TETRA TECH

May 5, 2021

Julie Mikulas
Martin Marietta
1800 North Taft Hill Road
Fort Collins, CO 80521

RE: Riverbend Mine Riverbank Evaluation, Cell 1; Tetra Tech Job No. 117-8741001

Dear Ms. Mikulas:

Tetra Tech was contracted to evaluate the riverbank location along the South Platte River at the Riverbend Mine site in Weld County near Fort Lupton, CO. The primary objectives of this study are to:

- Evaluate the location of the present-day riverbank along Cell 1
- Evaluate the various offset scenarios from the present-day riverbank that may be required by the Division of Reclamation Mining and Safety (DRMS) based on Mile High Flood District (MHFD), formerly Urban Drainage and Flood Control District, offset guidelines

Rivers are dynamic systems where the physical characteristics such as river thalweg, channel geometry, bank location, and sandbar locations are constantly changing. Given the dynamic nature of river migration, Tetra Tech surveyed the present-day riverbank on May 1, 2020. Exhibit 1, enclosed, shows the riverbank location has changed substantially since the mine permit was approved. Tetra Tech evaluated historic aerial photography near Cell 1 and found that the river has made changes in course over time, especially around the time of the 2015 flooding event when the river migrated channels south of Cell 1 and a portion of the river flowed through the Riverbend site. North of Cell 1, the river has migrated west up to 1,000 feet from its previous course.

For discussion purposes, Cell 1 was subdivided into three separate river reaches for analysis:

- South – The reach of river from Weld County Road 6 to the property line
- Northwest – The reach of river from the irrigation turnout structure to the conveyor river crossing
- Northeast – The reach of river from the conveyor river crossing to where the South Platte River flows north away from the Cell

The northern boundary of the site was separated to allow for consideration of the conveyor currently under construction. The conveyor is in the MHFD offset zones. We have assumed that the resource underneath the conveyor may be recovered in the future. Consequently, our evaluation also considered the riverbank in this area.

Tetra Tech

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SITE VISIT AND BANK EVALUATION RESULTS

A site visit was conducted on May 1, 2020, in which the alignment of the riverbank on the south and north edges of the site was recorded using a Trimble GeoXH 2005. Riverbank data was not recorded for the western bank offsite because it is located beyond the property boundaries and the likelihood of the mine limit being dependent on the geotechnical stability analysis offset requirements instead of the MHFD offset requirements. The vertical distance from the top of the riverbank to the river thalweg was estimated during the site visit along the riverbank alignment.

The riverbanks for each reach in this study have portions along the erosive edge of the river flow. Generally, on a curve in the river, the outside of the curve is where bank erosion occurs with sandbar deposition on the opposite side of the river. There are natural erosive forces acting along riverbank for all three reaches.

South Reach

Along the southern areas of the site, the GPS data showed that the riverbank on the South reach was nearly unchanged from the time of the Weld County USR map. The South reach of the South Platte River is deeply incised with nearly vertical banks along the Cell. There is existing concrete rubble located along the north riverbank. Based on Google Earth imagery available back to 2003, the concrete rubble appears to be in place from that time forward, which is prior to Martin Marietta ownership. This concrete rubble contributes some stability of the bank in this reach. The concrete rubble is randomly sized and placed. While the rubble may provide some stability, regulating agencies do not normally approve concrete rubble for use as bank stabilization and would require its removal for any improvements if mining within 250’ of the bank.

Photo 1: This photograph, looking west, shows concrete rubble that was placed on the north riverbank on the South reach

Northwest Reach

The Northwest reach of the South Platte has banks with shallower slopes. Approximately 250 feet downstream of the Lupton Bottoms irrigation diversion structure, the riverbank is no longer adjacent to the active channel. There was a low bench formed by a sandbar with vegetation between the identified riverbank and the active channel at the time of the site visit. Our evaluation of this reach concluded that this low bench was not protectable using MHFD riverbank stabilization techniques. The low bench is likely to change significantly as a part of the normal river geomorphological processes. Significant erosion of the sandy subgrade would undermine riverbank protection installed along the sandbar/river interface. The low bench is presented in Photo 3 below.

Photo 2: This photograph, looking north, shows the concrete irrigation structure and sandbars.

