWN BY	ARM	DEC 12
CHECKED BY		
PROJECT MGR		
CLIENT APPR.		

ARCHITECTURE
ENGINEERING
CONSTRUCTION MANAGEMENT
Tucson, Arizona
Chandler, Arizona
Hermosillo, Sonora Mexico
www. m3engg.com

Resolution Copper Mining, LLC

WEST MARRCO LINE
CIVIL
MARRCO ROUTE - OVERALL PLAN & PROFILE

PROJECT NO. M3-PN110036
DWG NO. **40500-CV-601**
REV NO. P2
DATE 16 MAY 13

This page left intentionally blank.