APPENDIX J
COMPENSATORY MITIGATION

ASARCO LLC
RIPSEY WASH TAILINGS STORAGE FACILITY

REVISED
CLEAN WATER ACT SECTION 404 CONCEPTUAL MITIGATION PLAN

Prepared for:

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TABLE OF CONTENTS

TABLES

FIGURES

(*follow text*)

APPENDICES

1. INTRODUCTION AND BACKGROUND

1.1. DOCUMENT PURPOSE AND ORGANIZATION

ASARCO LLC (Asarco or the Applicant) has identified the need for additional tailings storage to support ongoing mining operations at the Ray Mine in Pinal County, Arizona (***Figure 1***). The construction of a tailings storage facility (the Project) will require the discharge of fill material to surface drainage features that are considered waters of the United States (waters of the U.S. or waters) by the U.S. Army Corps of Engineers (Corps).

Asarco has identified the Ripsey Wash Tailings Storage Facility (TSF) as its proposed action in its Clean Water Act (CWA) Section 404 permit application to the Corps (Corps File No. SPL-2011-1005-MWL). As part of CWA Section 404 individual permit requirements for discharge into waters, a Mitigation Plan must be prepared in accordance with the Corps' and the U.S. Environmental Protection Agency's "Final Rule for Compensatory Mitigation for Losses of Aquatic Resources" (33 C.F.R. Part 332 and 40 C.F.R. Part 230; published in 73 Fed. Reg. 19594–19705 [April 10, 2008]), hereinafter referred to as the 2008 Mitigation Rule. This Conceptual Mitigation Plan has been prepared to describe Asarco's proposed mitigation as part of CWA Section 404 individual permit requirements. Asarco has coordinated with the Corps to identify the mitigation opportunities presented in this Conceptual Mitigation Plan, and a final Mitigation Plan in compliance with the 2008 Mitigation Rule will be completed based on the concepts identified in this plan. Asarco proposes both Applicant-sponsored mitigation in the Lower San Pedro River corridor and the purchase of credits from the Lower San Pedro River Wildlife Area (LSPRWA) In Lieu Fee Project.

This Conceptual Mitigation Plan is presented in three sections: ***Section 1*** identifies the document's purpose and organization, introduces the Project, and summarizes Project impacts to Waters; ***Section 2*** provides a description of the mitigation goals, including avoidance and minimization, compensatory mitigation, and other aquatic resource conservation measures that will provide functional benefits; ***Section 3*** outlines the site-specific conceptual plans for each proposed Applicant-sponsored mitigation area, identifies the expected outcome, success criteria, and implementation plan for each site, and describes the proposed long-term site protection and management measures to be implemented; and ***Section 4*** provides an overview of the LSPRWA In Lieu Fee Mitigation Project.

1.2. PROJECT DESCRIPTION

The proposed Ripsey Wash TSF is located approximately 4 miles south of the Ray Mine Complex, south of the Gila River, on lands currently owned and managed by the Arizona State Land Department that the Applicant is seeking to acquire. The Project will encompass approximately 2,636 acres (ac), nearly all of which will be located south of the Gila River. (The only facilities north of the Gila River will be pipelines and associated facilities for the transport of tailings and reclaimed water.)

The Applicant plans to employ conventional tailings deposition at the location of the proposed TSF. The TSF is proposed for development within Ripsey Wash and unnamed tributaries. It would be built with

cyclone centerline and upstream construction methods. A diversion embankment would be constructed to divert flows around the facility to the west to Zelleweger Wash and to the east to an unnamed ephemeral wash.

The Project includes tailings and reclaim water pipelines that would follow a gravity alignment north of the Gila River and run beside the Florence-Kelvin Highway south of the river. The pipelines would cross the Gila River on a bridge to be constructed immediately upstream of the Florence-Kelvin Highway bridge constructed by Pinal County. The Project also includes a power line for project-related infrastructure placed along the proposed pipelines; a proposed drain down pond and associated infrastructure north of the Gila River; the realignment of a portion of the existing Florence-Kelvin Highway; the realignment of a portion of the existing San Carlos Irrigation Project power line; and the realignment of a portion of the Arizona Trail.

1.3. JURISDICTIONAL IMPACTS

The development of the Ripsey Wash TSF Project included a substantial effort to avoid and minimize impacts to waters of the U.S. as outlined in the 404(b)(1) alternatives analysis prepared for the project[1]. ***Table 1*** summarizes the unavoidable impacts to waters of the U.S. that would result from the construction of the Project.

Table 1. Ripsey Wash Tailings Storage Facility Project Impacts to Waters

Impact Type	Acreage
Direct impacts to ephemeral flows	130.91
Dewatered ephemeral flows	3.74
Total	**134.65**

The Project is expected to result in direct impacts to 130.91 ac of ephemeral waters. An additional 3.74 ac of ephemeral waters will be cut off from upstream flows (these are hereinafter referred to as "dewatered" drainages). The proposed project will not adversely impact any special aquatic sites (including wetlands) or any perennial or intermittent waters.

To facilitate mitigation planning, impacted drainages within the Project area were grouped into three different classes; each is described below.

Ephemeral Class 1 – This class consists of very large, wide, ephemeral drainages which, within the Project footprint, are limited to the main channel of Ripsey Wash. Drainages within this class have a median width of 180 feet (ft) and an average width of 167 ft.

[1] WestLand Resources, Inc. 2017. Alternatives Screening and Clean Water Act Section 404(b)(1) Alternatives Analysis. Prepared for Corps File No. SPL-2011-1005-MWL. Dated November 22, 2017.

Ephemeral Class 2 – This class consists of relatively smaller drainages in comparison to Ephemeral Class 1. Ephemeral Class 2 drainages within the Ripsey Wash site include the larger tributaries of Ripsey Wash and another unnamed ephemeral channel that drains toward the Gila River. Drainages within this class have a median width of 35 ft and an average width of 60 ft.

Ephemeral Class 3 – This class consists of headwaters and relatively smaller drainages in comparison to Ephemeral Class 2 drainages. Ephemeral Class 3 drainages within Ripsey Wash are in the upper parts of the watershed and may drain into Class 2 or Class 1 ephemeral drainages. Drainages within this class have a median width of 6 ft and an average width of 10 ft.

The total amount of impacted waters was calculated and determined to be 134.65 ac., all of which are ephemeral. Impacts by drainage class are summarized in ***Table 2***.

Table 2. Impacts to Waters by Impacted Drainage Class

Impacted Drainage Class	Direct Impacts	Dewatered Drainages	Total
Ephemeral Class 1	64.94	3.09	68.03
Ephemeral Class 2	45.37	0.52	45.89
Ephemeral Class 3	20.60	0.13	20.73
Total	**130.91**	**3.74**	**134.65**

For impacts to ephemeral waters associated with the Project, offsite mitigation actions will provide functional gain through the implementation of active management, enhancement, and restoration of rare and valuable riparian zones adjacent to the San Pedro River, a major intermittent system.

2. MITIGATION SITE SELECTION OVERVIEW

2.1. MITIGATION SITE SELECTION AND APPROACH

The 2008 Mitigation Rule identifies general classes of compensatory mitigation and identifies clear preferences among these classes, specifically noting that Mitigation Banking and then In-Lieu-Fee Mitigation are preferred over Applicant-sponsored onsite or offsite mitigation. As a general matter, in-kind mitigation is preferred over out-of-kind mitigation. Asarco considered these general classes of compensatory mitigation from a watershed perspective when developing this Conceptual Mitigation Plan.

There are currently no mitigation banks established in Arizona. The LSPRWA In Lieu Fee Project managed by the Arizona Game and Fish Department (AGFD) is the only approved In-Lieu-Fee mitigation project within the Hydrologic Unit Code (HUC)-6 watershed associated with the Project.,.

The development of the Project design included a substantial effort to avoid and minimize impacts to waters. A number of onsite mitigation measures were incorporated into the Project design to address water quality and quantity functions. These measures include the construction of a detention dam, diversion channel, and piping infrastructure to route any runoff from undisturbed areas above the TSF around the

facility; the installation of energy dissipaters at the outfall locations of the diversion channel and piping; and the installation of monitoring and pump-back wells downstream from seepage-collection points and reclaim ponds.

The Project entails active mining operations requiring the diversion of upstream flows around the TSF and the Project area contains only ephemeral drainage channels with no potential for improvement through restoration. Therefore, no onsite mitigation opportunities exist and habitat functions that will be lost through the development of the Project will be mitigated offsite. The identification of offsite compensatory mitigation options was made after a review of various options within the watershed.

We are aware of no watershed planning efforts for the HUC-6 or HUC-8 watersheds (the watersheds in which the Project is located) that identify specific compensatory mitigation goals for aquatic resources. We have reviewed the Arizona Non-Point Education for Municipal Officials website for watershed plans[2] for the Middle Gila River to gain perspective on the nature of the resources within the watershed, looked at previous Corps mitigation projects associated with the Ray Mine, and reviewed general conservation efforts along the Gila and San Pedro Rivers to inform site selection and plan development.

Asarco has identified four sites located along the San Pedro River (Sites A through D) that are relatively close to the Project (approximately 29 river miles upstream) to compensate for unavoidable project impacts to waters of the U.S. (***Figure 1***). All of these sites are associated with perennial or intermittent aquatic resources, contain or have the potential to support high-value mesoriparian and hydroriparian habitats, and provide regional conservation benefit. The San Pedro River mitigation sites are associated with existing Corps-approved mitigation projects that have been developed in support of previous Corps permitting efforts at the Ray Mine and are contiguous with or near other conservation properties that have been established by the Bureau of Reclamation, the Salt River Project, and the LSPRWA In Lieu Fee Project (***Figure 2***). While the proposed mitigation measures will not create xeroriparian habitat similar to the habitats associated with the ephemeral drainages that will be impacted by the Project, the habitats within the mitigation sites that will be preserved, enhanced, and restored are rarer within the regional landscape and have higher productivity and wildlife values (***Table 3***). Asarco proposes to meet the remainder of its compensatory mitigation obligation through purchase of credits from the LSPRWA In Lieu Fee Project. A more detailed discussion of the proposed mitigation activities is provided in ***Section 3***.

2.2. FUNCTIONAL ASSESSMENT AND DETERMINATION OF MITIGATION RATIOS

The South Pacific Division of the Corps has developed a standard operating procedure for determining compensatory mitigation requirements called a Mitigation Ratio-Setting Checklist (MRSC; U.S. Army Corps of Engineers, South Pacific Division, Special Public Notice 12501-SPD, February 20, 2012). As part of the MRSC, a detailed qualitative functional assessment of the Ripsey Wash Alternative 3 TSF -impacted waters, the proposed Applicant–sponsored mitigation sites, and the LSPRWA In Lieu Fee Project was

[2] NRCS Rapid Watershed Assessment of the Middle Gila River HUC-8 has not been completed (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_064841.pdf; accessed 08272014).

conducted. The MRSC is the basis for the mitigation ratios used in this Conceptual Mitigation Plan (***Appendix A***).

Table 3. Summary of Offsite Mitigation Areas

Mitigation Site	Acreage	Description
Site A – PZ Ranch Northeastern Mesquite Bosque (Preservation)	29.8	Adjacent to an existing Corps mitigation site (***Figures 3 and 4***) and is included within the fenced boundary of that mitigation site. Active management of this site through proposed preservation efforts will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict off-road vehicle access to the site to enhance its riparian habitat values. The existing bosque habitat is second growth and was likely part of an earlier agricultural operation or the mesquite had been harvested for fuel wood or some other purpose. Mesquite bosque habitats were once relatively common and widespread along Arizona's larger rivers and streams, but mature bosque habitat has become relatively rare. The preservation and active management of this site will facilitate the development and maintenance of this habitat.
Site B – PZ Ranch Southern Mesquite Field (Restoration)	28.2	Former agricultural field on the eastern bank of the San Pedro River. This field is within an existing Corps mitigation site. In 1993, the field was planted with containerized mesquite. The portion of this field included here represents excess mitigation area not needed for the original project. The functional values of this site have increased as indicated by a measurable increase in vegetative cover (***Figures 5a and 5b***). The restoration area is part of the San Pedro River riparian corridor and is contiguous with other Corps mitigation sites and conservation areas managed by the Bureau of Reclamation (***Figure 3***).
Site C – PZ Ranch Northwestern Mesquite Field (Restoration)	25.8	Adjacent to an existing Corps mitigation site on the western bank of the San Pedro River (***Figures 3 and 6***) and included within the fenced boundary of that mitigation site. Active management of the site will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict off-road vehicle access to enhance its riparian habitat values. The site is vegetated by patches of native mesquite and an understory of native forbs and shrubs mixed with weedy forbs (***Figure 6***). Portions of the site are associated with prior agricultural practices, and it appears that fuel wood harvesting occurred at some point in the past. Proposed restoration activities will include the control of weedy plant species (principally tamarisk), planting native mesquite trees, and seeding with native plant species. These activities will restore the functional values of the site as a riparian buffer for the San Pedro River.
Site D – San Pedro River Active Floodplain (Preservation)	14.1	Area within the active floodplain of the San Pedro River adjacent to an existing Corps mitigation site on the western bank of the San Pedro River (***Figures 3 and 6***). The dominant vegetation is tamarisk, although cottonwoods are also present. The site will be actively managed to exclude livestock and off-road vehicle traffic to enhance its riparian value.
LSPRWA In Lieu Fee Project	77.06	The LSPRWA ILF project is a single contiguous site and has been categorized as a Resource Category 1 for Wildlife and Wildlife Habitat Compensation by AGFD[3], providing habitat with the highest value to Arizona wildlife. The proposed mitigation actions at the LSPRWA ILF Project will help maintain or restore natural functions along this last remaining undammed river and its associated riparian buffers, which together form an important riparian corridor.

[3] Lowery, Shawn F., Angela Stingelin, and Charles Hofer. 2016. "Conceptual Plan, January 2016, In-Lieu Fee Restoration Project Site Wetland Restoration and Monitoring at the Lower San Pedro River Wildlife Area, Pinal County, Arizona." Phoenix, Arizona: Arizona Game and Fish Department.

3. APPLICANT-SPONSORED MITIGATION SITE-SPECIFIC CONCEPTS

3.1. SAN PEDRO RIVER SITE A (MESQUITE BOSQUE PRESERVATION)

Site A is a 29.8-ac site adjacent to and within the fence constructed for an existing approved Corps mitigation property (***Figures 3 and 4***). The existing bosque habitat is second growth and was likely part of an earlier agricultural operation or the mesquite had been harvested for fuel wood or some other purpose. Measurements of vegetation structure and composition using Total Vegetative Volume[4] along two transects within the site were 1.14 and 2.01 m^3/m^2. These values are substantially greater than measurements taken from riparian habitats within Ripsey Wash, which ranged from 0.08 to 0.68 m^3/m^2. Mesquite bosque habitats were once relatively common and widespread along Arizona's larger rivers and streams, but mature bosque habitat has become relatively rare. The preservation and active management of this site will facilitate the development of mature bosque habitat.

Goal: Active management and protection to provide opportunity for mesquite bosque habitat to mature and develop.

Implementation: The active management of this site through proposed preservation efforts will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict off-road vehicle access to the site to enhance its riparian habitat values. The mitigation goals for the site will be met when a conservation easement is recorded to protect the site in perpetuity. No on-the-ground implementation activities are required.

Establishment Period Activities: Quantitative goals are not proposed. The site will be considered established and successful when the site-protection instrument has been recorded on the property. No establishment period activities are planned.

3.2. SAN PEDRO RIVER SITE B (MESQUITE FIELD RESTORATION)

Site B is a 28.2-ac former agricultural field on the eastern bank of the San Pedro River. This field is part of an existing Corps mitigation site (Corps File No. 1990-4008400-RJD). In 1993, the field was planted with containerized mesquite. The portion of the field included here represents excess mitigation area not needed for the original project. Although managed in conjunction with the mitigation established under that permit, this 28.2-ac parcel ***is not*** part of the required mitigation under that permit.

Since 1993, the functional values of this site have increased as indicated by a visible increase in vegetation on the site (***Figures 5a and 5b***). In addition, based on field studies conducted in 2008, the percent canopy cover of this field has increased from no native plant cover to approximately 47 percent native cover since the 1993 planting.

[4] Mills, G. S., J. B. Dunning, Jr., and J. M. Bates. 1991. The Relationship between Breeding Bird Density and Vegetation Volume. *The Wilson Bulletin*, Vol. 103, No. 3, pp. 468–479.

Goal: The mitigation goal for this site is the restoration of mesquite-dominated riparian habitat. (This has been achieved.)

Implementation: Restoration activities took place at this site in 1993. Most recently, fencing maintenance and repair activities were completed there. This site is within an area that is subject to a management agreement with the AGFD. No further implementation actions are necessary.

Establishment Period Activities: The site is established and no establishment period activities are required.

3.3. SAN PEDRO RIVER SITE C (MESQUITE FIELD RESTORATION)

Site C is a 25.8-ac site adjacent to an existing Corps mitigation site on the western bank of the San Pedro River. The site is vegetated by patches of native mesquite and an understory of native forbs and shrubs mixed with weedy forbs (***Figure 6***). Portions of the site are associated with prior agricultural practices, and it appears that fuel wood harvesting occurred at some point in the past. The site is included within the fencing constructed for the existing adjacent mitigation site. Proposed restoration activities will include the control of weedy plant species (principally tamarisk), planting native mesquite trees, and seeding with native plant species. Active management of the site will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict off-road vehicle access to enhance its riparian habitat values. These activities will restore the functional values of the site as a riparian buffer for the San Pedro River.

Goal: Restoration goals for this site include the establishment of mesquite-dominated riparian habitat that is established and no longer requires supplemental watering and active management and protection to provide opportunity for mesquite bosque habitat to mature and develop.

Implementation: During the development of a final approved mitigation plan, a detailed site inventory and restoration plan will be developed. This plan will identify the existing resources to be protected during restoration activities, any grading or other site stabilization that might be necessary, preferred approaches to irrigation based on engineering constraints and available water rights, and the development of a planting plan.

The mitigation concept anticipates containerized plantings that would be contract-grown in tall pot containers for the Project. Tall pot containers are used because they allow for the cultivation of plants with a large root-to-shoot ratio to facilitate establishment. If practicable, the seed used to grow the trees will be collected from local sources. We anticipate that contract growing will take approximately 9 months. Supplemental irrigation will be used (either gel packs or temporary irrigation from an existing well [#15] located within the adjacent mitigation site). The principal tree species that will be used at this restoration and enhancement site is mesquite, although other trees (ash, hackberry) and shrubs (wolfberry, desert hackberry) will be incorporated into the final planting plan. The anticipated density of tree and shrub plantings within the disturbed/open portions of the site is 100 per acre. Prior to the implementation of any work at the site, desirable stands of native vegetation will be fenced and/or flagged to prevent damage during construction. Once trees and shrubs are planted and suitable irrigation systems and other site

improvements have been completed, the disturbed portions of the site will be seeded with native grasses and forbs to establish an understory.

The implementation period is anticipated to take approximately 1 year.

Establishment Period Activities: During the establishment period, supplemental watering (drip irrigation or gel pack) will be provided, as necessary, and in a manner that allows for the gradual weaning of the planted trees from requiring supplemental watering. The site and plantings will be regularly monitored, and issues that might affect plant health and riparian function will be identified. The existing fence around the site will also be maintained, and the site will be inspected for erosion and undesirable vegetation. Maintenance to address any of these issues will take place as necessary.

3.4. SAN PEDRO RIVER SITE D (ACTIVE FLOODPLAIN PRESERVATION)

Site D (14.1 ac) is within the active floodplain of the San Pedro River (***Figure 6***). The dominant riparian tree species within this area is tamarisk, with cottonwoods and mesquite also present. The site will be actively managed to exclude livestock and off-road vehicle traffic, and to preclude fuel wood harvesting.

Goals: Active management and protection to preserve riparian habitat along the San Pedro River corridor and adjacent to existing Corps-approved mitigation sites.