Photo 3: This photograph, looking west, shows the low bench sandbar on the Northwest reach. The riverbank is obscured in this photograph.

Northeast Reach

The riverbank for the Northeast reach of the South Platte continues east, generally paralleling the active channel until it turns sharply north. The low bench that is present in the Northwest reach also continues through this area. The Northeast reach terminates at the point where the river migrated channels in 2015. This termination point is located where existing concrete rubble stabilization is installed along the eastern riverbank. The concrete rubble was placed prior to Martin Marietta ownership and is visible on Google Earth imagery (available as of 2003).

Photo 4: This photograph, looking northeast, shows the concrete rubble on the Northeast reach.

SETBACK GUIDELINES

Setbacks from specific features are required based upon multiple regulatory requirements. We have considered only the MHFD setbacks in this evaluation. Other setback requirements may be defined in the approved DRMS permit. We assumed that existing oil and gas wells on this site would be plugged and abandoned; therefore, there are no setback considerations for the wells. This project is outside the MHFD boundaries. However, the DRMS considers the MHFD setbacks to be the state of the practice and requires consideration of the setbacks for all new mines regardless of location.

The MHFD published the *Technical Review Guidelines for Gravel Mining & Water Storage Activities* (*Guidelines*), dated January 2013. The *Guidelines* establish setbacks from the riverbank using a table that accounts for the stabilized areas and river alignment type.

There are three river alignment types listed in the *Guidelines*: Unstable, Master Plan, and Minimum Maintenance. The river alignment type for the South Platte River at the Riverbend Mine, if it were within MHFD boundaries, would be classified as Unstable. This classification reflects that this reach of the river is not classified as Minimum Maintenance or Master Plan and does not reflect actual potential for bank instability. Minimum Maintenance and Master Plan reaches are reserved for areas within the MHFD boundary.

Different minimum offsets from the riverbank are allowable depending on the areas that are stabilized, as summarized below:

- Pit-side Protection – 300 feet
- Riverbank Protection – 250 feet
- Riverbank and Pit-side Protection – 150 feet

We evaluated each of the protection scenarios for this analysis.

CONCEPTUAL LAYOUTS

Exhibit 2, enclosed, illustrates recommended stabilization areas, based on the field estimated riverbank location and height, the existing topographic survey of the site, regulatory offset requirements, and property line considerations. Stabilization recommendations for riprap, bedding, and side slopes are based on Figure 1 (Figures 2.2 from the Guidelines) and Figure 2 (Figure 2.5 from the *Guidelines.)*