Implementation: The active management of this site through proposed preservation efforts will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict off-road vehicle access to the site to enhance its riparian habitat values. The mitigation goals for the site will be met when a conservation easement is recorded to protect the site in perpetuity. No on-the-ground implementation activities are required.

Establishment Period Activities: Quantitative goals are not proposed. The site will be considered established and successful when the site-protection instrument has been recorded on the property. No establishment period activities are planned.

3.5. LONG-TERM SITE PROTECTION AND MANAGEMENT AT APPLICANT-SPONSORED SITES A THROUGH D

All of the Applicant-sponsored mitigation parcels will have a suitable site-protection instrument (Conservation Easement or Restrictive Covenant) recorded with the County to provide long-term protection of the conservation objectives outlined here and to comply with the Corps' 2008 Mitigation Rule. The details of the site-protection instrument to be recorded on the mitigation parcels have not been finalized at this time. At PZ Ranch, Asarco has been working with the Corps and the AGFD to develop a Conservation Easement for the existing approved mitigation projects. We anticipate Mitigation Sites A through D will be incorporated into this instrument once the final form of the site-protection instrument has been accepted by the Corps and the AGFD and a permit is issued for the Project. The final Conservation Easement will

include prohibitions on any forms of grazing or other land uses, such as fuel wood harvesting, that are not compatible with maintaining the aquatic functions of the parcel. Some low public uses such as hiking and bird watching or limited types of hunting may be allowed. The Applicant would provide funds for the long-term management by AGFD of the sites pursuant to the Conservation Easement. Should the Conservation Easement not be finalized for any reason, the Applicant would record a restrictive covenant, in a form acceptable to the Corps, over the Applicant-Sponsored mitigation sites.

4. LOWER SAN PEDRO RIVER WILDLIFE AREA IN LIEU FEE PROJECT

For ILF mitigation, Asarco proposes to meet part of its compensatory mitigation obligation through purchase of credits from the LSPRWA In Lieu Fee Project. The Corps prioritizes ILF projects that include a given project's impacts within their service area[5], though the scope and extent of service areas vary depending on the ILF project.

For the AGFD ILF projects, the service areas are established by the USGS Hydrologic Unit Code (HUC) 4 watersheds. The Project is located within the Middle Gila HUC 4 watershed (HUC 1505; **Figure 7**). The LSPRWA is the only AGFD ILF project located within the Middle Gila watershed.

Stretching along approximately 7 miles of the Lower San Pedro River, the LSPRWA ILF Project has the potential to support high-value mesoriparian and hydroriparian habitats, and provide regional conservation benefits. While the mitigation measures proposed within the LSPRWA ILF Project are not focused on the type of xeroriparian habitat associated with the ephemeral drainages to be impacted by the Project, the habitats within the mitigation site that will be preserved, enhanced, and restored are more rare within the regional landscape, have higher productivity, and possess higher wildlife values than the impacted xeroriparian habitats (Lowery, Stingelin, and Hofer 2016). **Table 4** provides a brief summary of the proposed mitigation areas within the LSPRWA ILF Project. A more thorough discussion of the functions and values of the mitigated habitats is provided in **Appendix A**, in support of the determination of mitigation credits.

[5] U.S. Army Corps of Engineers. 2012. "Proposed Re-Authorization of the Existing Arizona Game and Fish Department In-Lieu Fee Program." *SPL-2012-00541-MB*.

Table 4. Description of Mitigation Areas within the LSPRWA ILF Project

Proposed Treatment	Total Acreage	Available Acreage	Description
Riparian Restoration Area	677	675.46	The Riparian Restoration Area of the LSPRWA ILF Project includes approximately 677 acres, adjacent to the San Pedro River (see **Figure 8**). Most of the Riparian Restoration Area is currently composed of river floodplain vegetated by stands of tamarisk. The replacement of tamarisk with native cottonwood, willow, and mesquite will create habitat suitable for native wildlife, including the endangered southwestern willow flycatcher and threatened yellow-billed cuckoo, and maintain these functions during the anticipated die-off of non-native tamarisk when the tamarisk leaf beetle arrives along this reach of the San Pedro River.
Wetland Establishment Area	2	0.98	The Wetland Establishment Area encompasses approximately 2 acres of floodplain adjacent to the San Pedro River (**Figure 8**). The establishment of emergent wetlands in this area will provide a valuable and rare aquatic resource that has the potential to benefit special status species.

5. CONTINGENCY PLAN

The ILF credit requirement of 77.06 credits includes 47.48 advance mitigation credits that are currently available to Asarco for purchase, and 29.58 future project credits that would be released pursuant to the subject LSPRWA In-Lieu Fee Enabling Instrument. Should those 29.58 credits not be available to Asarco as compensatory mitigation for the Project, Asarco would either purchase available ILF credits from another source, or implement additional applicant-sponsored restoration activities on privately owned lands within and adjacent to the Gila River, approximately nine river miles upstream from the Project. The proposed contingency plan will be subject to approval by the Corps and described in detail in the Habitat Mitigation and Monitoring Plan for the Project.

FIGURES

Pinal County
Image Source: 2015 USDA NAIP Orthophoto

WestLand Resources

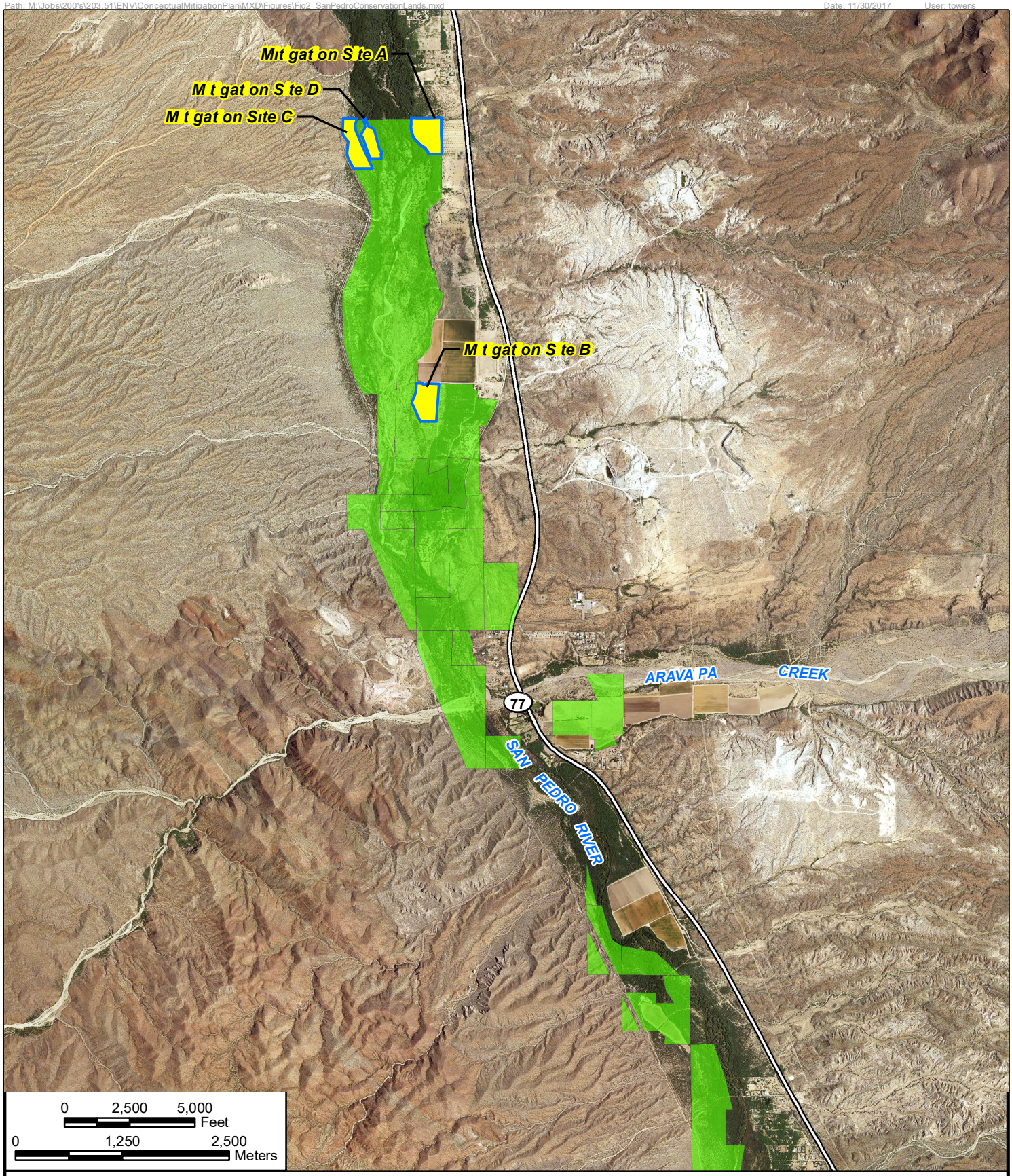
0 2 4 Miles
0 4 8 Kilometers

N

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

LOCATION MAP
Figure 1



Pinal County
Image Source: 2015 USDA NAIP Orthophoto

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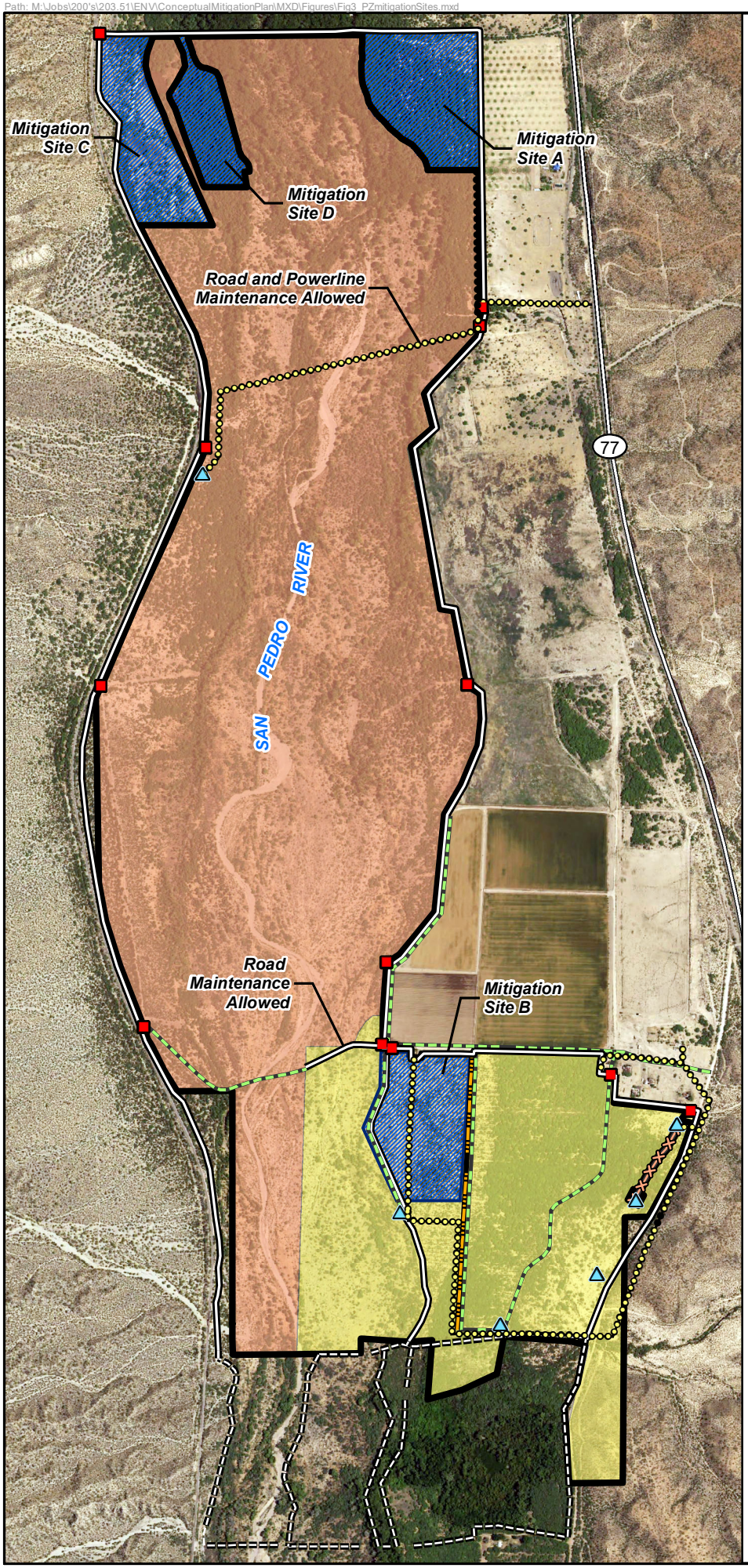
LEGEND

- Mitigation Site Location
- Existing Conservation Lands

ASARCO LLC
Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

CONSERVATION LANDS
ALONG THE LOWER
SAN PEDRO RIVER
Figure 2



N

0 750 1,500 Feet

0 325 650 Meters

Image Source: 2015 USDA NAIP Orthophoto

NOTE: Fence and land ownership boundaries provided by Cardinal Land Surveying.

LEGEND

- PZ Ranch
- PZ-1 Mitigation Lands
- PZ-2 Mitigation Lands
- Available for Future Mitigation
- PZ Ranch Fencing
- Fencing Maintained by Others
- Access Road
- Powerline
- BuriedPowerline
- Irrigation Canal
- Well Location Within Mitigation Lands
- Gate Location

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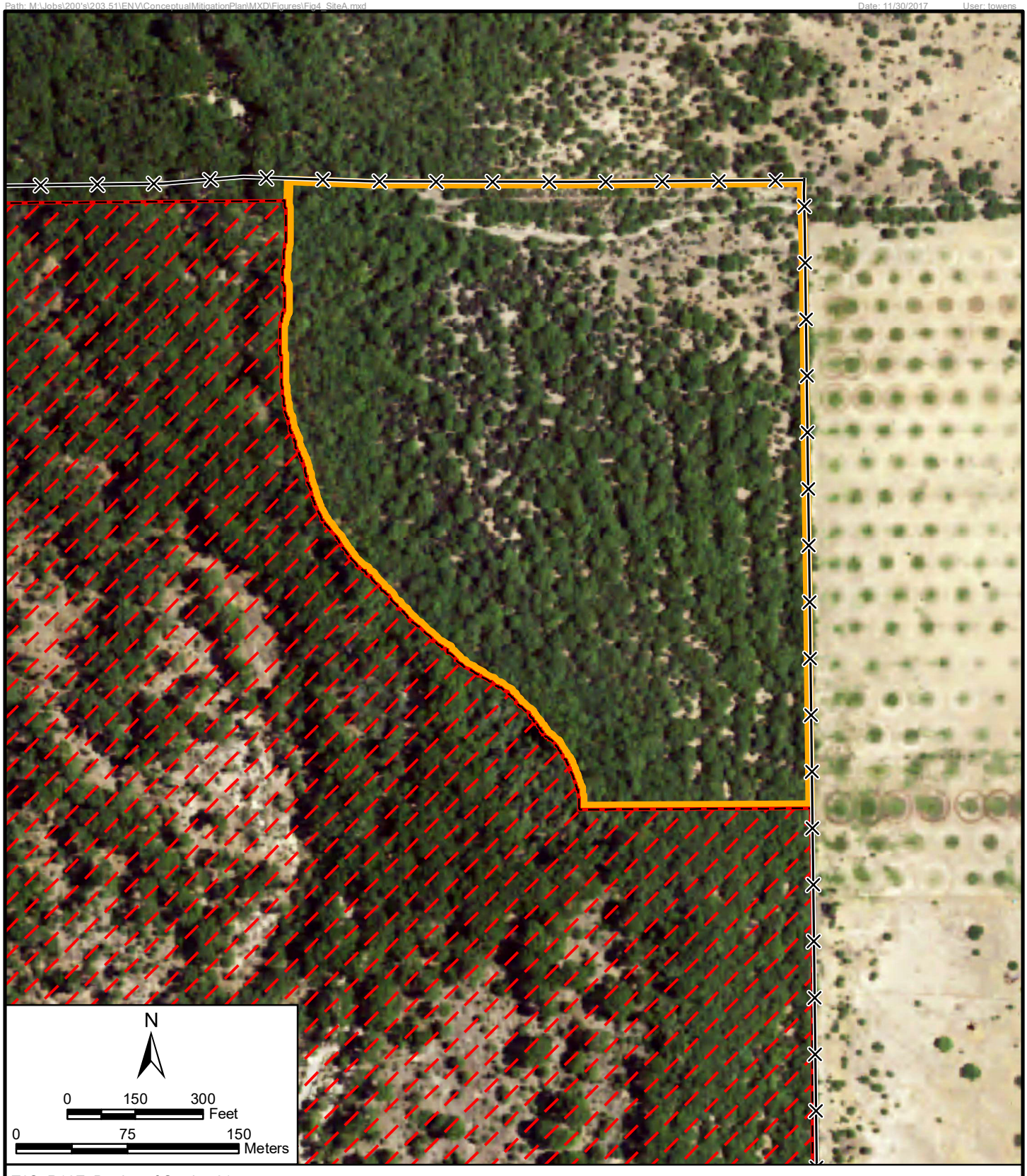
Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

MITIGATION SITES AT PZ RANCH

Figure 3



T6S, R16E, Portion of Section 21,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site A (Mesquite Bosque Preservation)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

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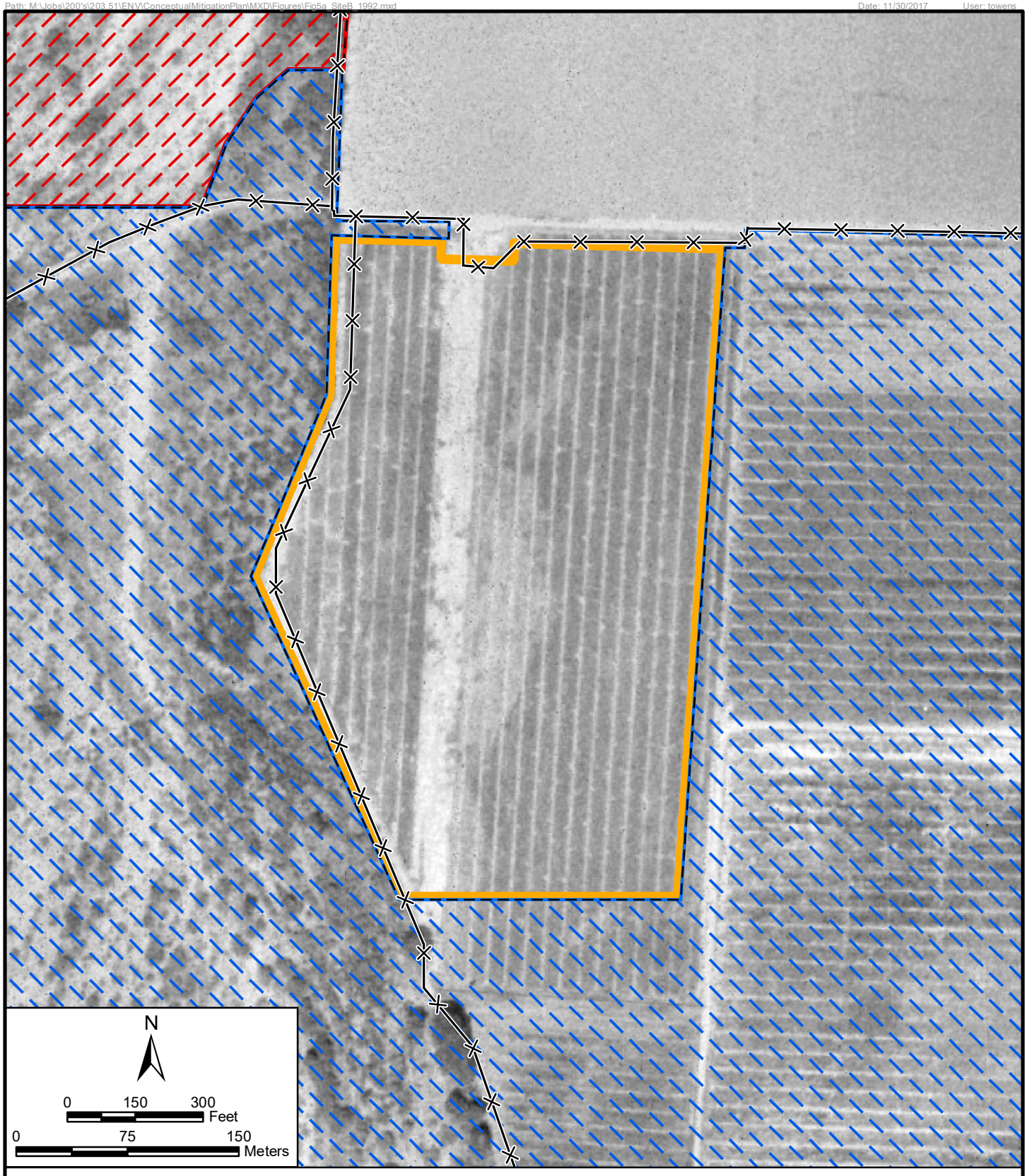
Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