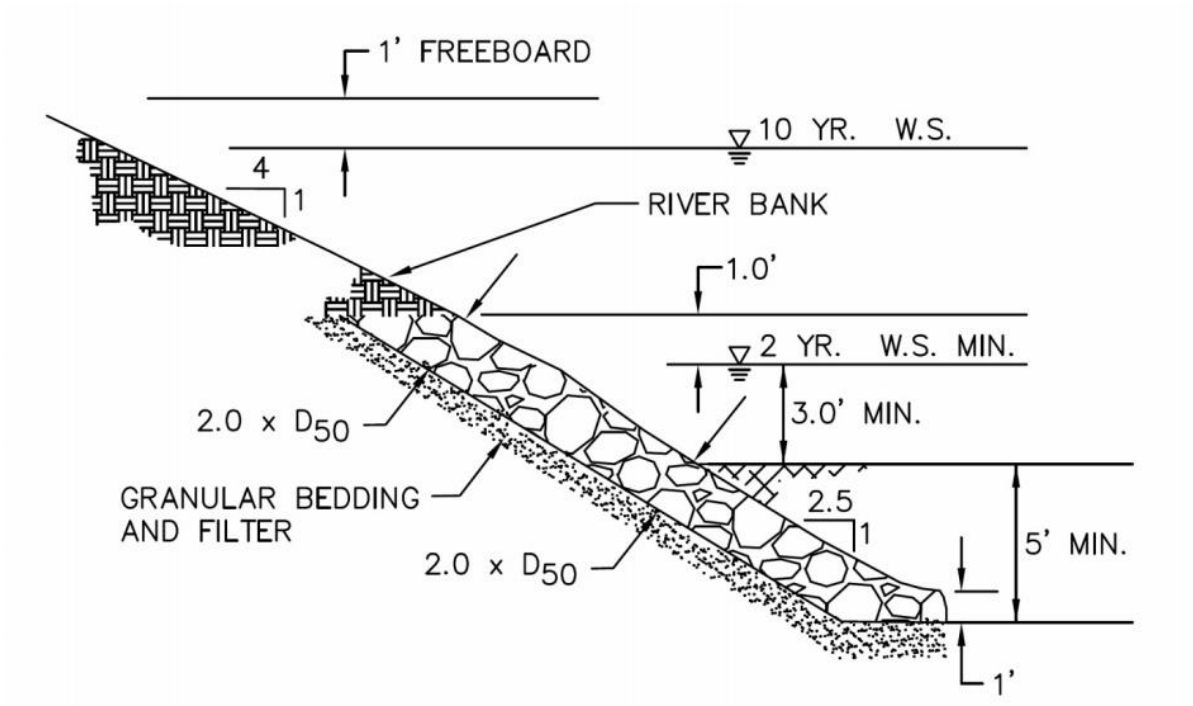

Figure 1: Mile High Flood District Riprap Slope Protection for Riverbank Stabilization (Figure 2.2, Guidelines)

As explained below and shown in Figure 1, buried riprap or seeding is not required for riverside stabilization for this site.

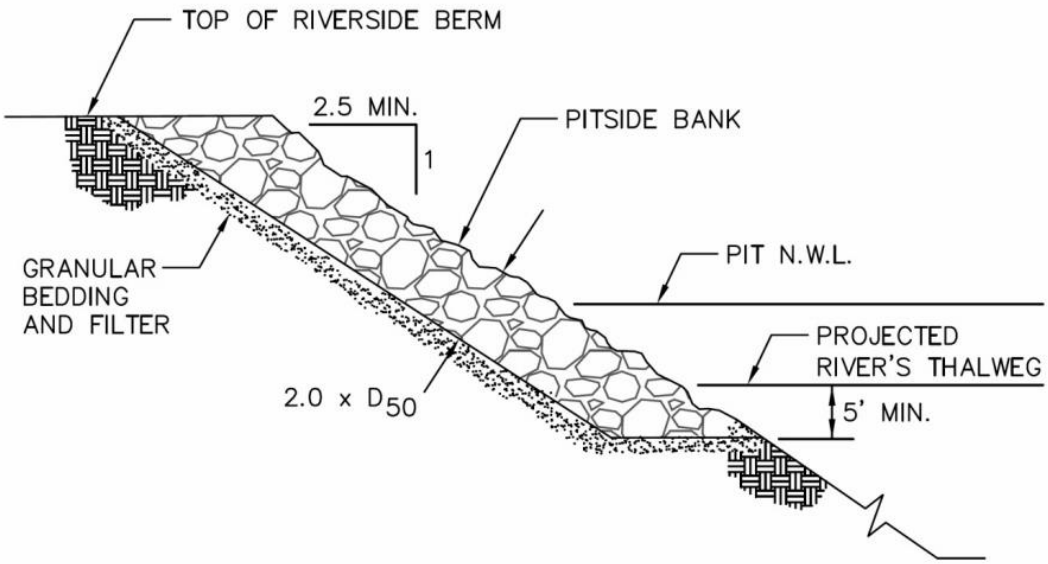

Figure 2: Mile High Flood District Riprap Slope Protection for Pit-side Stabilization (Figure 2.5, Guidelines)

Existing grade elevations for the top of the riverbank and the top of the pits were estimated from the topographic survey of the site. The average pit height was estimated based on the existing ground elevation from the topographic survey at the 150-foot and 300-foot offsets and the estimated river thalweg elevation. The height of the riverbank was estimated based on the top of the riverbank elevation and the estimated river thalweg elevation.

Tetra Tech used the topographic data for the previous Riverbend Mine FHDP applications. This data was supplied by the Farnsworth Group of Denver in June 2005. The vertical datum used was NAVD 88. Riverbank location was field located as described in the *Site Visit and Bank Evaluations Results* section above. The elevation of the river thalweg was estimated utilizing elevations of the top of the riverbank based on the topographic survey of the existing site and the observations from the May 1, 2020 field visit.

Tetra Tech also examined the hydraulic model that was prepared for the Weld County Flood Hazard Development Permit (FHDP) to estimate the 2-year water surface elevation. We determined that this model was not suitable to estimate the 2-year water surface elevation because there is insufficient low-flow channel data for the model to calculate it. This is due to the limitations of aerial topographic survey technology where no elevation data is obtained below a water surface. This limitation causes the hydraulic model to neglect the hydraulic capacity in the low-flow river channel and calculate water surface elevations much higher than expected. For Riverbend, this modeling limitation calculated 2-year water surface elevations that inundated Cell 1.

The 2-year water surface is a component of the riverbank protection used to determine the top of protection elevation. We do not anticipate the regulating agencies requiring fill to achieve the minimum top of protection elevation as shown in MHFD Figure 1. MHFD Figure 1 indicates that riprap should be installed from 5 feet below the river thalweg to a minimum of one foot above the 2-year water surface elevation for riverbank stabilization. For this analysis, it was assumed that riprap would be installed from 5 feet below the river thalweg to the top of the riverbank for riverbank stabilization.

USACE PERMITTING

The construction of riverbank stabilization may take place within jurisdictional waters. Work within jurisdictional waters will require permitting with the U.S. Army Corps of Engineers (USACE) pursuant to Section 404 of the Clean Water Act. Broadly, there are two types of permits that allow bank stabilization work within jurisdictional waters: a Nationwide Permit (NWP) or an Individual Permit (IP). We have assumed that pit-side stabilization and mining will not impact jurisdictional waters.

Prior to an application for an NWP or IP from the USACE, a wetland and other Waters of the U.S. delineation must be conducted to establish horizontal boundaries of jurisdictional waters. The total impacts of the proposed improvements on jurisdictional waters would be estimated using the delineated boundaries. The 2005 USR map shows the extents of jurisdictional waters at the time of preparation; however, the current boundaries of the jurisdiction waters are expected to have changed since 2005 and would not be suitable to use for impact analysis. Once the jurisdictional waters boundaries and total impacts have been estimated, a scoping meeting with the USACE would be conducted to discuss the project and confirm the appropriate process.

Significant changes in jurisdictional waters regulations are occurring. The USACE revised and implemented new Waters of the U.S. rules, reducing the types of streams and wetlands regulated under the rules. The State of Colorado is developing its own similar rules establishing State jurisdiction of streams and wetlands no longer regulated by the USACE. In general, USACE rules will apply to intermittent or perennial surface waters and wetlands with a surface water connection to a jurisdictional stream. State rules may apply to ephemeral waters and wetlands without a surface water connection to a jurisdictional stream. State rules have not been finalized, so the types of State-regulated waters may change. The State has set a target implementation date of July 2022. Until State rules become effective, certain waters are now considered non-jurisdictional. Prior to work within previously regulated waters, Tetra Tech recommends applying for an approved jurisdictional determination (AJD) from the USACE to confirm non-jurisdictional status.

Nationwide Permits

Many different NWPs pre-authorize a single type of activity within jurisdictional waters. Tetra Tech reviewed the language of *NWPs 13 (Riverbank Stabilization), 27 (Aquatic Habitat Restoration, Enhancement, and Establishment Activities), 44 (Mining),* and *33 (Temporary Construction, Access, and Dewatering)*. Each of the Nationwide Permits includes specific maximum thresholds for disturbance amounts. Once exceeded by the proposed work, the construction is no longer covered by the NWP and an Individual Permit (IP) is required. It is possible to gain the approval of an NWP for initial work and approval of an IP for a subsequent Project. The thresholds for NWPs and IPs would consider the cumulative impacts of multiple projects. As described in the sections below, it is unlikely an initial project would qualify for an NWP. The full text of each NWP can be found here.

NWP 13 (Riverbank Stabilization) allows for up to 500 LF of riverbank improvements as long as the protection is less than 1 cubic yard of material per running foot. The district engineer can waive these requirements. The length of possible improvements along Cell 1 exceeds 500 LF in total. The total estimated cross-section also exceeds 1 cubic yard of material per running foot. Riparian wetlands likely occur along the streambank and are a special aquatic site. An exception would be required for riverbank stabilization in wetlands.