SAN PEDRO RIVER SITE A (PRESERVATION)

Figure 4



T6S, R16E, Portion of Section 33,
Pinal County, Arizona,
Image Source: USGS DOQQ, 1992

LEGEND

- Site B (Mesquite Field Restoration)
- PZ-1 Mitigation Lands (Corps File No. 1990-400-8400-RJD)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

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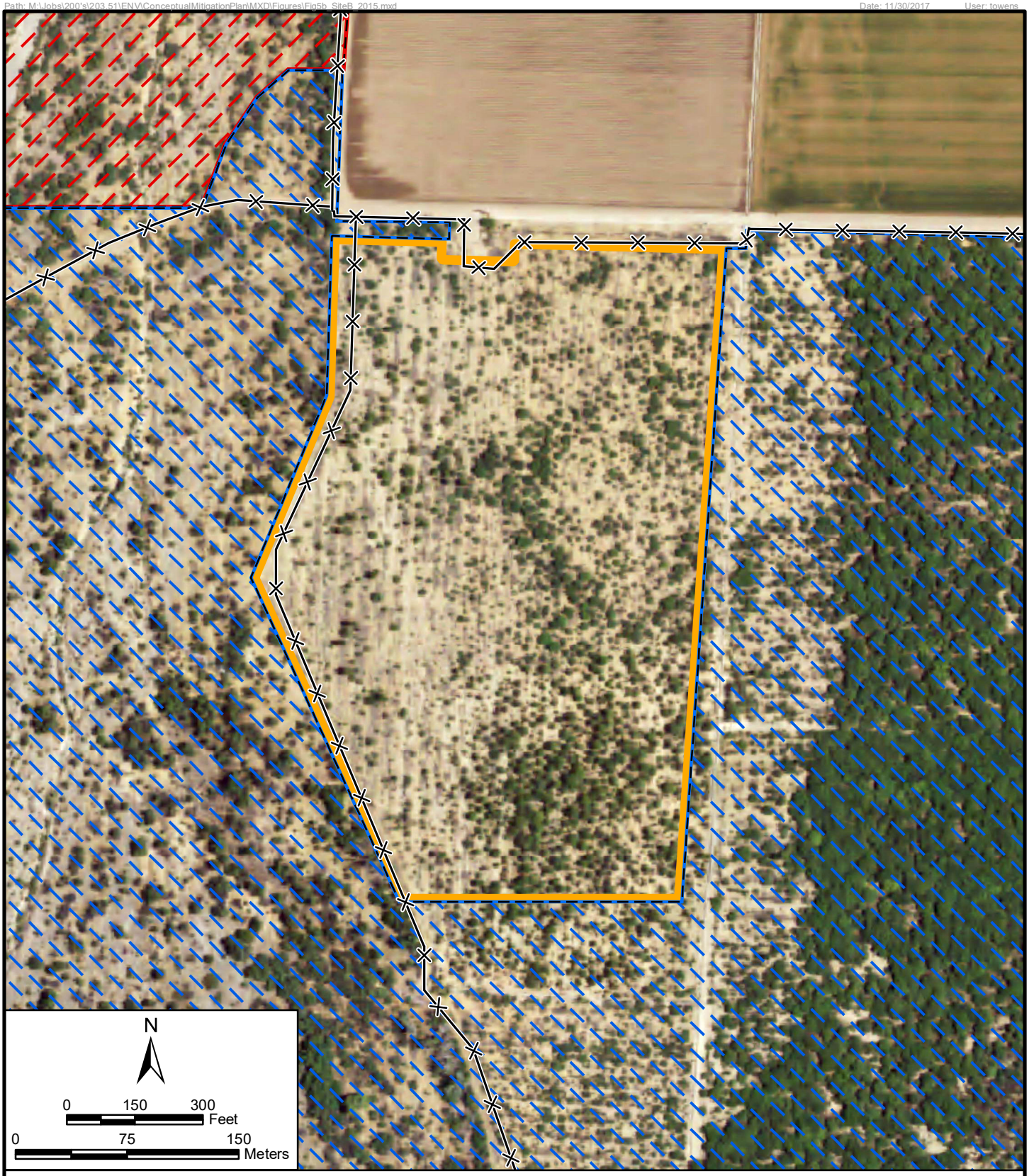
ASARCO LLC

Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

SAN PEDRO RIVER SITE B (RESTORATION) (1992)

Figure 5a



T6S, R16E, Portion of Section 33,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site B (Mesquite Field Restoration)
- PZ-1 Mitigation Lands (Corps File No. 1990-400-8400-RJD)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

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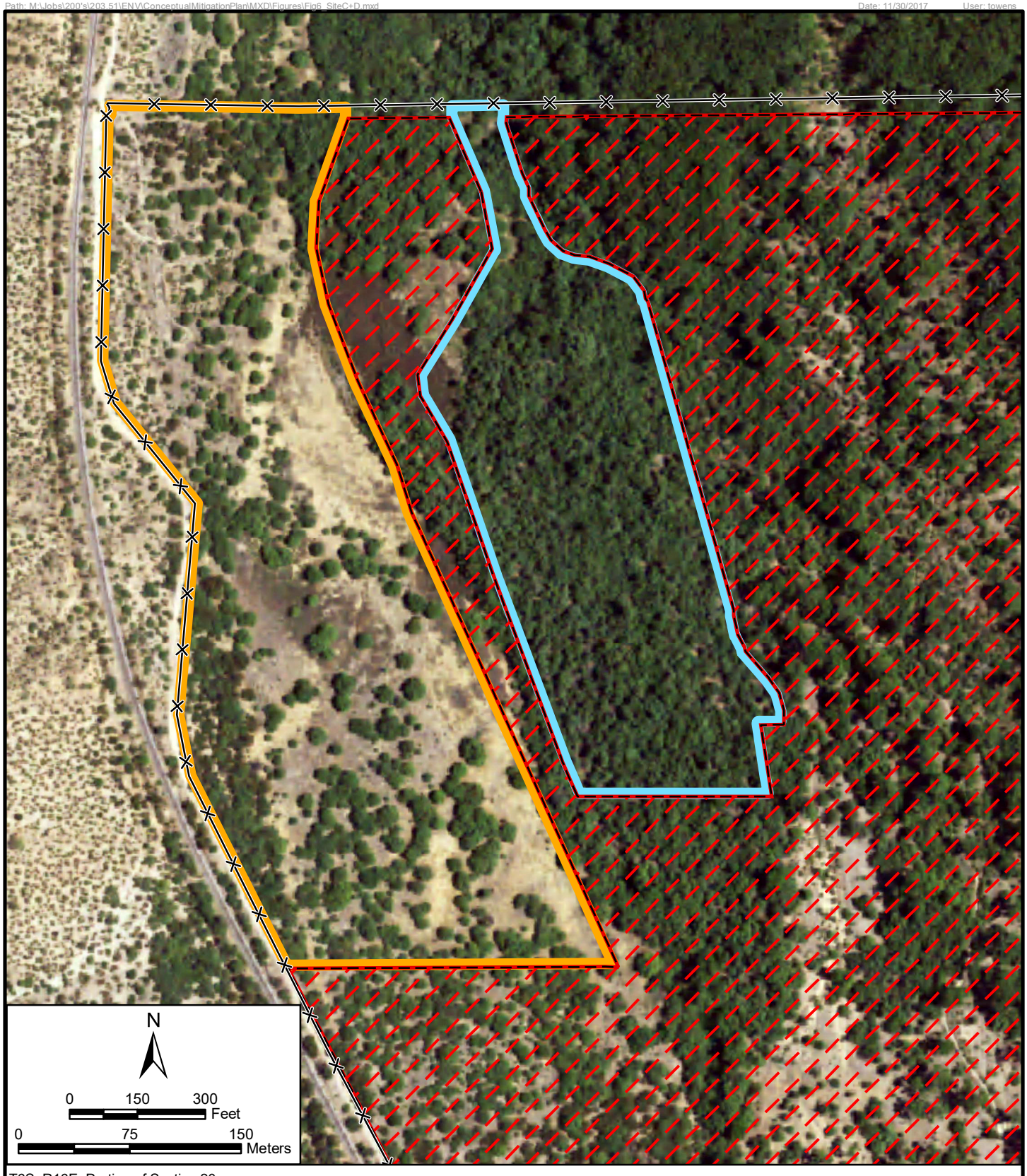
Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

SAN PEDRO RIVER SITE B (RESTORATION) (2015)

Figure 5b



T6S, R16E, Portion of Section 20,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site C (Mesquite Field Restoration)
- Site D (Active Floodplain Preservation)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

SAN PEDRO SITE C (RESTORATION) &
SAN PEDRO SITE D (PRESERVATION)

Figure 6

Path: M:\Jobs\200's\203.51\ENV\ConceptualMitigationPlan\MXD\Figures\Fig7_ProjectServiceArea.mxd Date: 11/30/2017 User: towens

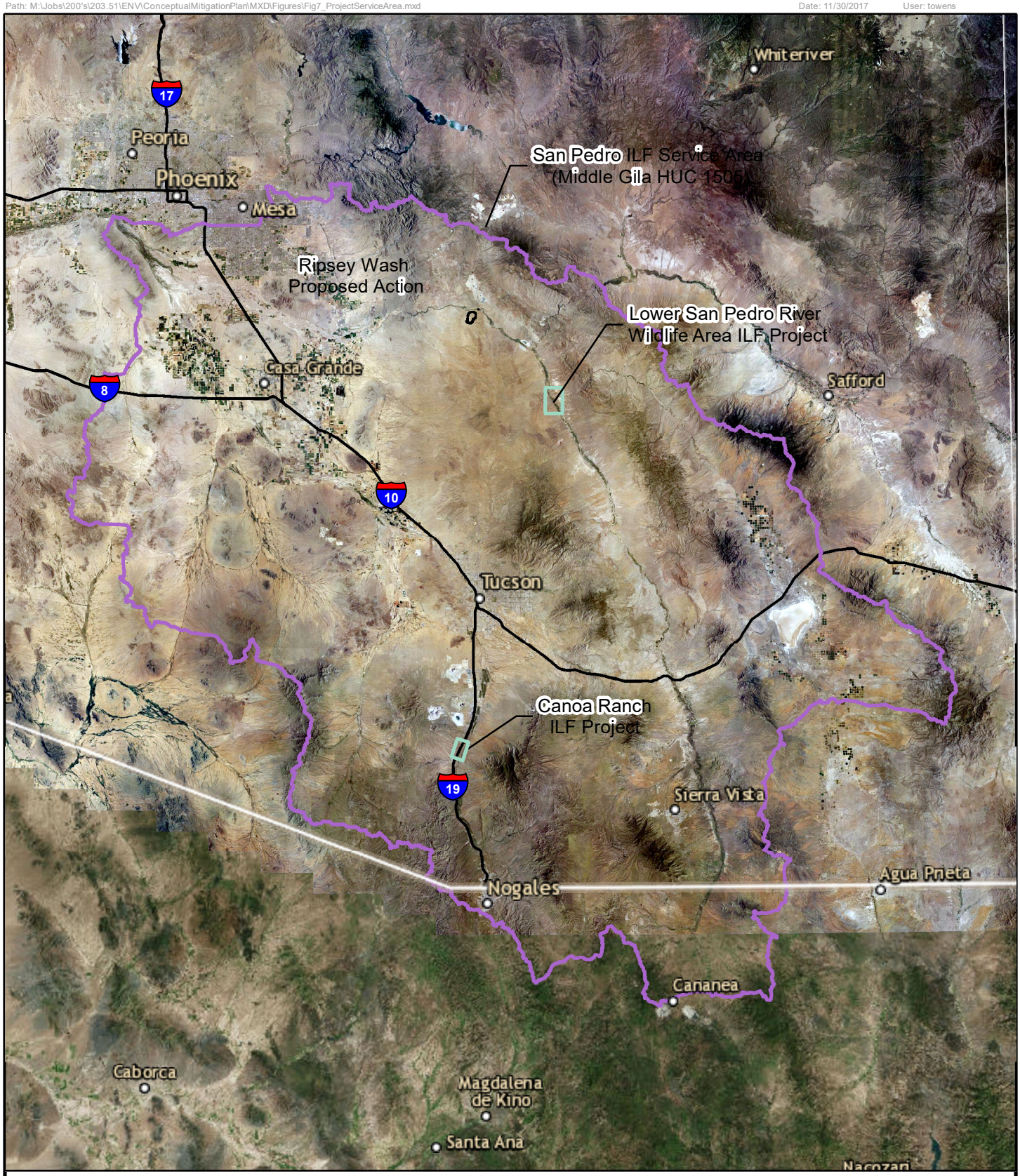


Image Source: 2015 USDA NAIP Orthophoto

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

PROJECT SERVICE AREA

Figure 7

WestLand Resources

0 14 28 Miles

0 28 56 Kilometers

N

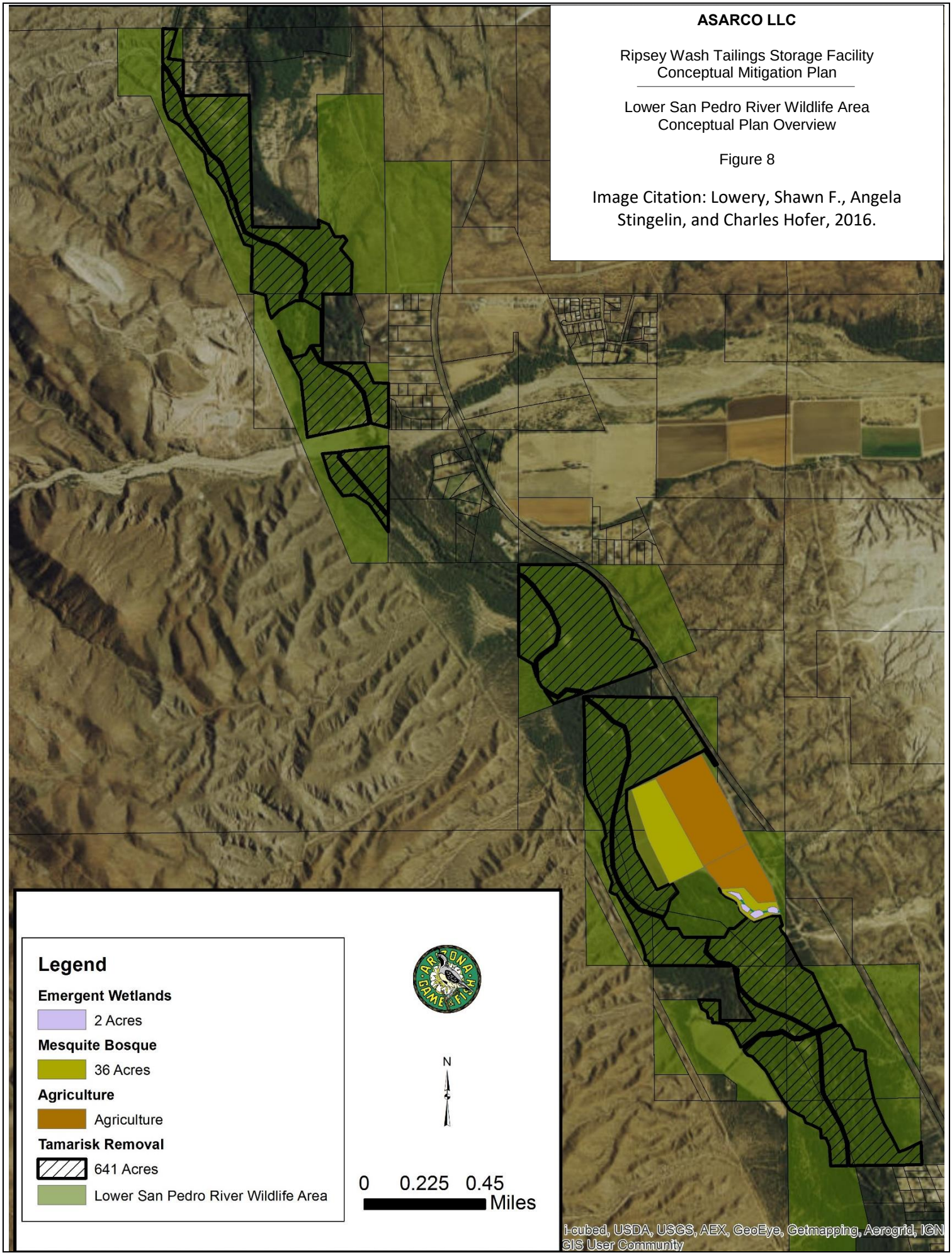
ASARCO LLC

Ripsey Wash Tailings Storage Facility
Conceptual Mitigation Plan

Lower San Pedro River Wildlife Area
Conceptual Plan Overview

Figure 8

Image Citation: Lowery, Shawn F., Angela Stingelin, and Charles Hofer, 2016.



APPENDIX A

ASARCO LLC
RIPSEY WASH TAILINGS STORAGE FACILITY MITIGATION RATIO-SETTING CHECKLIST

RIPSEY WASH TAILINGS STORAGE FACILITY
REVISED
MITIGATION RATIO-SETTING CHECKLIST

ASARCO LLC

Prepared for:

U.S. ARMY CORPS OF ENGINEERS

Prepared by:

WestLand Resources, Inc.
Engineering and Environmental Consultants
4001 E. Paradise Falls Drive
Tucson, Arizona 85712

On behalf of:

ASARCO LLC – RAY OPERATIONS
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Revised February 1, 2018
Project No. 203.51
Corps File No. SPL-2011-1005-MWL

TABLE OF CONTENTS

TABLES

FIGURES

(*follow text*)

APPENDICES

1. INTRODUCTION AND BACKGROUND

1.1. DOCUMENT PURPOSE AND ORGANIZATION

ASARCO LLC (Asarco or the Applicant) has identified the need for additional tailings storage to support ongoing mining operations at the Ray Mine in Pinal County, Arizona (***Figure 1***). The construction of a tailings storage facility (the Project) will require the discharge of fill material to surface drainage features that are considered waters of the United States (waters of the U.S. or waters) by the U.S. Army Corps of Engineers (Corps).

Asarco has identified the Ripsey Wash Tailings Storage Facility (TSF) as its proposed action in its Clean Water Act (CWA) Section 404 permit application to the Corps (Corps File No. SPL-2011-1005-MWL). As part of CWA Section 404 individual permit requirements for discharge into waters, a mitigation plan must be prepared in accordance with the Corps' and the U.S. Environmental Protection Agency's (EPA) *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 C.F.R. Part 332 and 40 C.F.R. Part 230; published in 73 Fed. Reg. 19594-19705 (April 10, 2008)), hereinafter referred to as the 2008 Mitigation Rule. The fundamental objective of the 2008 Mitigation Rule is to establish standardized compensatory mitigation criteria for all mitigation types to offset unavoidable impacts to waters authorized through the issuance of a CWA Section 404 permit. The South Pacific Division of the Corps has developed a standard operating procedure in the form of a Mitigation Ratio-Setting Checklist (MRSC) for determining compensatory mitigation requirements.

Asarco has coordinated with the Corps to identify potential mitigation opportunities for the Project. Following review and approval (or modification, as appropriate) by the Corps of the concepts contained in Asarco's Ripsey Wash Tailings Storage Facility Conceptual Mitigation Plan (submitted under separate cover), a final Mitigation Plan in compliance with the 2008 Mitigation Rule will be completed. Asarco proposes both Applicant-sponsored mitigation in the Lower San Pedro River corridor and purchase of credits from the Lower San Pedro River Wildlife Area (LSPRWA) In Lieu Fee Project.

This MRSC report has been prepared to support the Ripsey Wash Tailings Storage Facility Conceptual Mitigation Plan. This report is presented in three sections: ***Section 1*** introduces the Project and summarizes Project impacts to waters; ***Section 2*** provides an overview of proposed mitigation actions; and ***Section 3*** describes the methods used for determining final mitigation ratios and acreages in this analysis, and provides the results of applying the checklist.

1.2. PROJECT DESCRIPTION

The proposed Ripsey Wash TSF is located approximately four miles south of the Ray Mine Complex, south of the Gila River, on lands currently owned and managed by the Arizona State Land Department (ASLD) that the Applicant is seeking to acquire. The Project will encompass approximately 2,636 acres, nearly all of which will be located south of the Gila River. (The only facilities north of the Gila River will be pipelines

and associated facilities for the transport of tailings generated at the existing Ray Concentrator and reclaimed water.)

The Applicant plans to employ conventional tailings deposition at the location of the proposed TSF. The TSF would impact portions of Ripsey Wash and unnamed tributaries. The proposed TSF would be built with cyclone centerline and upstream construction methods. A diversion embankment would be constructed to divert flows around the facility to the west to Zelleweger Wash and to the east to an unnamed ephemeral wash.

The Project includes tailings delivery and reclaim water pipelines that would follow the Pinal County right of way along the existing Florence-Kelvin Highway and span the Gila River at a new pipeline bridge located directly adjacent to (upstream of) a new Florence-Kelvin Highway bridge proposed by Pinal County; a power line for project related infrastructure to be placed along the Florence-Kelvin Highway opposite the proposed pipelines; a proposed drain down pond and associated infrastructure north of the Gila River; realignment of a portion of the existing Florence-Kelvin Highway; realignment of a portion of the existing San Carlos Irrigation Project power line; and realignment of a portion of the Arizona Trail.

1.3. JURISDICTIONAL IMPACTS

The development of the Ripsey Wash TSF Project included a substantial effort to avoid and minimize impacts to waters of the United States as outlined in the 404(b)(1) alternatives analysis prepared for the project.[1] ***Table 1*** summarizes unavoidable impacts to waters of the U.S. that would result from construction of the Project. The Project is expected to result in the direct impact to 130.91 acres of ephemeral waters. An additional 3.74 acres of ephemeral waters will be cut off from upstream flows. The proposed project will not adversely impact any special aquatic sites including wetlands.

Table 1. Ripsey Wash Tailings Storage Facility Project Impacts to Waters

Impact Type	Acreage
Direct impacts to ephemeral flows	130.91
Dewatered ephemeral flows	3.74
Total	**134.65**

2. MITIGATION SITE SELECTION OVERVIEW

The 2008 Mitigation Rule identifies general classes of compensatory mitigation and identifies clear preference among these classes, specifically noting that Mitigation Banking and then In Lieu Fee Mitigation are preferred over applicant sponsored, on-site, or off-site mitigation. As a general matter, in-kind mitigation is preferred over out-of-kind mitigation. Asarco considered these general classes of compensatory mitigation from a watershed perspective when developing this conceptual mitigation plan.

[1] WestLand Resources, Inc. 2015. Alternatives Screening and Clean Water Act Section 404(b)(1) Alternatives Analysis. Prepared for Corps File No. SPL-2011-1005-MWL. Dated July 17, 2015.

There are currently no mitigation banks established in Arizona. One approved In-Lieu-Fee mitigation project is within the Hydrologic Unit Code (HUC)-6 watershed associated with the Project, the LSPRWA In Lieu Fee Project managed by the Arizona Game and Fish Department (AGFD).

The development of the Project design included a substantial effort to avoid and minimize impacts to waters. A number of onsite mitigation measures were incorporated into the Project design to address water quality and quantity functions. These measures include the construction of a detention dam, diversion channel, and piping infrastructure to route any runoff from undisturbed areas above the TSF around the facility; the installation of energy dissipaters at the outfall locations of the diversion channel and piping; and the installation of monitoring and pump-back wells downstream from seepage-collection points and reclaim ponds.

The Project entails active mining operations requiring the diversion of upstream flows around the TSF and the Project area contains only ephemeral drainage channels with no potential for improvement through restoration. Therefore, no onsite mitigation opportunities exist and habitat functions that will be lost through the development of the Project will be mitigated offsite. The identification of offsite compensatory mitigation options was made after a review of various options within the watershed.

We are aware of no watershed planning efforts for the HUC-6 or HUC-8 watersheds that contain the Project that identify specific compensatory mitigation goals for aquatic resources. We have reviewed the Arizona Non-point Education for Municipal Officials (NEMO) website for watershed plans[2] for the Middle Gila to gain perspective on the nature of the resources within the watershed, looked at previous Corps mitigation projects associated with the Ray Mine, and reviewed general conservation efforts along the Gila and the San Pedro Rivers to inform site selection and plan development.

Asarco has identified four sites located along the San Pedro River (Sites A through D) that are relatively close to the Project (approximately 29 river miles upstream) to partially compensate for unavoidable project impacts to waters of the U.S. (***Figure 1***). All of these sites are associated with intermittent aquatic resources, contain or have the potential to support high-value mesoriparian and hydroriparian habitats, and provide regional conservation benefit. The San Pedro River mitigation sites are associated with existing Corps-approved mitigation projects that have been developed in support of previous Corps permitting efforts at the Ray Mine and are contiguous with or near other conservation properties that have been established by the Bureau of Reclamation, the Salt River Project, and the LSPRWA In Lieu Fee Project (***Figure 3***). While the proposed mitigation measures will not create xeroriparian habitat similar to the habitats associated with the ephemeral drainages that will be impacted by the Project, the habitats within the mitigation sites that will be preserved, enhanced, and restored are rarer within the regional landscape and have higher productivity and wildlife values (***Table 2***).

[2] NRCS Rapid Watershed Assessment of the Middle Gila River HUC-8 has not been completed (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_064841.pdf; accessed August 27, 2014).

Asarco proposes to meet the remainder of its compensatory mitigation obligation through purchase of credits from the LSPRWA In Lieu Fee Project.

Table 2. Summary of Offsite Mitigation Areas

Mitigation Site	Acreage	Description
Site A PZ Ranch Northeastern Mesquite Bosque (Preservation)	29.8	Adjacent to an existing Corps mitigation site (***Figures 3 and 4***) and is included within the fenced boundary of that mitigation site. Active management of this site through proposed preservation efforts will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict ORV access to this site to enhance its riparian habitat values. The existing bosque habitat is second growth and was likely part of an earlier agricultural operation or the mesquite had been harvested for fuel wood or other purpose. Mesquite bosque habitats were once relatively common and widespread along Arizona's larger rivers and streams but mature bosque habitat has become relatively rare. The preservation and active management of this site will facilitate the development and maintenance of this habitat.
Site B PZ Ranch Southern Mesquite Field (Restoration)	28.2	Former agricultural field on the east bank of the San Pedro River. This field is within an existing Corps mitigation site. In 1993 the field was planted with containerized mesquite. The portion of this field included here represents excess mitigation area not needed for the original project. The functional values of this site have increased as indicated by a measurable increase in vegetative cover (***Figures 5a and 5b***). The restoration area is part of the San Pedro River riparian corridor and is contiguous with other Corps mitigation sites and conservation areas managed by the Bureau of Reclamation (***Figure 3***). .
Site C PZ Ranch Northwestern Mesquite Field (Restoration)	25.8	Adjacent to an existing Corps mitigation site on the west bank of the San Pedro River (***Figures 3 and 6***) and included within the fenced boundary of that mitigation site. Active management of this site will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict ORV access to this site to enhance its riparian habitat values. The site is vegetated by patches of native mesquite and an understory of native forbs and shrubs mixed with weedy forbs (***Figure 6***). Portions of the site have been associated with prior agricultural practices, and it appears as if fuel wood harvesting has occurred at some point in the past. Proposed restoration activities will include the control of weedy plant species (principally tamarisk), planting native mesquite trees, and seeding with native plant species. These activities will restore the functional values of the site as a riparian buffer for the San Pedro River.
Site D San Pedro River Active Floodplain (Preservation)	14.1	Area within the active floodplain of the San Pedro River adjacent to an existing Corps mitigation site on the west bank of the San Pedro River (***Figures 3 and 6***). The dominant vegetation is tamarisk, although cottonwoods are also present. The site will be actively managed to exclude livestock and ORV traffic to enhance its riparian value.
LSPRWA In Lieu Fee Project	77.06	The LSPRWA ILF project is a single contiguous site and has been categorized as a Resource Category 1 for Wildlife and Wildlife Habitat Compensation by AGFD[3], providing habitat with the highest value to Arizona wildlife. The proposed mitigation actions at the LSPRWA ILF Project will help maintain or restore natural functions along this last remaining undammed river and its associated riparian buffers, which together form an important riparian corridor.

3 Lowery, Shawn F., Angela Stingelin, and Charles Hofer. 2016. "Conceptual Plan, January 2016, In-Lieu Fee Restoration Project Site Wetland Restoration and Monitoring at the Lower San Pedro River Wildlife Area, Pinal County, Arizona." Phoenix, Arizona: Arizona Game and Fish Department.

3. MITIGATION RATIO-SETTING CHECKLIST METHODS AND RESULTS

The MRSC procedure includes completion of a checklist to determine the amount of acreage or credits necessary as compensatory mitigation (ACOE 12501-SPD). The checklist comprises a 10-step process that allows for a functional analysis of impacted waters and proposed mitigation parcels, establishes baseline mitigation ratios, and authorizes adjustment of those ratios based on specified criteria.

3.1. IDENTIFICATION AND CLASSIFICATION OF WATERS (STEP 1)

Step one within the MRSC checklist is the identification and classification of impacted waters and proposed mitigation sites. In order to assess the functions of waters within the Ripsey Wash impact areas, impacted drainages were grouped into three different classes (***Figure 2***):

Ephemeral Class 1 – This class consists of very large, wide, ephemeral drainages, which within the Project footprint are limited to the main channel of Ripsey Wash. Drainages within this class have a median width of 180 feet (ft) and an average width of 167 ft.

Ephemeral Class 2 – This class consists of relatively smaller drainages in comparison with Ephemeral Class 1. Ephemeral Class 2 drainages within the Ripsey Wash site include the larger tributaries of Ripsey Wash and another unnamed ephemeral channel that drains toward the Gila River. Drainages within this class have a median width of 35 ft and an average width of 60 ft.

Ephemeral Class 3 – This class consists of headwaters and relatively smaller drainages in comparison to Ephemeral Class 2 drainages. Ephemeral Class 3 drainages within the Ripsey Wash are in the upper parts of the watershed and may drain into Class 2 or Class 1 ephemeral drainages. Drainages within this class have a median width of 6 ft and an average width of 10 ft.

The total amount of impacted waters was calculated and determined to be 134.65 acres, all of which are ephemeral waters. Anticipated areas of impact for each of these classes are presented in ***Table 3***.

Table 3. Impacts to Waters by Impacted Drainage Class

Impacted Drainage Class	Direct Impacts	Dewatered Drainages	Total
Ephemeral Class 1	64.94	3.09	68.03
Ephemeral Class 2	45.37	0.52	45.89
Ephemeral Class 3	20.60	0.13	20.73
Total	**130.91**	**3.74**	**134.65**

For impacts to ephemeral waters associated with the Project, offsite mitigation actions will provide functional gain through the active management, enhancement, and restoration of rare and valuable riparian zones adjacent to major intermittent and perennial systems, the San Pedro River.

Each Applicant-sponsored mitigation parcel was scored as a whole unit. Functional scoring for these sites consists primarily of an evaluation of the functional gain that the mitigation sites would provide upon achievement of mitigation success. The *Ripsey Wash Tailings Storage Facility Functional Assessment of Impacted Waters and Proposed Mitigation Sites* was prepared by WestLand and submitted to the Corps under separate cover.[4]

The resources and functions present at the LSPRWA ILF Project were classified and evaluated by area, where areas were defined by existing physical characteristics and by the specific primary mitigation actions proposed. Defined areas within the LSPRWA ILF Project include the Wetland Establishment Area and the Riparian Restoration Area. Functional scoring of the mitigation site was done by area, and consists primarily of an evaluation of the functional gain that the area would provide upon achievement of mitigation success (***Appendix A***). A brief description of each area is provided below.

LSPRWA ILF Project – Wetland Establishment Area: The Wetland Establishment Area of the LSPRWA ILF Project encompasses approximately 2 acres of wetlands adjacent to the San Pedro River. Mitigation activities proposed for this area include the establishment of wetlands. There are currently 0.98 acres of mitigation credit remaining in the Wetland Establishment Area.

LSPRWA ILF Project – Riparian Restoration Area: The Riparian Restoration Area within the LSPRWA ILF Project includes approximately 677 acres adjacent to the San Pedro River. Mitigation activities proposed for the Riparian Restoration Area include removal of invasive tamarisk and establishment of native riparian vegetation within the floodplain of the San Pedro River across approximately 641 acres, and establishment of mesquite bosque woodlands on another 36 acres (see **Figure 8**). There are currently 675.46 acres of mitigation credit remaining in the Riparian Restoration Area.

3.2. QUALITATIVE IMPACT-MITIGATION COMPARISON (STEP 2)

WestLand Resources, Inc. conducted a detailed qualitative functional assessment of the Ripsey Wash Tailings Storage Facility impacted waters and the proposed mitigation sites[4] , a brief summary of which is provided, below. The detailed qualitative functional assessment of the LSPRWA ILF Project mitigation areas is provided in ***Appendix A***.

A set of 11 hydrologic, chemical, and biotic functions was developed for this purpose (***Table 4***).

4 Westland Resources, Inc. 2015. Ripsey Wash Tailings Storage Facility Functional Assessment of Impacted Waters and Proposed Mitigation Sites. Report Revised November 5, 2015.

Table 4. Functions Evaluated in the Comparison of Ripsey Wash Impacted Areas and Proposed Mitigation Sites

Hydrologic Functions
Hydrologic Connectivity
Subsurface Flow and Groundwater Recharge
Energy Dissipation
Sediment Transport/ Regulation
Chemical Functions
Elements, Compounds, and Particulate Cycling
Organic Carbon Export/Sequestration
Biotic Functions
Aquatic Invertebrate Fauna
Presence of Fish and Fish Habitat Structure
Riparian/Wetland Vegetation Structure
Age Class Distribution of Wooded Riparian or Wetland Vegetation
Native/Non-native Vegetation Species

Scoring for these 11 functions was conducted based on available data, published literature, field data collected within planned impact areas and mitigation lands, aerial photos, and planned mitigation activities. The categories were scored qualitatively on a six-rank scale: none, low, low-moderate, moderate, moderate-high and high. Based on this scale a numeric score was assigned as identified in ***Table 5***.

Table 5. Numeric Scores assigned to the Qualitative Functional Score

Qualitative Functional Score	Numeric Score
None	0
Low	1
Low-Moderate	2
Moderate	3
Moderate-High	4
High	5

Table 6 provides the functional scoring of the three classes of waters that would be impacted by the Project and the projected functional scoring at the proposed mitigation sites upon achievement of mitigation success.

Based on this functional assessment, the mitigation ratio for each impacted drainage class and mitigation site was adjusted from the starting 1:1 ratio (***Table 7***). The MRSC worksheets in ***Appendix B*** provide the comparison of functional scores and rationale for the mitigation ratio adjustments.

Table 6. Functional Assessment Scoring for Impacted Drainage Classes and Mitigation Sites

Functions	Impact Drainage Classes			Mitigation Sites upon Achievement of Mitigation Success Criteria					
	Ephemeral Class 1	Ephemeral Class 2	Ephemeral Class 3	San Pedro River Site A (Preservation)	San Pedro River Site B (Restoration)	San Pedro River Site C (Restoration)	San Pedro River Site D (Preservation)	LSPRWA ILF- Wetland Establishment	LSPRWA ILF – Riparian Restoration
Hydrologic Functions									
Hydrologic Connectivity	4	4	3	4	3	4	4	4	4
Subsurface Flow/Groundwater Recharge	2	2	1	3	2	3	4	3	4
Energy Dissipation	3	2	1	4	3	4	4	2	4
Sediment Transport/ Regulation	3	2	1	5	4	5	5	2	4
Chemical Functions									
Elements, Compounds, and Particulate Cycling	3	2	1	3	3	3	3	4	4
Organic Carbon Export/Sequestration	2	2	1	4	3	3	4	4	4
Biotic Functions									
Aquatic Invertebrate Fauna	0	0	0	0	0	0	0	5	3
Presence of Fish and Fish Habitat Structure	0	0	0	0	0	0	0	3	3
Riparian/Wetland Vegetation Structure	2	2	1	5	2	3	5	4	5
Age Class Distribution of Woody Riparian or Wetland Vegetation	4	3	3	4	3	4	4	5	4
Native/Non-native Vegetation Species	5	5	5	4	5	3	1	5	5
Total Numeric Score	**28**	**24**	**17**	**36**	**28**	**32**	**34**	**41**	**44**

Table 7. Mitigation Baseline Ratios Based on the Functional Assessment of Impacted Drainage Classes and Mitigation Sites

Site	Ephemeral Class 1 Feature Mitigation Ratio	Ephemeral Class 2 Feature Mitigation Ratio	Ephemeral Class 3 Feature Mitigation Ratio
San Pedro River Site A (Mesquite Bosque Preservation)	4.2:1	-	-
San Pedro River Site B (Mesquite Field Restoration)	1:1.5	-	-
San Pedro River Site C (Mesquite Field Restoration)	1:1.5	-	-
San Pedro River Site D (Active Floodplain Preservation)	4:1	-	-
LSPRWA ILF- Wetland Establishment	1:2.46	-	-
LSPRWA ILF- Riparian Restoration	1:2.36	1:2.58	1:3.24

Note: The order in which mitigation credits were applied was from highest functionally scoring impacted drainage class (Ephemeral Class 1) to lowest functionally scoring impacted drainage class (Ephemeral Class 3) starting with San Pedro River Site A and then sequentially working through each mitigation site from A to D and LSPRWA ILF Wetland Establishment and Riparian Restoration Areas, as needed, until the mitigation credits needed were fully applied. Because of this sequential process, not all the mitigation ratios developed were used. For instance, baseline mitigation ratios were developed for all drainage classes for San Pedro River Site A, but those mitigation credits were only applied to Ephemeral Class 1 drainage impacts.

3.3. QUANTITATIVE IMPACT-MITIGATION COMPARISON (STEP 3)

Steps 2 and 3 of the MRSC are mutually exclusive, and provide a comparison of the impact and mitigation sites based on a set of defined functional values. Step 2 is qualitative comparison (used in this analysis and described above) and Step 3 is a quantitative comparison. In order to proceed using Step 3, the MRSC requires an accepted method for conducting the assessment quantitatively. In most cases, this requires a published peer-reviewed assessment manual that is appropriate for the region and the aquatic functions present within all considered sites. Currently, there is no Corps-approved assessment method for the Desert Southwest. Therefore, this analysis will use the qualitative assessment in Step 2 and omit Step 3.

3.4. MITIGATION SITE LOCATION (STEP 4)

Step 4 in the MRSC is a ratio adjustment based on the location of a mitigation site with respect to the impact site. This is generally determined based on whether both sites are located within the same watershed as defined by the appropriate HUC. There is no defined standard HUC level for use in completing the MRSC. For this project, the Corps has indicated a preference for using the HUC-6 designation.

The mitigation sites along the San Pedro River (Mitigation Sites A, B, C, and D) are located in a watershed outside of the impacted HUC-6 watershed. Therefore, the ratios for those mitigation sites have been adjusted by +1.