NWP 27 (Aquatic Habitat Restoration) can be considered for use. However, this permit is normally reserved for environmental improvements to aquatic habitat. The primary argument that could be made here is that the concrete rubble within the river would be removed. Since other NWPs are more closely related to the proposed work, we expect that the USACE would likely favor the other Nationwide Permits.

NWP 44 (Mining) allows for impacts that do not cause the loss of greater than 1/2-acre of non-tidal wetlands. For mining activities involving discharges of dredged or fill material in non-tidal open waters, the mined area, including

permanent and temporary impacts due to discharges of dredged or fill material into jurisdictional waters, must not exceed 1/2-acre. In addition, discharges must not cause the loss of more than 300 linear feet of stream bed.

The proposed project is expected to exceed these thresholds; however, there is potential the USACE would not interpret all areas of disturbance as a loss of wetlands, the mined area would not intersect the South Platte River, and the USACE would likely not interpret all riverbank stabilization activities as losses of stream bed. Therefore, there is potential that bank stabilization activities could be authorized under NWP 44, depending on USACE determinations, the precise location of jurisdictional boundaries, and final design.

NWP 33 (Temporary Construction, Access, and Dewatering) authorizes temporary dewatering of construction sites, provided the riverbank stabilization activities are authorized by the USACE. NWP requires that any temporary disturbance areas associated with dewatering are returned to preconstruction conditions following the construction activities.

Wetland delineation activities and preparation of a wetland delineation report and request for authorization to work under an NWP could be prepared and submitted to the USACE in approximately six weeks. Delineations must be performed within approximately May-September in Colorado (the growing season) to be accepted by the USACE. The USACE will render a decision within approximately 60 days of submittal of a complete NWP request. All activities authorized under an NWP must follow Colorado Regional Conditions and NWP General Conditions which require documentation that demonstrates compliance with the Endangered Species Act and Section 106 of the National Historic Preservation Act.

Regional General Permits

Regional General Permits (RGPs) pre-authorize activities within jurisdictional waters within Colorado. The full text of these permits can be found here. The Project would not comply with RGP-7-DEN because it is not located within the jurisdiction of the MHFD.

RGP 37-DEN for Stream Stabilization Projects in Colorado requires that the activity is no more than 1,000 feet in length along the riverbank, the activity will not exceed an average of two cubic yards per running foot as measured along the length of the treated bank, and the activity will not exceed 0.5 acres of permanent impacts to wetlands. The district engineer can waive the requirement for two cubic yards per running foot. Depending on USACE determinations, the precise location of jurisdictional boundaries, and final design, bank stabilization activities could potentially be authorized by RGP 37. Like the NWPs, bank stabilization activities are expected to exceed these thresholds. RGP 37 has its own set of general conditions outlined in the permit including documentation that demonstrates compliance with the Endangered Species Act and Section 106 of the National Historic Preservation Act.

Individual Permit

An IP authorizes projects within jurisdictional waters which will exceed impacts designated NWPs. The USACE is required under the National Environmental Policy Act (NEPA) to consider environmental impacts before issuance of an IP in either an Environmental Analysis (EA) or an Environmental Impact Statement (EIS). The USACE would likely be able to determine whether the IP would require an EA or EIS during an initial scoping meeting based on the level of anticipated environmental effects.

Of the two processes, the EA would require less time and expense. Review of an IP application and associated EA by the USACE requires an analysis of alternatives and lasts approximately one year, assuming the USACE requires only minor revisions to the project and associated documentation. The USACE will solicit public comment as part of the review. This process is reserved for projects that do not have significant environmental impacts, which is at the USACE's sole discretion.

The USACE would require preparation of an EIS if the Project will cause significant environmental effects. Review of an IP application and associated EIS is a lengthy process that can last 1-4 years or more. Similar to the preparation of an EA, an EIS requires an analysis of alternatives and public comment. In this Project's case, an EIS alternatives analysis would likely evaluate an increase in the riverbank buffer. An EIS process is likely to receive a high volume of negative public comment.