The LSPRWA ILF Project is located outside the impacted HUC-6 watershed. Therefore, the ratio has been adjusted by +1.

3.5. NET LOSS OF AQUATIC RESOURCE SURFACE AREA (STEP 5)

Per the MRSC instructions, credit can only be given for this step if establishment or re-establishment of aquatic features is to be completed by proposed mitigation actions. Net loss of aquatic resources is scored with a modification of +0 for establishment mitigation (San Pedro River Mitigation Sites B and C) and +1 for all remaining mitigation types.

Net loss of aquatic resources is scored with a modification of +0 for both the LSPRWA ILF Project Riparian Restoration Area and LSPRWA ILF Project Wetland Establishment Area.

3.6. TYPE CONVERSION (STEP 6)

Out-of-kind mitigation can result in an increase to the mitigation ratio if the mitigation site presents lower quality or less valuable habitat. However, if it is determined that the mitigation site has or will have a rare, unique, or valuable resource type for the determined watershed, a decrease of the mitigation ratio could be applied. Scoring for this category can range from +4 for out-of-kind habitat that is common to -4 for restoration or conversion of rare and valuable habitat. The scoring for this category compares the impact sites and the mitigation sites by assessing the rarity of the stream or habitat type and the overall functional benefit to the watershed.

The Project is expected to result in the permanent impact of 134.65 acres of ephemeral waters. The proposed project will not adversely impact any special aquatic sites including wetlands. Three defined classes of impacted waters at Ripsey Wash consist of ephemeral desert washes that supported less than 20 percent cover from riparian and wetland species with vegetation densities that were typically between 0.245 and 0.364 m^3/m^2, indicating that these areas are xeroriparian or upland with relatively sparse vegetation and temporary flow regimes. While these features play an important role in desert ecology, they are more common and provide less functional value when compared to the riparian areas along the San Pedro and Gila Rivers offered by the proposed mitigation sites.

The proposed mitigation sites provide opportunities for restoration, enhancement, preservation, and long-term management along the San Pedro and Gila Rivers. Within existing preservation and restoration sites (San Pedro Sites A, B, and D)[5] and within future restoration or enhancement sites (San Pedro Site C and LSPRWA ILF Project, upon achievement of the mitigation success criteria, the proposed mitigation would provide dense riparian habitat which is both rare and important within Arizona.

Due to the dense riparian vegetation adjacent to intermittent aquatic resource, which is a rare and valuable resource in Arizona, a ratio adjustment of -2.5 is applied to San Pedro River Mitigation Sites A, B, and C. The existing bosque habitat within San Pedro River Mitigation Site A is second growth and was likely part

[5] San Pedro Mitigation Sites A, B, and D are sites that have already been restored or actively managed and no future mitigation actions, other than continued active management and long term protection, are planned. These sites are available to Asarco for use as mitigation, and their application as mitigation for the Ripsey Wash Tailings Storage Facility will cause the continued and ongoing management of these lands and prevent agricultural type conversion, fuel wood harvesting, and other vegetation removal activities from being conducted within these areas.

of an earlier agricultural operation or the mesquite had been harvested for fuel wood or other purpose. Mesquite bosque habitats were once relatively common and widespread along Arizona's larger rivers and streams, but mature bosque habitat has become relatively rare. The preservation and active management of this site, adjacent to a large block of existing conservation lands (***Figure 3***), will facilitate the development and maintenance of this habitat San Pedro River Mitigation Site B consists of the restoration of a former agricultural field with native vegetation plantings consisting largely of mesquite (***Figure 5***). This field is within an existing Corps mitigation site. In 1993, the field was planted with containerized mesquite. The portion of this field included here represents excess mitigation area not needed for the original project. The functional values of this site have increased as indicated by a measurable increase in vegetative cover (***Figures 5a and 5b***). The restoration area is part of the San Pedro River riparian corridor and is contiguous with other Corps mitigation sites and conservation areas managed by the Bureau of Reclamation (***Figure 3***).

San Pedro River Mitigation Site C is also adjacent to an existing Corps mitigation site on the west bank of the San Pedro River (***Figure 3***). Active management of this site will exclude cattle from the site, restrict fuel wood and other wood harvesting, and restrict ORV access to this site to enhance its riparian habitat values. The site is vegetated by patches of native mesquite and an understory of native forbs and shrubs mixed with weedy forbs (***Figure 6***). Portions of the site have been associated with prior agricultural practices and it appears as if fuel wood harvesting has occurred at some point in the past. Proposed restoration activities will include the control of weedy plant species (principally tamarisk), planting native mesquite trees, and seeding with native plant species. These activities will enhance the functional values of the site as a riparian buffer for the San Pedro River.

San Pedro Mitigation Site D consists of dense and contiguous riparian habitat within the active floodplain of the San Pedro River within a large block of existing conservation lands, and therefore a ratio adjustment of -2.75 was applied to this site (***Figures 3*** *and* ***6***). The dominant vegetation is tamarisk, although cottonwoods are also present. The site will be actively managed to exclude livestock and ORV traffic to enhance its riparian value. The preservation of riparian forest within Site D will improve overall watershed functions as part of the larger conservation block.

The mitigation areas of the LSPRWA ILF Project provide opportunities for restoration, enhancement, preservation, and long-term management along the Lower San Pedro River. Upon achievement of the mitigation success criteria, the LSPRWA ILF Project would provide high quality riparian and wetland habitat deemed both rare and important within Arizona. As a rare and valuable perennial aquatic resource in Arizona, the LSPRWA Wetland Establishment Area has an adjustment ratio of -3. As an intermittent aquatic resource with adjacent dense riparian habitat that is also rare and valuable in Arizona, the LSPRWA Riparian Restoration Area has an adjustment ratio of -2.5.

3.7. RISK AND UNCERTAINTY (STEP 7)

Risk and uncertainty is assessed so that the mitigation ratio reflects the uncertainty inherent in some mitigation activities. Factors that are considered include: 1) permittee-responsible mitigation; 2) mitigation site did not formerly support targeted aquatic resources; 3) difficult-to-replace resources (see 33 CFR

332.3(e)(3) and (f)(2)); 4) modified hydrology (e.g., high-flow bypass); 5) artificial hydrology (e.g., pumped water source); 6) structures requiring long-term maintenance (e.g., outfalls, drop structures, weirs, bank stabilization structures); 7) planned vegetation maintenance (e.g., mowing, land-clearing, fuel modification activities); 8) e.g., shallow, buried structures (riprap, clay liners), and 9) absence of long-term preservation mechanism.

Each element of risk is scored from +0.1 to +0.3 based on the amount of uncertainty.

A ratio adjustment of +0.1 was applied to San Pedro Mitigation Sites A, B, and D, as mitigation is already in place at these sites, and therefore, there is minimal associated risk and uncertainty. These sites provide existing functional gain and do not require further mitigation actions. These sites would be managed along with a large tract of conservation area that has an existing management program to ensure the long-term protection of the mitigation lands. These sites are actively managed and protected with existing fencing. The application of these areas as mitigation for the Ripsey Wash Tailings Storage Facility will cause the continued and ongoing management of these lands that will prevent agricultural type conversion, fuel wood harvesting, and other vegetation removal activities from being conducted within these areas. Based on this, there is no additional risk or uncertainty associated with these sites.

San Pedro Mitigation Site C consists of a mitigation area within an active management plan, and has a ratio adjustment of +0.3. The planned mitigation actions are designed to continue to enhance and improve upon existing conditions. Additional vegetation plantings are anticipated to succeed based on the currently established vegetation and there is a low risk associated with the planned enhancement. This site is also fenced and would be managed along with a large tract of conservation area that has an existing management program to ensure the long term protection of the mitigation lands. The application of this area as mitigation for the Ripsey Wash Tailings Storage Facility will cause the continued and ongoing management of these lands that will prevent agricultural type conversion, fuel wood harvesting, and other vegetation removal activities from being conducted within these areas.

The MRSC instructions note that the cost of uncertainty is factored into the cost of credits for ILF projects, in which case no ratio adjustment would occur at this step. As such, no adjustment was made for the proposed purchase of credits from the LSPRWA ILF Project.

3.8. TEMPORAL LOSS (STEP 8)

Temporal loss associated with mitigation activities that begin after impacts are made and the amount of time it takes for a mitigation activity to reach full, functional potential are considered in this step. Ratio adjustments are applied based on the amount of time required for the planting, establishment, and growth of vegetation. The temporal adjustment to the mitigation ratio is .05 per month and generally assumes a 20-month time-frame (adjustment of +1) for herbaceous growth, a 40-month time frame (adjustment of +2) for woody shrubs, and a 60-month (adjustment of +3) or 5 year time frame for tree species.

San Pedro Mitigation Sites A, B, and D provide preservation and/or mitigation that is the result of previously implemented preservation and/or restoration actions (but are not the result of actions that the Applicant was legally required to take).

San Pedro Site C (restoration) include mitigation actions such as planting or seeding, and a ratio adjustment is applied based on the time it is expected to take for the new trees to mature and reach full functional benefit within the system. Based on this, there is a +3 ratio adjustment for these sites based on the estimated time for the planted trees to mature (60 months or 5 years).

The ILF projects in Arizona include a 3-year phase-in process during which advance mitigation credits are sold, with the clock for the phase-in starting upon receipt of the first mitigation payments. In this case, the maximum adjustment for temporal loss would be +1.8 (=36 x 0.05). Based on this, an adjustment of +1.8 was made for the LSPRWA ILF Project.

3.9. FINAL MITIGATION RATIO (STEP 9)

The final ratios determine the amount of acreage credits that are generated by each mitigation parcel when compared to each impacted drainage class.

Step 9 of the MRSC is the calculation of final mitigation scoring ratios from Steps 2-8 in the MRSC. The mitigation ratios for each impact class and mitigation site were compiled and are summarized in ***Table 8.***

Table 8. Final Mitigation Ratios Per Impacted Drainage Class and Mitigation Site

Site	Ephemeral Class 1 Feature Mitigation Ratio	Ephemeral Class 2 Feature Mitigation Ratio	Ephemeral Class 3 Feature Mitigation Ratio
Site A (Preservation)	3:1	-	-
Site B (Restoration)	1:1	-	-
Site C (Restoration)	1.9:1	-	-
Site D (Preservation)	2.4:1	-	-
LSPRWA ILF- Wetland Establishment	1:1	-	-
LSPRWA ILF- Riparian Restoration	1:1	1:1	1:1

Note 1: When the mitigation ratio was less than 1:1, a ratio of 1:1 was used in the final mitigation credit calculation based on MRSC instructions.

Note 2: The order in which mitigation credits were applied was from highest functional scoring impacted drainage class (Ephemeral Class 1) to lowest functional scoring impacted drainage class (Ephemeral Class 3) starting with San Pedro River Site A and then sequentially working through each mitigation site from A to D, and LSPRWA ILF Wetland Establishment and Riparian Restoration Areas, as needed, until the mitigation credits needed were fully applied.

3.10. FINAL COMPENSATORY MITIGATION SUMMARY (STEP 10)

The total acres of impacted areas by drainage class are applied to the number of mitigation credits provided based on the final mitigation ratios. ***Table 9*** summarizes the application of the MRSC derived mitigation ratios to the Applicant-sponsored mitigation sites in a sequential fashion. The order in which mitigation credits were applied was from highest functionally scoring impacted drainage class (Ephemeral Class 1) to lowest functionally scoring impacted drainage class (Ephemeral Class 3) starting with San Pedro River Site A and then sequentially working through each mitigation site from A to D, and LSPRWA ILF Wetland Establishment and Riparian Restoration Areas as needed, until all of the functional impacts for each drainage class was mitigated. ***Table 10*** provides the LSPRWA In Lieu Fee mitigation credits required for each impact drainage class

Table 9. Final Mitigation Credits Applied by Impact Drainage Class and Applicant-Sponsored Mitigation Site

Impact Drainage Class	Impact Acres	Mitigation Site	Mitigation Acres Available	Mitigation Ratio	Mitigation Credits at Site for selected Class	Mitigation Credits Used	Mitigation Credits Remaining	Remaining Impact Acres
Ephemeral Class 1	68.03	Site A (Preservation)	29.8	3:1	9.93	9.93	0.0	58.1
		Site B (Restoration)	28.2	1:1	28.2	28.2	0.0	29.9
		Site C (Restoration)	25.8	1.9:1	13.58	13.58	0.0	16.32
		Site D (Preservation)	14.1	2.4:1	5.88	5.88	0.0	10.44

Table 10. Final Mitigation Credits Applied by Impacted Aquatic Resource Class and LSPRWA ILF Project Mitigation Type

Impact Drainage Class	Impact Acres	LSPRWA ILF Mitigation Area	ILF Project Mitigation Acres Available	Mitigation Ratio	ILF Project Mitigation Acres Purchased
Ephemeral Class 1	10.44	Wetland Establishment	0.98	1:1	0.98
		Riparian Restoration	675.46	1:1	9.46
Ephemeral Class 2	45.89	Riparian Restoration	674.28	1:1	45.89
Ephemeral Class 3	20.73	Riparian Restoration	628.39	1:1	20.73
Total	77.06				77.06

FIGURES

Pinal County
Image Source: 2015 USDA NAIP Orthophoto

WestLand Resources

0 2 4 Miles
0 4 8 Kilometers

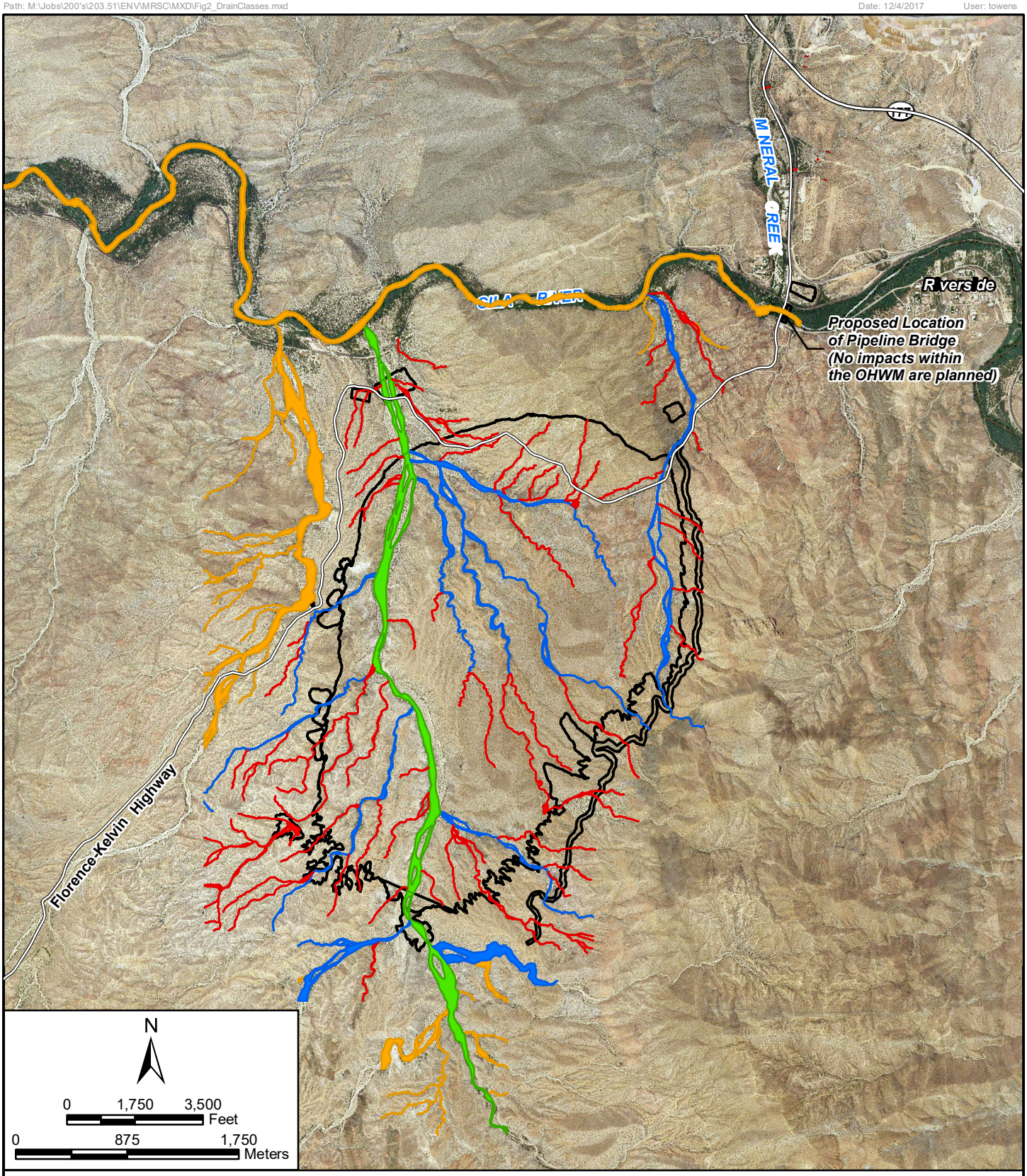
N

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

LOCATION MAP
Figure 1

Path: M:\Jobs\200's\203.51\ENV\MRSC\MXD\Fig2_DrainClasses.mxd Date: 12/4/2017 User: towens



Pinal County, Arizona,
Image Source: 2015 USDA
NAIP Orthophoto

LEGEND

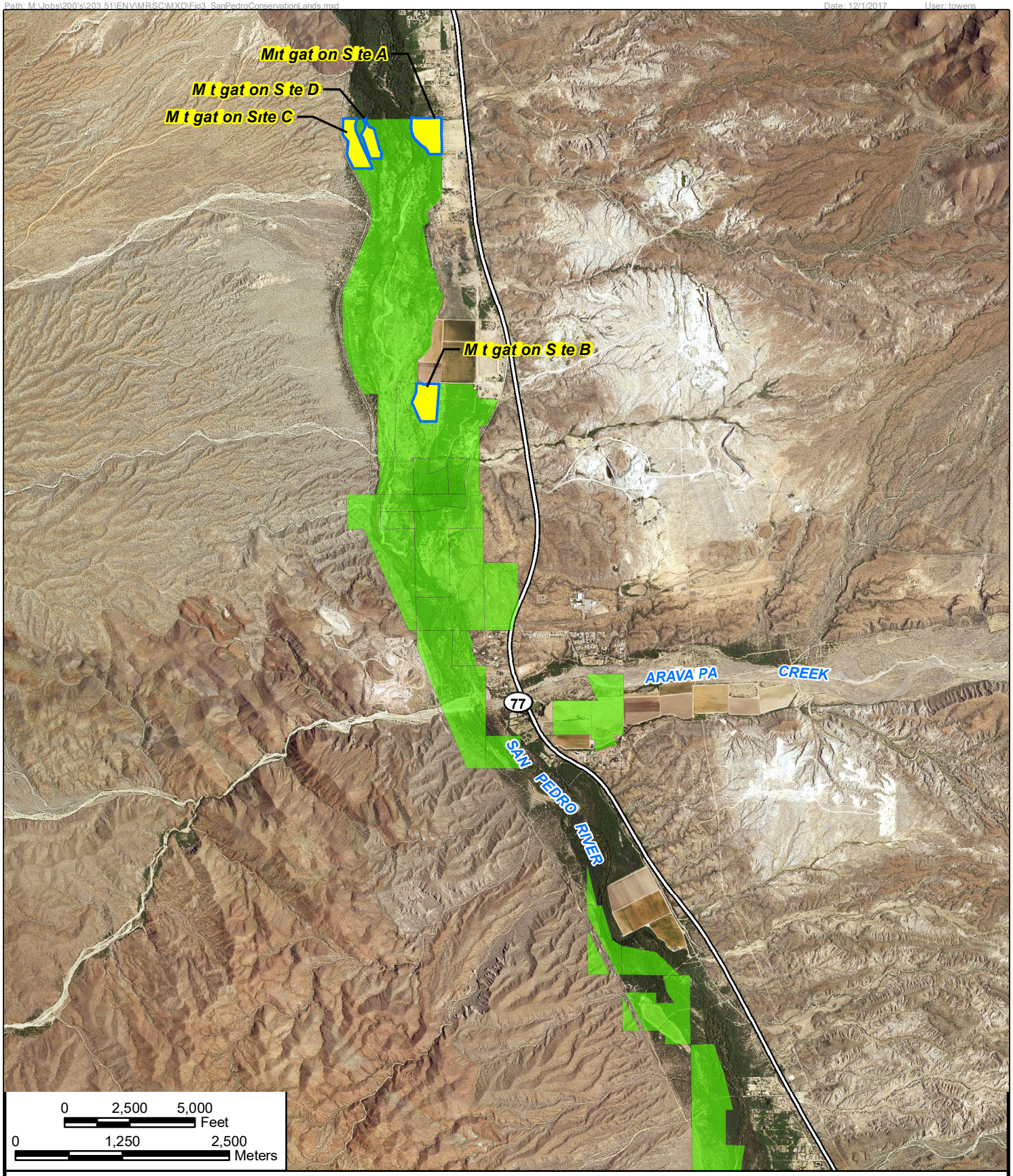
- Ripsey Wash Alternative 3 Tailings Storage Facility Footprint
- Ephemeral Class 1 (Ripsey Wash)
- Ephemeral Class 2
- Ephemeral Class 3
- No Classification Assigned (No Impacts Proposed)

WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility Mitigation Ratio-Setting Checklist

RIPSEY WASH PROJECT AREA
IMPACTED DRAINAGE CLASSIFICATIONS
Figure 2



Pinal County
Image Source: 2015 USDA NAIP Orthophoto

WestLand Resources

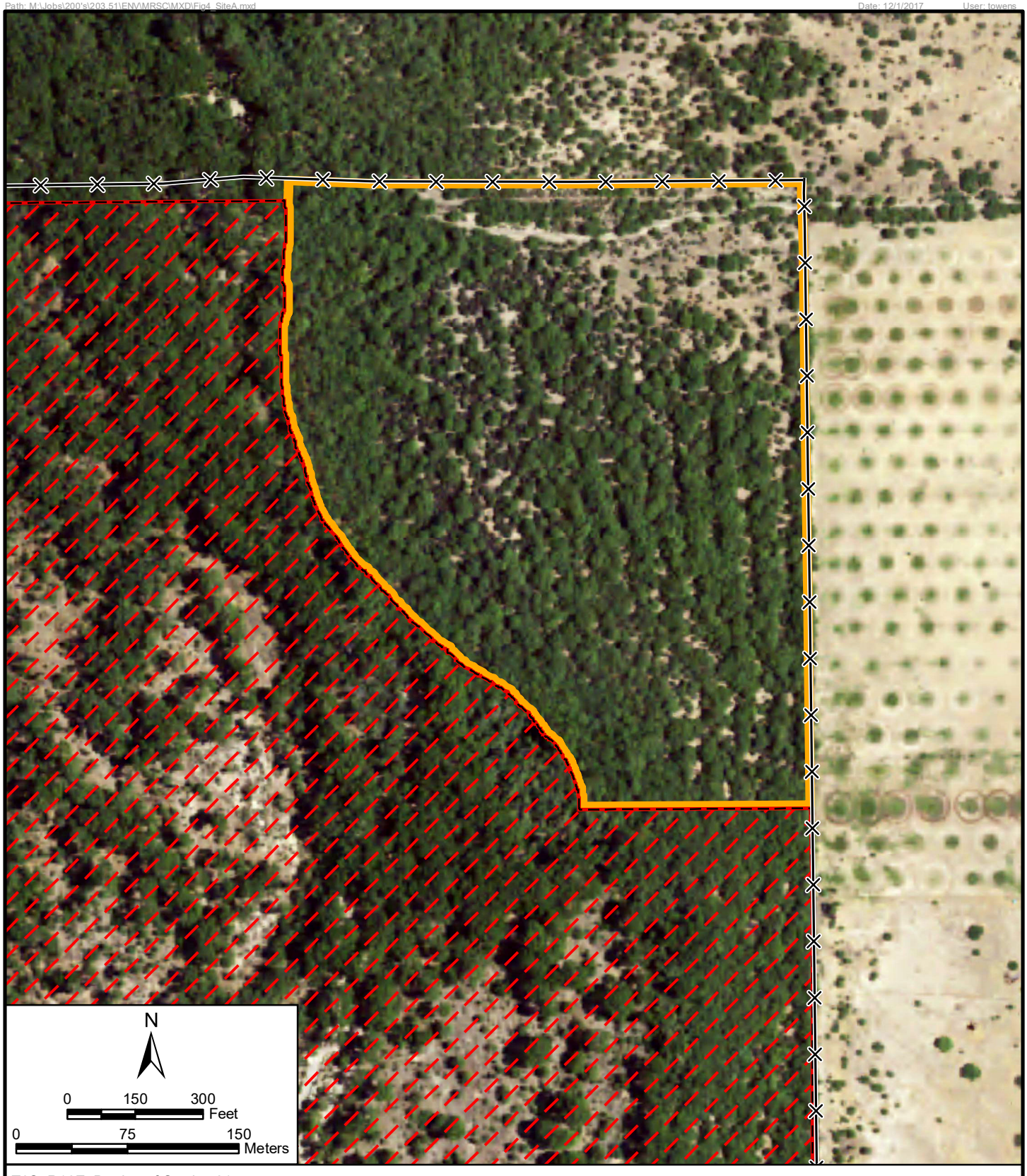
LEGEND

- Mitigation Site Location
- Existing Conservation Lands

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

CONSERVATION LANDS
ALONG THE LOWER
SAN PEDRO RIVER
Figure 3



T6S, R16E, Portion of Section 21,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site A (Mesquite Bosque Preservation)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

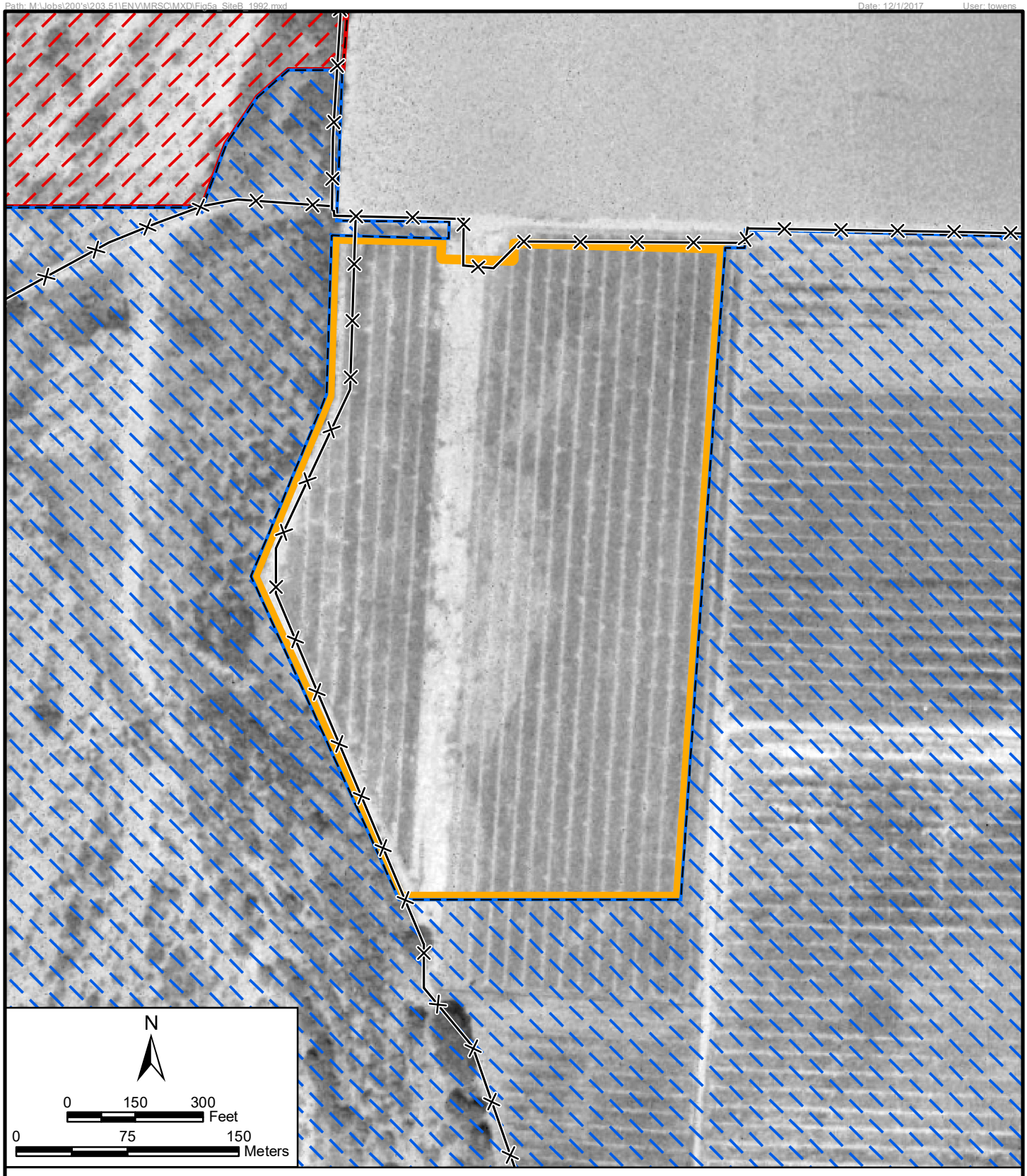
WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility Mitigation Ratio-Setting Checklist

SAN PEDRO RIVER SITE A (PRESERVATION)

Figure 4



T6S, R16E, Portion of Section 33,
Pinal County, Arizona,
Image Source: USGS DOQQ, 1992

LEGEND

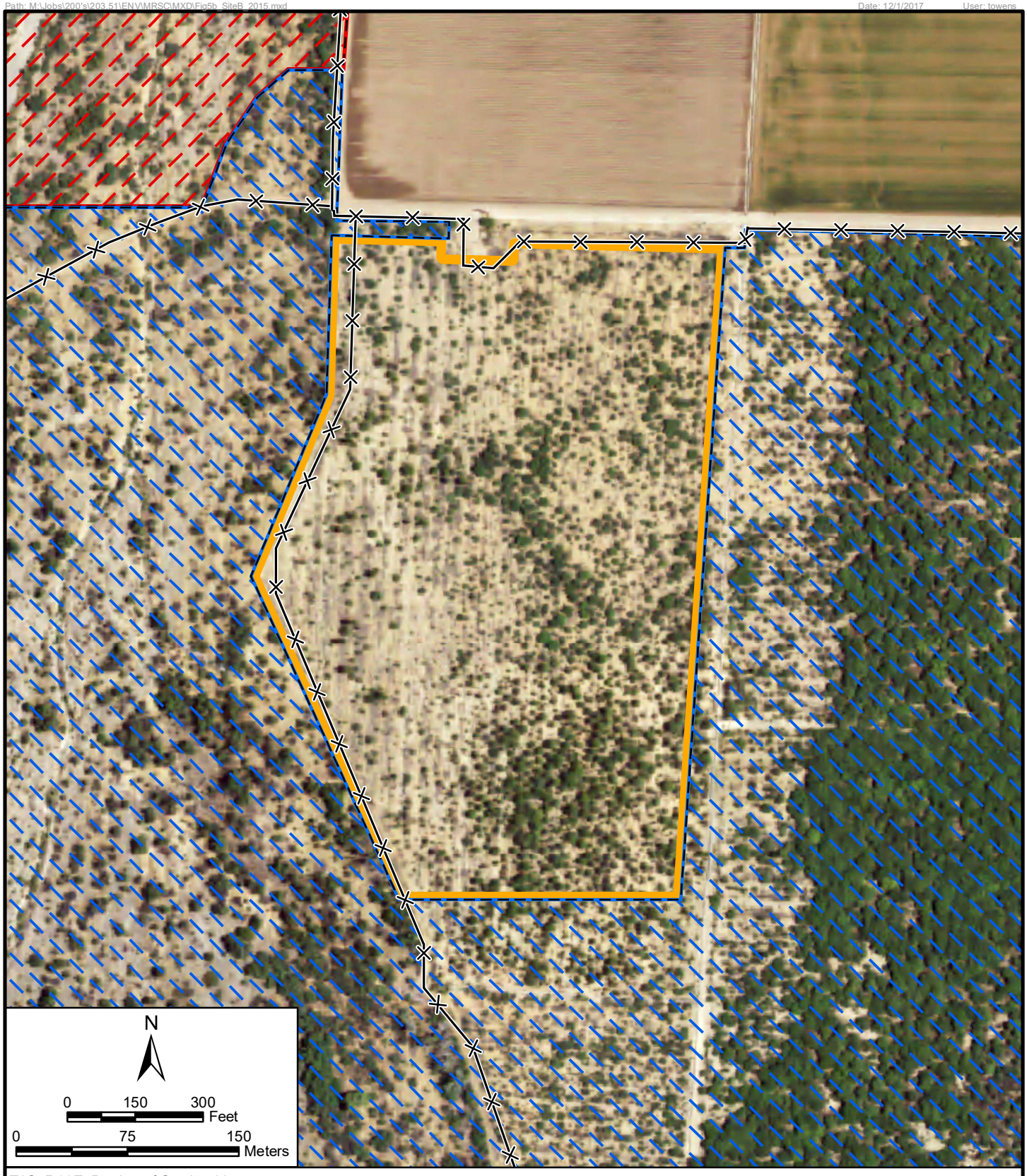
- Site B (Mesquite Field Restoration)
- PZ-1 Mitigation Lands (Corps File No. 1990-400-8400-RJD)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

SAN PEDRO RIVER SITE B (RESTORATION) (1992)
Figure 5a



T6S, R16E, Portion of Section 33,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site B (Mesquite Field Restoration)
- PZ-1 Mitigation Lands (Corps File No. 1990-400-8400-RJD)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

WestLand Resources

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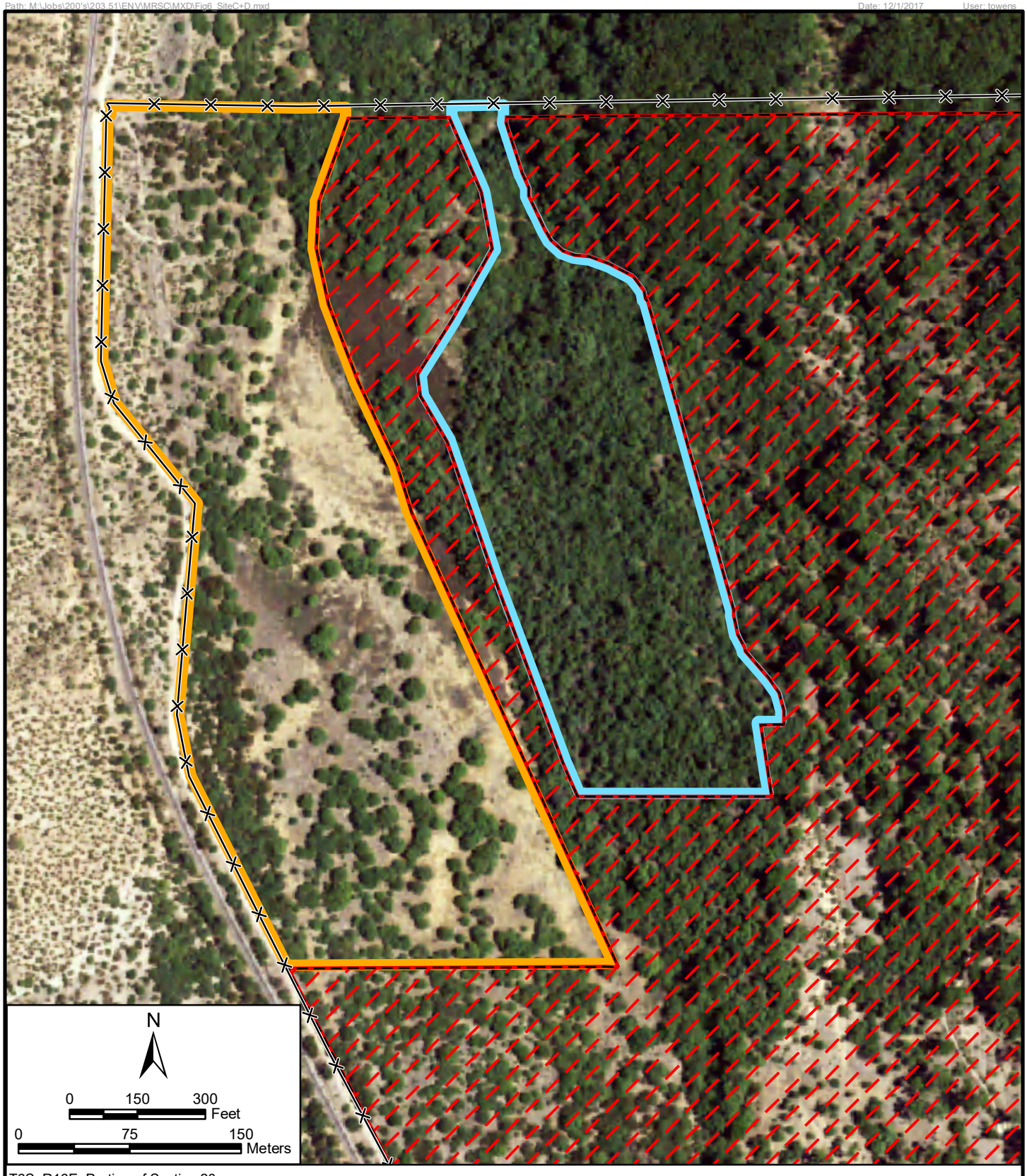
Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

SAN PEDRO RIVER SITE B (RESTORATION) (2015)

Figure 5b

Path: M:\Jobs\200's\203.51\ENV\MRSC\MXD\Fig6_SiteC+D.mxd Date: 12/1/2017 User: towens



T6S, R16E, Portion of Section 20,
Pinal County, Arizona,
Image Source: 2015 USDA NAIP Orthophoto

LEGEND

- Site C (Mesquite Field Restoration)
- Site D (Active Floodplain Preservation)
- PZ-2 Mitigation Lands (Corps File No. 904-0084-MB)
- Existing Fence