If an Individual Permit is preferred, we recommend that the entire Riverbend Mine be permitted at once instead of separate permits by cell other subdivision of the mine. A single USACE IP is preferable to multiple permits from both a cost and scheduling standpoint.

Mitigation Requirements

Mitigation requirements vary on a project-by-project basis. The current reclamation plan for the mine includes some areas where wetlands may be mitigated on-site. The total mitigation area required by the USACE for any process may be incorporated into these mitigation banks that have already been set aside.

Alternatively, mitigation banks may be available for Martin Marietta to purchase credits or otherwise contribute funding. Mitigation bank availability will vary as projects are proposed or completed. The typical cost to contribute to a mitigation bank varies; however, similar projects may budget $100,000 per acre.

Permitting Costs

Permitting costs will vary by the USACE process that is ultimately selected.

OTHER PERMITTING AND AGENCY REQUIREMENTS

The Riverbend Mine is located within the mapped FEMA floodplain and floodway for the South Platte River. Work within the mapped floodplain may require Weld County and FEMA review of the proposed project for fill placed for Riverside Stabilization.

Weld County may require a Flood Hazard Development Permit for work within the mapped FEMA floodplain. This permit application is used to demonstrate that a proposed project has impacts that do not exceed FEMA requirements. The Weld County review process takes approximately 6 months. Adverse impacts, such as increases in water surface elevation on adjacent landowners are allowed under Weld County and FEMA regulations. However, Martin Marietta is responsible for damages caused by water surface elevation increases associated with the project.

Work within the regulatory floodway may also require a FEMA Conditional Letter of Map Revision (CLOMR). A CLOMR is a report similar to the Weld County FHDP that presents the project to FEMA to evaluate the impacts on the floodplain and floodway. An alternatives analysis to mitigate increases in water surface elevations is required for a CLOMR request. The review time for a CLOMR is approximately one year from the time of submittal.

A Letter of Map Revision (LOMR) would be required after the completion of construction activities. This LOMR would be based on the as-constructed conditions of the improvements. The review time for a LOMR is approximately one year from the time of submittal.

RISK CONSIDERATIONS

The stabilization measures described in this evaluation should not be considered infallible. Flooding is dynamic and destructive. For any flood, unpredictable changes can occur within a river with unforeseeable results. The stabilization measures are only intended for normal river flows and minor flooding events. The stabilization measures will not prevent flooding of the mine or destruction of equipment.

This evaluation was limited to areas that are subject to the setback requirements as shown on the approved DRMS maps. The secondary channel where flooding occurred in 2015 is not subject to the setback requirements because it is not located along the main channel of the river

Sincerely,

TETRA TECH

Jeffrey Butson, P.E.
Senior Engineer

Enclosures: Exhibit 1 – Riverbend Mine – Cell 1, Riverbank Alignment
Exhibit 2 – Riverbend Mine – Cell 1, Preliminary Riverbank and Pitside Protection Evaluation