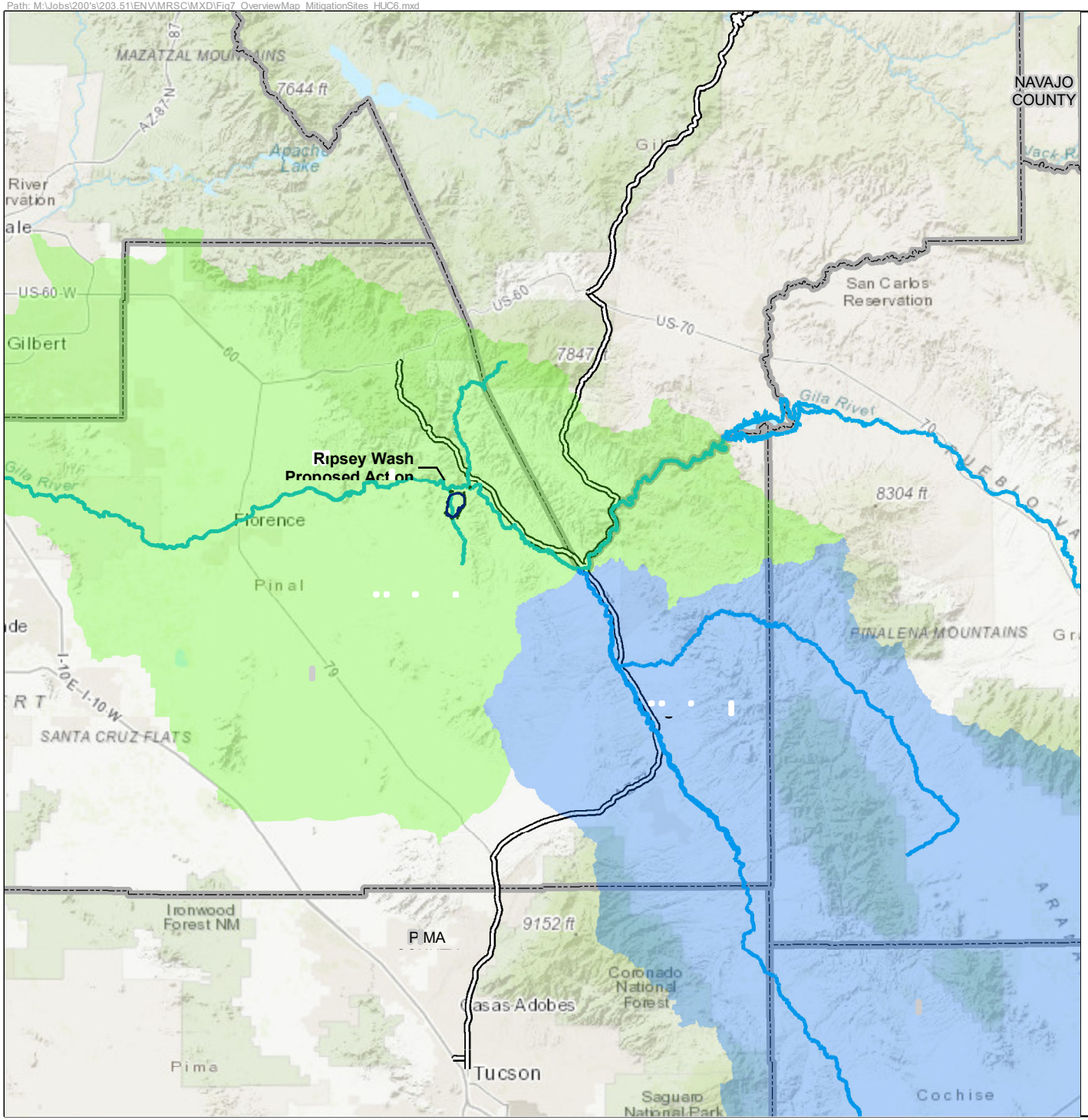
WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility Mitigation Ratio-Setting Checklist

SAN PEDRO SITE C (RESTORATION) &
SAN PEDRO SITE D (PRESERVATION)

Figure 6



N

0 7.5 15 Miles

0 15 30 Kilometers

1 in = 15 miles

Watershed Boundary Dataset: Downloaded from Geospatial Data Gateway (https://datagateway.nrcs.usda.gov/)

Base Map: ESRI Online, World Topo Map

Legend

- Ripsey Wash Tailings Storage Facility Footprint
- Ripsey Mitigation Site

Watershed Boundary Dataset

6-digit HU (HUC-6)

- Middle Gila Basin (150501)
- San Pedro-Willcox Basin (150502)

WestLand Resources

ASARCO LLC

Ripsey Wash Tailings Storage Facility Mitigation Ratio-Setting Checklist

RIPSEY MITIGATION SITES WITH HUC-6 WATERSHED MAPPING

Figure 7

Path: M:\Jobs\200's\203.51\ENV\MRSC\MXD\Fig8_ProjectServiceArea.mxd Date: 12/1/2017 User: towens

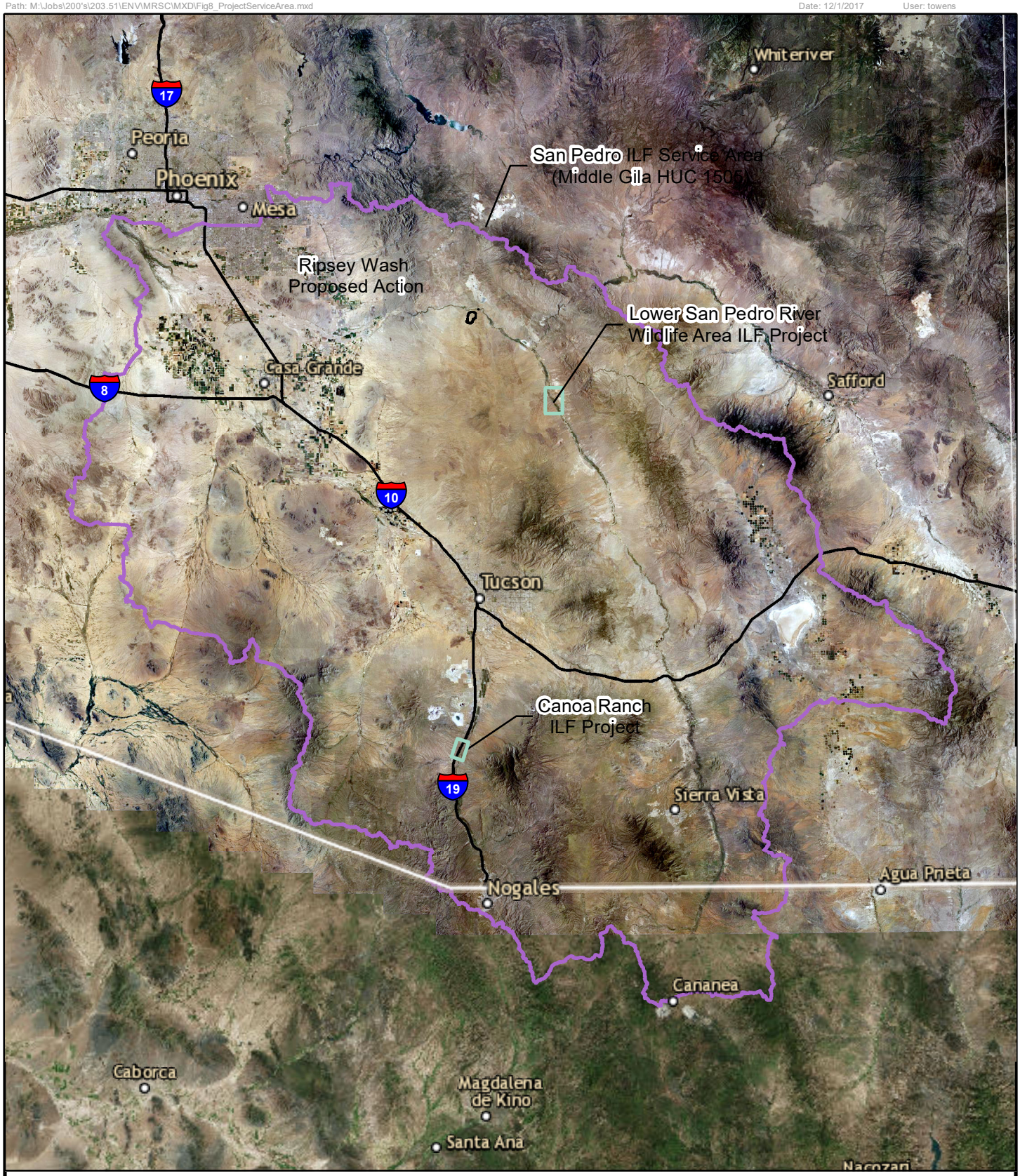


Image Source: 2015 USDA NAIP Orthophoto

WestLand Resources

0 14 28 Miles

0 28 56 Kilometers

N

ASARCO LLC

Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

PROJECT SERVICE AREA

Figure 8

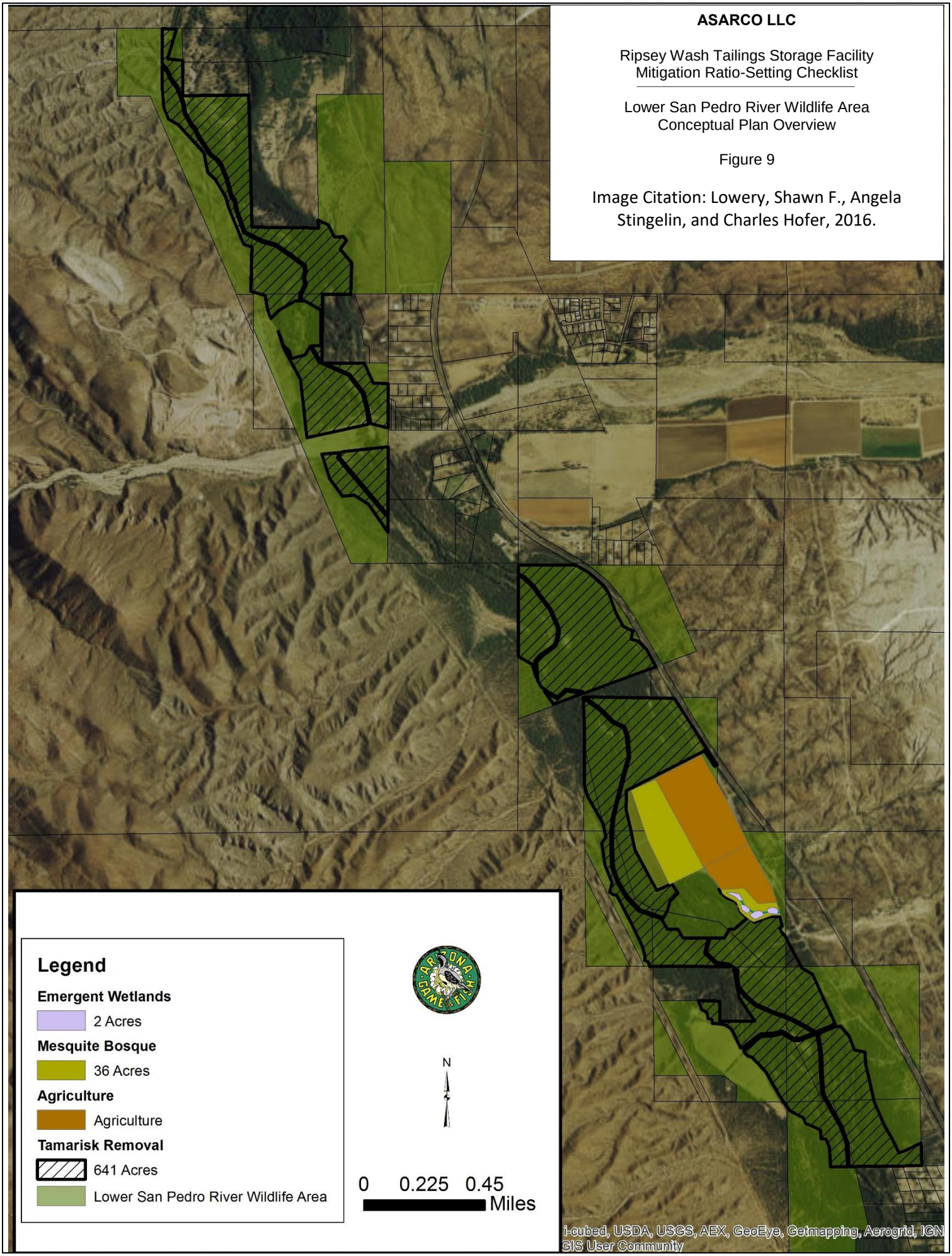
ASARCO LLC

Ripsey Wash Tailings Storage Facility
Mitigation Ratio-Setting Checklist

Lower San Pedro River Wildlife Area
Conceptual Plan Overview

Figure 9

Image Citation: Lowery, Shawn F., Angela Stingelin, and Charles Hofer, 2016.



APPENDIX A

FUNCTIONAL ASSESSMENT OF THE LOWER SAN PEDRO RIVER WILDLIFE AREA IN LIEU FEE PROJECT

Lower San Pedro River Wildlife Area ILF – Wetland Establishment Area

Function	Score	Explanation
Hydrologic Functions		
Hydrologic Connectivity	4 Moderate-High	The planned mitigation in the wetland establishment area consists of creating an emergent wetland. This wetland area will provide additional depressional storage and increased surface infiltration over conditions that would have developed if no mitigation activities were conducted. These factors will aid in the reduction of overland flow in the area, lowering peak flow intensity and erosional damage, providing for a functional score of "moderate-high."
Subsurface Flow/Groundwater Recharge	3 Moderate	The creation of wetland areas to retain water in the wetland establishment area will increase infiltration and allow additional water into the shallow water aquifer. The increased infiltration capacity will also allow for increased subsurface flow through the riparian area, supporting vegetation, and reaching the San Pedro River. The increased infiltration will also allow additional water to pass through the vadose zone into deeper groundwater aquifers. The limited extent of the wetland area provides for a functional score of "moderate."
Energy Dissipation	2 Low-Moderate	The mitigation actions in the wetland establishment area will create an emergent wetland adjacent to the perennial to intermittent San Pedro River. The retention of water within the wetland area will increase depressional storage and surface infiltration within the site. These factors will aid in the reduction of peak flow intensity and erosional damage. The limited extent of the wetland area provides for a functional score of "low-moderate."
Sediment Transport/Regulation	2 Low-Moderate	The proposed mitigation will create an emergent wetland within the floodplain of the adjacent San Pedro River. The retention of water within the wetland will slow water flow and allow sediment to settle out. The limited extent of the wetland area and the assumed limited connectivity between the wetland and the San Pedro River channel supports a functional score of "low-moderate" for this site.
Chemical Functions		
Elements, Compounds, and Particulate Cycling	4 Moderate-High	The mitigation actions in the wetland establishment area will result in the establishment of an emergent wetland, which will increase and maintain sequestration of nutrients. The emergent wetland will also aid in the denitrification process, which can prevent excessive nitrogen levels that lead to eutrophication and hypoxia from reaching the adjacent San Pedro River. The onsite breakdown of organic matter to its constituent elements for reuse in the immediate area provide for a functional score of "moderate-high" at this site.
Organic Carbon Export/Sequestration	4 Moderate-High	The planned mitigation in the wetland establishment area will sequester and allow for onsite cycling of carbon within the San Pedro River system, and provide for a functional score of "moderate-high."

Lower San Pedro River Wildlife Area ILF – Wetland Establishment Area

Function	Score	Explanation
Biotic Functions		
Aquatic Invertebrate Fauna	5 High	The establishment of an emergent wetland adds a different aquatic habitat type to the San Pedro corridor in the LSPRWA, and is expected to increase the diversity and quantity of aquatic invertebrate fauna within the San Pedro River system, providing for a functional score of "high."
Presence of Fish and Fish Habitat Structure	3 Moderate	Both native and non-native fish are present within the perennial portions of the San Pedro River. Establishment of an emergent wetland may provide appropriate habitat for native fish species appropriate to wetland aquatic conditions, but is expected to have no direct effects on the presence and species diversity of fish or fish habitat structure within the San Pedro River itself, providing for a functional rating of "moderate."
Riparian/Wetland Vegetation Structure	4 Moderate-High	The wetland establishment area will include emergent vegetation and fringe vegetation is anticipated to be continuous or nearly continuous with the emergent vegetation or its litter, and to have vegetation volume above 1 m^3/m^2, providing for a functional rating of "moderate-high."
Age Class Distribution of Woody Riparian or Wetland Vegetation	5 High	The mitigation actions in the wetland establishment area will result in establishment of emergent vegetation. Woody vegetation is expected to be limited to the fringe of the lentic feature, where the proposed mitigation is expected to produce an age-class structure containing the seedling, sapling, and mature age classes of the riparian vegetation. The senescent age class will develop over time. Wetland vegetation is anticipated to develop and persist within this site. The eventual presence of all four ages classes, coupled with the likely presence of wetland vegetation, indicates a score for this function of "high."
Native/Non-native Vegetation Species	5 High	The mitigation actions in the wetland establishment area will establish native, emergent vegetation within the lentic area, and restore native fringe riparian species through active management of non-native woody species. The establishment of native species and active management are expected to limit encroachment of woody exotics. The projected encroachment of the tamarisk leaf beetle will lead to seasonal defoliation of this site, leading ultimately to the death of the current riparian vegetation. The replacement of tamarisk with native wetland species within the lentic area and native cottonwood, willow, and mesquite along the lentic fringe will create riparian refugia for wildlife and maintain the other functions during the eventual die-off from the beetle, providing a score of "high."

Lower San Pedro River Wildlife Area ILF– Riparian Restoration

Function	Score	Explanation
Hydrologic Functions		
Hydrologic Connectivity	4 Moderate-High	The planned riparian restoration consists mainly of thinning the non-native riparian vegetation and planting native riparian trees, with some creation of mesquite bosque in former agricultural fields along a portion of the San Pedro River that has perennial to intermittent flows. The projected encroachment of the tamarisk leaf beetle will lead to seasonal defoliation of this site, ultimately leading to the death of the current riparian vegetation. The replacement of tamarisk with native cottonwood, willow, and mesquite will create riparian refugia for wildlife during the eventual die-off from the beetle. The replacement of the non-native riparian vegetation that is expected to die off will provide increased overland roughness, additional depressional storage, and increased surface infiltration over conditions that would have developed if no mitigation activities were conducted. These factors will aid in the reduction of overland flow in the area lowering peak flow intensity and erosional damage. The projected increase in healthy native riparian vegetation provides for a functional score of "moderate-high."
Subsurface Flow/Groundwater Recharge	4 Moderate-High	The conversion of non-native riparian vegetation in the riparian restoration area will maintain infiltration and allow additional water into the shallow water aquifer. The increased infiltration capacity provided by the additional root mass will also allow for increased subsurface flow through the riparian area, supporting vegetation and reaching the San Pedro River. The increased infiltration will also increase the potential for additional water to pass through the vadose zone into deeper groundwater aquifers. The projected final density of riparian vegetation provides for a functional score of "moderate-high."
Energy Dissipation	4 Moderate-High	The mitigation actions in riparian restoration area will convert at-risk non-native riparian tamarisk to native riparian vegetation. The riparian restoration area is adjacent to the perennial to intermittent San Pedro River. The conversion of riparian vegetation will ensure overland roughness, depressional storage, and surface infiltration are maintained or increased within the site. These factors will aid in the reduction of peak flow intensity and erosional damage. Furthermore, tamarisk can reach levels of excessive density that can retard the access of flood flows to the adjacent riparian floodplain. The projected effects of diversifying the riparian vegetation to maintain the energy dissipation function during tamarisk die-off provides for a functional score of "moderate-high."

Lower San Pedro River Wildlife Area ILF– Riparian Restoration

Function	Score	Explanation
Sediment Transport/Regulation	4 Moderate-High	A die-off in riparian vegetation caused by the tamarisk leaf beetle would limit the ability of the area to regulate sediment transport to the adjacent Gila River. A reduction of vegetation limits the ability of riparian areas to reduce damaging overland flows and prevents the trapping and deposition of sediment from overland flows. A lack of herbaceous ground cover and living root mass from herbaceous and woody plants also increases the amount of erosional loss within the site itself. The proposed mitigation will convert the at-risk tamarisk to a native and fully functioning native riparian area within the floodplain of the adjacent perennial to intermittent San Pedro River. The projected effects of diversifying the riparian vegetation to maintain the sediment regulation function during tamarisk die-off supports a functional score of "moderate-high" for this site.
Chemical Functions		
Elements, Compounds, and Particulate Cycling	4 Moderate-High	The mitigation actions in riparian restoration area will result in the conversion of tamarisk to dense native riparian vegetation. The anticipated conversion of riparian vegetation in the riparian restoration area will increase and maintain sequestration of nutrients that can be released to the Gila River during flood events and through subsurface travel. The restored riparian vegetation will also aid in the denitrification process, which can prevent excessive nitrogen levels that lead to eutrophication and hypoxia from reaching the adjacent San Pedro River. The removal of tamarisk will also improve soil quality and reduce the potential for the build-up salts within surface soils and runoff. The moderate density of riparian vegetation and distance to the adjacent aquatic feature provide for a functional score of "moderate-high" at this site.
Organic Carbon Export/Sequestration	4 Moderate-High	The planned mitigation in the riparian restoration area will ensure the riparian vegetation at this site continues to be a highly functioning export and sequestration mechanism for carbon for the San Pedro River. The mitigation actions are projected to result in dense riparian vegetation and provide for a functional score of "moderate-high."
Biotic Functions		
Aquatic Invertebrate Fauna	3 Moderate	The replacement of the invasive tamarisk trees with different species of native riparian trees in the riparian restoration area is expected to improve the diversity and of aquatic invertebrate fauna within the adjacent San Pedro River. This indicates a functional score of "moderate."
Presence of Fish and Fish Habitat Structure	3 Moderate	Both native and non-native fish are present within the perennials portions of the San Pedro River. Improvements to the riparian restoration area are expected to have negligible direct effects on, but will maintain, the presence and species diversity of fish or fish habitat structure beyond that captured under other listed functions related to the general health of the river system. This together indicates a functional score of "moderate."