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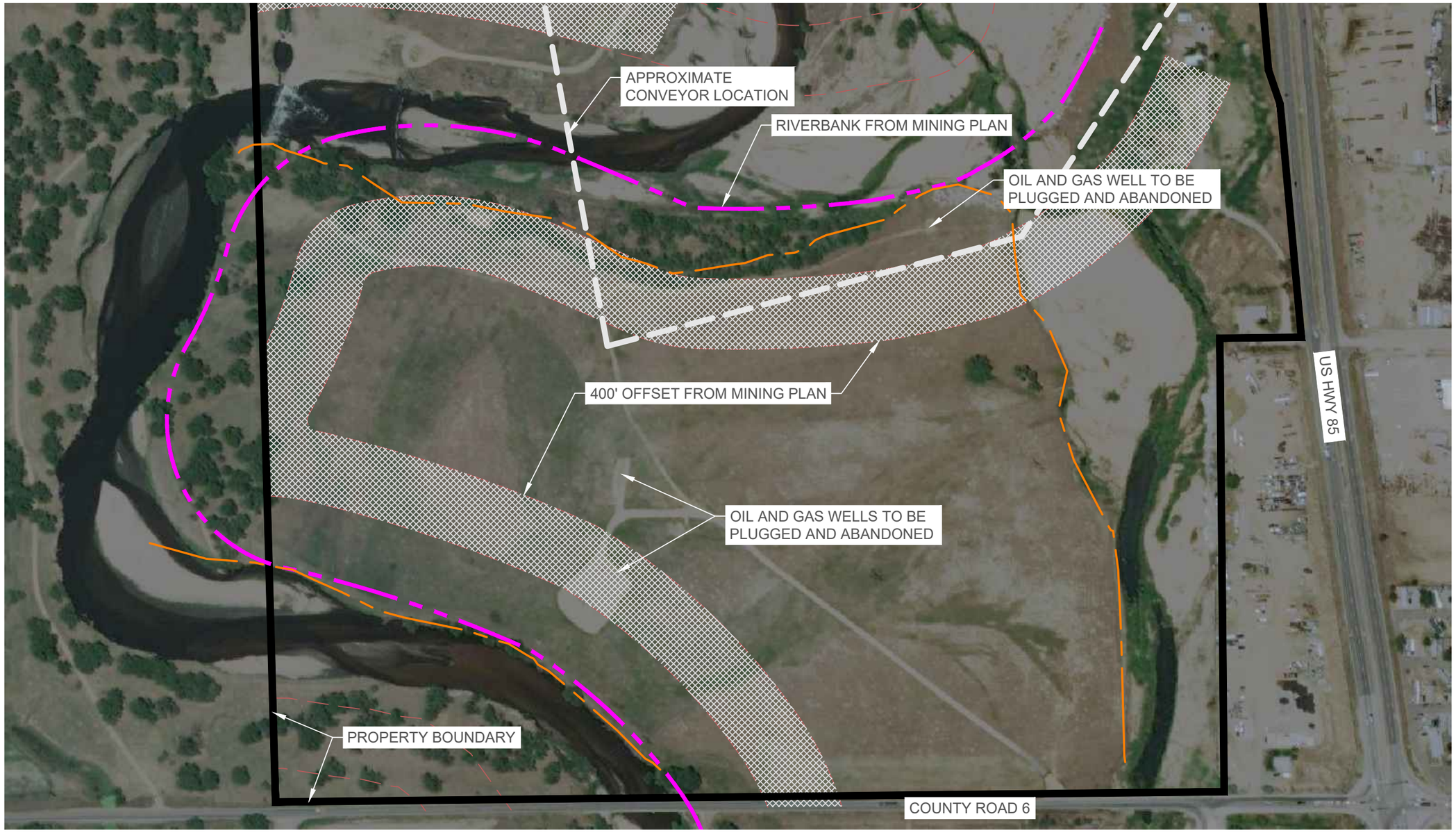

LEGEND

RIVERBANK ALIGNMENT (MAY 1, 2020 FIELD VISIT)

0 150' 300'

SCALE: 1" = 300'

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MARK	DATE	DESCRIPTION	BY

MARTIN MARIETTA MATERIALS

RIVERBEND

RIVERBEND MINE - CELL 1
RIVERBANK ALIGNMENT

PROJ:	117-8741001
DESN:	KKJ
DRWN:	JJA
CHKD:	JAB

EXHIBIT 1

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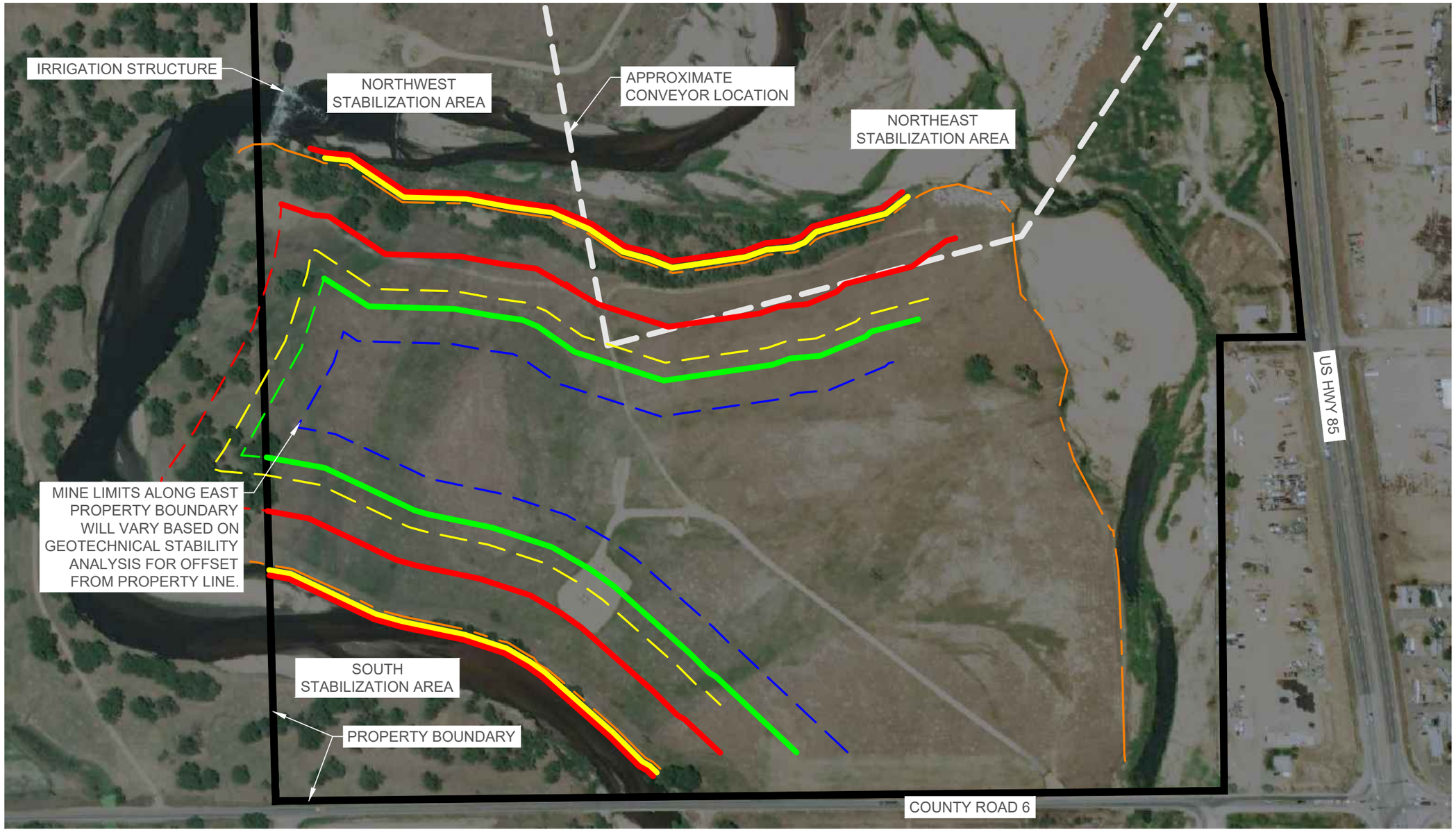

LEGEND

- RIVERBANK ALIGNMENT (MAY 1, 2020 FIELD VISIT)
- 150 FOOT OFFSET - RIVERBANK AND PIT STABILIZATION
- 250 FOOT OFFSET - RIVERBANK STABILIZATION
- 300 FOOT OFFSET - PIT STABILIZATION
- 400 FOOT OFFSET - NO STABILIZATION REQUIRED

APPROXIMATE RECOMMENDED STABILIZATION AREAS BASED ON SETBACK REQUIREMENTS

- 150 FOOT OFFSET - RIVERBANK AND PIT
- 250 FOOT OFFSET - RIVERBANK
- 300 FOOT OFFSET - PIT

N

0 150' 300'

SCALE: 1" = 300'

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MARK	DATE	DESCRIPTION	BY

MARTIN MARIETTA MATERIALS

RIVERBEND

RIVERBEND MINE - CELL 1
PRELIMINARY RIVERBANK AND
PITSIDE PROTECTION EVALUATION

PROJ:	117-8741001
DESN:	KKJ
DRWN:	JJA
CHKD:	JAB

EXHIBIT 2

Bar measures 1 inch, otherwise drawing is not to scale

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