Lower San Pedro River Wildlife Area ILF– Riparian Restoration

Function	Score	Explanation
Riparian/Wetland Vegetation Structure	5 High	The projected encroachment of the tamarisk leaf beetle would lead to seasonal defoliation of this site, ultimately leading to the death of the current riparian vegetation. The replacement of tamarisk with native cottonwood, willow, and mesquite in the riparian restoration area is anticipated to keep vegetation volumes above 1 m^3/m^2, and will result in an enhancement of the overall riparian system, providing for a functional rating of "high."
Age Class Distribution of Woody Riparian or Wetland Vegetation	4 Moderate-High	The mitigation actions in the riparian restoration area will restore native riparian vegetation with a stable and robust age-class structure within an area that consists of a relative monoculture of invasive tamarisk. The proposed mitigation is expected to produce an age-class structure containing the seedling, sapling, and mature age classes of the riparian vegetation. The senescent age class will develop over time. The eventual presence of all four ages classes, but without emergent wetland vegetation, indicates a score for this function of "moderate-high."
Native/Non-native Vegetation Species	5 High	The mitigation actions in the riparian restoration area will focus mainly on the restoration of native riparian species through active management of non-native woody species. The establishment of native species and active management are expected to limit encroachment of woody exotics. The projected encroachment of the tamarisk leaf beetle would lead to seasonal defoliation of this site, leading ultimately to the death of the current riparian vegetation. The replacement of tamarisk with native cottonwood, willow, and mesquite will create riparian refugia for wildlife and maintain the other functions during the eventual die-off from the beetle, and indicates a score for this function of "high."

APPENDIX B.

MITIGATION RATIO-SETTING CHECKLIST WORKSHEETS

1	Date: 8/28/2014	Corps File No.:	SPL-2011-1005-MWL	Project Manager	MWL				
	Impact Site Name:	Ephemeral Class 1	ORM Resource Type:	River/Stream		Hydrology:	Ephemeral		
	Impact Cowardin or HGM type:	Riverine	Impact area :	68.03	acres	Impact distance:	16,280	linear feet	

		Mitigation Sites											
		San Pedro Site A		**San Pedro Site B**		**San Pedro Site C**		**San Pedro Site D**		**LSPRWA ILF (Wetland Establishment Area)**		**LSPRWA ILF (Riparian Restoration Area)**	
		Mitigation Site Name:	San Pedro Site A- Mesquite Bosque	Mitigation Site Name:	San Pedro Site B- Mesquite Field	Mitigation Site Name:	San Pedro Site C- Mesquite Field	Mitigation Site Name:	San Pedro Site D- Active Floodplain	Mitigation Site Name:	LSPRWA ILF	Mitigation Site Name:	LSPRWA ILF
		Mitigation Type:	Preservation	Mitigation Type:	Restoration	Mitigation Type:	Restoration	Mitigation Type:	Preservation	Mitigation Type:	Establishment	Mitigation Type:	Restoration
		ORM Resource Type		ORM Resource Type		ORM Resource Type		ORM Resource Type		ORM Resource Type		ORM Resource Type	
		Cowardin/HGM type:	Riverine	Cowardin/HGM type:	Riverine	Cowardin/HGM type:	Riverine	Cowardin/HGM type:	Riverine	Cowardin/HGM type:	Wetland	Cowardin/HGM type:	Riverine
		Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Perennial	Hydrology:	Intermittent
2	**Qualitative impact-mitigation comparison:**	Starting ratio:	1.0 : 1.0	Starting ratio:	1.0 : 1.0	Starting ratio:	1.0 : 1.0	Starting ratio:	1.0 : 1.0	Starting ratio:	1.0 : 1.0	Starting ratio:	1.0 : 1.0
		Ratio adjustment:	3.20	Ratio adjustment:	-0.50	Ratio adjustment:	-0.50	Ratio adjustment:	3.00	Ratio adjustment:	-1.46	Ratio adjustment:	-1.36
		Baseline ratio:	4.20 : 1.00	Baseline ratio:	1.00 : 1.50	Baseline ratio:	1.00 : 1.50	Baseline ratio:	4.00 : 1.00	Baseline ratio:	1.00 : 2.46	Baseline ratio:	1.00 : 2.36
		PM justification: See qualitative sheet for adjustment		PM justification: See qualitative sheet for adjustment		PM justification: See qualitative sheet for adjustment		PM justification: See qualitative sheet for adjustment		PM justification: See qualitative sheet for adjustment		PM justification: See qualitative sheet for adjustment	
3	**Quantitative impact-mitigation comparison:**	NA	:	NA	:	NA	:	NA	:	NA	:	NA	:
4	**Mitigation site location**	Ratio adjustment:	1	Ratio adjustment:	1	Ratio adjustment:	1	Ratio adjustment:	1	Ratio adjustment:	1	Ratio adjustment:	1
		PM justification: Not within the HUC 6 or smaller watershed		PM justification: Not within same HUC 6 or smaller watershed		PM justification: Not within same HUC 6 or smaller watershed		PM justification: Not within same HUC 6 or smaller watershed		PM justification: Not within same HUC 6 or smaller watershed		PM justification: Not within same HUC 6 or smaller watershed	
5	**Net loss of aquatic resource surface area:**	Ratio adjustment:	1	Ratio adjustment:	0	Ratio adjustment:	0	Ratio adjustment:	1	Ratio adjustment:	0	Ratio adjustment:	0
		PM justification: No aquatic resources to be established		PM justification:		PM justification:		PM justification: No aquatic resources to be established		PM justification:		PM justification:	
6	**Type conversion:**	Ratio adjustment:	-2.5	Ratio adjustment:	-2.5	Ratio adjustment:	-2.5	Ratio adjustment:	-2.75	Ratio adjustment:	-3	Ratio adjustment:	-2.5
		PM justification: Dense riparian vegetation adjacent to intermittent aquatic resource is a rare and valuable resource in Arizona		PM justification: Riparian vegetation adjacent to intermittent aquatic resource is a rare and valuable resource in Arizona		PM justification: Riparian vegetation adjacent to intermittent aquatic resource is a rare and valuable resource in Arizona		PM justification: Dense riparian vegetation adjacent to intermittent aquatic resource is a rare and valuable resource in Arizona		PM justification: Perennial aquatic resources are a rare and valuable resource in Arizona		PM justification: Intermittent aquatic resources and adjacent dense riparian habitat are a rare and valuable resource in Arizona	
7	**Risk and uncertainty:**	Ratio adjustment:	0.1	Ratio adjustment:	0.1	Ratio adjustment:	0.3	Ratio adjustment:	0.1	Ratio adjustment:	0	Ratio adjustment:	0
		PM justification:		PM justification:Minimal R&C because mitigation already in place		PM justification:		PM justification:		PM justification:		PM justification:	
8	**Temporal loss:**	Ratio adjustment:	0	Ratio adjustment:	0	Ratio adjustment:	3	Ratio adjustment:	0	Ratio adjustment:	1.8	Ratio adjustment:	1.8
		PM justification:		PM justification:		PM justification: +3 adjustment for planted trees to mature		PM justification:		PM justification:		PM justification:	
9	**Final mitigation ratio(s):**	Baseline ratio from 2 or 3:	4.20 : 1.00	Baseline ratio from 2 or 3:	1.00 : 1.50	Baseline ratio from 2 or 3:	1.00 : 1.50	Baseline ratio from 2 or 3:	4.00 : 1.00	Baseline ratio from 2 or 3:	1.00 : 2.46	Baseline ratio from 2 or 3:	1.00 : 2.36
		Total adjustments (4-8):	-0.4	Total adjustments (4-8):	-1.4	Total adjustments (4-8):	1.8	Total adjustments (4-8):	-0.65	Total adjustments (4-8):	-0.2	Total adjustments (4-8):	0.3
		Final ratio:	**3.00 : 1.00**	Final ratio:	**1.00 : 1.00**	Final ratio:	**1.90 : 1.00**	Final ratio:	**2.40 : 1.00**	Final ratio:	**1.00 : 1.00**	Final ratio:	**1.00 : 1.00**
		to Resource type	Project Manager:	to Resource type	Project Manager:	to Resource type	Project Manager:	to Resource type	Project Manager:	to Resource type	Project Manager:	to Resource type	Project Manager:
		Cowardin or HGM:	Ephemeral Class 1	Cowardin or HGM:	Ephemeral Class 1	Cowardin or HGM:	Ephemeral Class 1	Cowardin or HGM:	Ephemeral Class 1	Cowardin or HGM:	Ephemeral Class 1	Cowardin or HGM:	Ephemeral Class 1
		Hydrology:		Hydrology:		Hydrology:		Hydrology:		Hydrology:		Hydrology:	
		Total Acreage at Site	29.8 acres / linear feet	Total Acreage at Site	28.2 acres / linear feet	Total Acreage at Site	25.8 acres / linear feet	Total Acreage at Site	14.1 acres / linear feet	Total Acreage at Site[1]	0.98 acres / linear feet	Total Acreage at Site[1]	n/a acres / linear feet
		of Resource type	0	of Resource type	0	of Resource type	0	of Resource type	0	of Resource type	0	of Resource type	0
		Cowardin or HGM:	Riverine	Cowardin or HGM:	Riverine	Cowardin or HGM:	Riverine	Cowardin or HGM:	Riverine	Cowardin or HGM:	Wetland	Cowardin or HGM:	Riverine
		Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Intermittent	Hydrology:	Perennial	Hydrology:	Intermittent
		Mitigation Credits:	9.93 acres / linear feet	Mitigation Credits:	28.20 acres / linear feet	Mitigation Credits:	13.58 acres / linear feet	Mitigation Credits:	5.88 acres / linear feet	Mitigation Credits:	0.98 acres / linear feet	Mitigation Credits[2]:	9.46 acres / linear feet
10	**Final compensatory mitigation requirements:**	Starting impact:	68.03 acres	Starting impact:	58.10 acres	Starting impact:	29.90 acres	Starting impact:	16.32 acres	Starting impact:	10.44 acres	Starting impact:	9.46 acres
		Remaining impact:	58.10 acres	Remaining Impact:	29.90 acres	Remaining Impact:	16.32 acres	Remaining Impact:	10.44 acres	Remaining Impact:	9.46 acres	Remaining Impact:	0.00 acres
		Additional PM comments:		Additional PM comments:		Additional PM comments:		Additional PM comments:		Additional PM comments:		Additional PM comments:	

1: This is the total acreage available of a particular mitigation type at the mitigation site
2: This is the total number of mitigation credits required: Impacted acres * Final Ratio

Ripsey Wash - Ephemeral Class 1 Features

	Function	Score
Physical	Hydrologic Connectivity	Moderate-High (4)
	Subsurface Flow\Groundwater Recharge	Low-Moderate (2)
	Energy Dissipation	Moderate (3)
	Sediment Transport/Regulation	Moderate (3)
Chemical	Elements, Compounds, and Particulate Cycling	Moderate (3)
	Organic Carbon Export/Sequestration	Low-Moderate (2)
Biotic	Aquatic Invertebrate Fauna	None (0)
	Presence of Fish\Fish Habitat Structure	None (0)
	Riparian/Wetland Habitat Structure	Low-Moderate (2)
	Age Class Distribution of Wooded Riparian or Wetland Habitat	Moderate-High (4)
	Native/Non-native Vegetation Species	High (5)

San Pedro River Site A (Mesquite Bosque Preservation)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	3	↑	
	Energy Dissipation	3	4	↑	
	Sediment Transport/Regulation	3	5	↑↑	
Chemical	Elements, Compounds, and Particulate Cycling	3	3	↔	
	Organic Carbon Export/Sequestration	2	4	↑↑	
Biotic	Aquatic Invertebrate Fauna	0	0	↔	
	Presence of Fish\Fish Habitat Structure	0	0	↔	
	Riparian/Wetland Habitat Structure	2	5	↑↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	4	↔	
	Native/Non-native Vegetation Species	5	4	↓	
	Total	28	36		3.20

Total Adjustment:	3.20
PM Justification:	

San Pedro River Site B (Mesquite Field Restoration)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	3	↓	
	Subsurface Flow\Groundwater Recharge	2	2	↔	
	Energy Dissipation	3	3	↔	
	Sediment Transport/Regulation	3	4	↑	
Chemical	Elements, Compounds, and Particulate Cycling	3	3	↔	
	Organic Carbon Export/Sequestration	2	3	↑	
Biotic	Aquatic Invertebrate Fauna	0	0	↔	
	Presence of Fish\Fish Habitat Structure	0	0	↔	
	Riparian/Wetland Habitat Structure	2	2	↔	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	3	↓	
	Native/Non-native Vegetation Species	5	5	↔	
	Total	28	26		-0.50

Total Adjustment:	-0.50
PM Justification:	

San Pedro River Site C (Mesquite Field Restoration)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	3	↔	
	Energy Dissipation	3	4	↑	
	Sediment Transport/Regulation	3	5	↑↑	
Chemical	Elements, Compounds, and Particulate Cycling	3	3	↔	
	Organic Carbon Export/Sequestration	2	3	↑	
Biotic	Aquatic Invertebrate Fauna	0	0	↔	
	Presence of Fish\Fish Habitat Structure	0	0	↔	
	Riparian/Wetland Habitat Structure	2	3	↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	4	↔	
	Native/Non-native Vegetation Species	5	3	↓↓	
	Total	28	32		-0.50

Total Adjustment:	-0.50
PM Justification:	

San Pedro River Site D (Active Floodplain Preservation)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	4	↑↑	
	Energy Dissipation	3	4	↑	
	Sediment Transport/Regulation	3	5	↑↑	
Chemical	Elements, Compounds, and Particulate Cycling	3	3	↔	
	Organic Carbon Export/Sequestration	2	4	↑↑	
Biotic	Aquatic Invertebrate Fauna	0	0	↔	
	Presence of Fish\Fish Habitat Structure	0	0	↔	
	Riparian/Wetland Habitat Structure	2	5	↑↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	4	↔	
	Native/Non-native Vegetation Species	5	1	↓↓↓↓	
	Total	28	34		3.00

Total Adjustment:	3.00
PM Justification:	

LSPRWA ILF (Wetland Establishment)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	3	↑	
	Energy Dissipation	3	2	↑	
	Sediment Transport/Regulation	3	2	↓	-0.39
Chemical	Elements, Compounds, and Particulate Cycling	3	4	↑	
	Organic Carbon Export/Sequestration	2	4	↑↑	-0.29
Biotic	Aquatic Invertebrate Fauna	0	5	↑↑↑↑↑	
	Presence of Fish\Fish Habitat Structure	0	3	↑↑↑	
	Riparian/Wetland Habitat Structure	2	4	↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	5	↑	
	Native/Non-native Vegetation Species	5	5	↔	-0.79
	Total	28	41		-1.46

Total Adjustment:	-1.46
PM Justification:	

LSPRWA ILF (Riparian Restoration Area)

	Function	Functional Score of Class 1 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	4	↑↑	
	Energy Dissipation	3	4	↑	
	Sediment Transport/Regulation	3	4	↑	-0.57
Chemical	Elements, Compounds, and Particulate Cycling	3	4	↑	
	Organic Carbon Export/Sequestration	2	4	↑↑	-0.29
Biotic	Aquatic Invertebrate Fauna	0	n/a*	↑↑↑	
	Presence of Fish\Fish Habitat Structure	0	n/a*	↑↑↑	
	Riparian/Wetland Habitat Structure	2	5	↑↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	4	4	↔	
	Native/Non-native Vegetation Species	5	5	↔	-0.50
	Total	28	38		-1.36

*Score not applicable for comparison with an ephemeral system

Total Adjustment:	-1.36
PM Justification:	

Attachment 12501.6 - SPD Mitigation Ratio Setting Checklist (See 12501-SPD for Revisions Sheet)

1	Date: 8/29/14	Corps File No.:	SPL-2011-1005-MWL	Project Manager:	MWL				
	Impact Site Name:	**Ephemeral Class 2**	ORM Resource Type:	River/Stream		Hydrology:	Ephemeral		
	Impact Cowardin or HGM type:	Riverine	Impact area:	45.89	acres	Impact distance:	52,950	linear feet	

		Mitigation Sites		
		LSPRWA ILF (Riparian Restoration Area)		
		Mitigation Site Name:	LSPRWA ILF	
		Mitigation Type:	Restoration	
		ORM Resource Type:		
		Cowardin/HGM type:	Riverine	
		Hydrology:	Intermittent	
2	**Qualitative impact-mitigation comparison**:	Starting ratio:	**1.0 : 1.0**	
		Ratio adjustment:	**-1.58**	
		Baseline ratio:	**1.00 : 2.58**	
		PM justification: See qualitative sheet for adjustment		
3	**Quantitative impact-mitigation comparison**:	NA	**:**	
4	**Mitigation site location**:	Ratio adjustment:	**1**	
		PM justification: Not within same HUC 6 or smaller watershed		
5	**Net loss of aquatic resource surface area**:	Ratio adjustment:	**1**	
		PM justification: No aquatic resources to be established		
6	**Type conversion:**	Ratio adjustment:	**-2.4**	
		PM justification: Perennial aquatic resources and adjacent dense riparian habitat are a rare and valuable resource in Arizona		
7	**Risk and uncertainty**:	Ratio adjustment:	**0**	
		PM justification:		
8	**Temporal loss**:	Ratio adjustment:	**1.8**	
		PM justification:		
9	**Final mitigation ratio(s):**	Baseline ratio from 2 or 3:	1.00 : 2.58	
		Total adjustments (4-8):	1.4	
		Final ratio:	**1.00 : 1.00**	
		to Resource type:	River/Stream	
		Cowardin or HGM:	Riverine	
		Hydrology:		
		Total Acreage at Site[1]:	n/a acres / linear feet	
		of Resource type:	0	
		Cowardin or HGM:	Riverine	
		Hydrology:	Intermittent	
		Mitigation Credits[2]:	45.89 acres / linear feet	
10	**Final compensatory mitigation requirements:**	Starting impact:	45.89 acres	
		Remaining Impact:	0.00 acres	
		Additional PM comments:		

1: This is the total acreage available of a particular mitigation type at the mitigation site
2: This is the total number of mitigation credits required: Impacted acres * Final Ratio

Ripsey Wash - Ephemeral Class 2 Features

	Function	Score
Physical	Hydrologic Connectivity	Moderate-High (4)
	Subsurface Flow\Groundwater Recharge	Low-Moderate (2)
	Energy Dissipation	Low-Moderate (2)
	Sediment Transport/Regulation	Low-Moderate (2)
Chemical	Elements, Compounds, and Particulate Cycling	Low-Moderate (2)
	Organic Carbon Export/Sequestration	Low-Moderate (2)
Biotic	Aquatic Invertebrate Fauna	None (0)
	Presence of Fish\Fish Habitat Structure	None (0)
	Riparian/Wetland Habitat Structure	Low-Moderate (2)
	Age Class Distribution of Wooded Riparian or Wetland Habitat	Moderate (3)
	Native/Non-native Vegetation Species	High (5)

LSPRWA ILF (Riparian Restoration Area)

	Function	Functional Score of Class 2 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	4	4	↔	
	Subsurface Flow\Groundwater Recharge	2	4	↑↑	
	Energy Dissipation	2	4	↑↑	
	Sediment Transport/Regulation	2	4	↑↑	-0.67
Chemical	Elements, Compounds, and Particulate Cycling	2	4	↑↑	
	Organic Carbon Export/Sequestration	2	4	↑↑	-0.33
Biotic	Aquatic Invertebrate Fauna	0	n/a*	↔	
	Presence of Fish\Fish Habitat Structure	0	n/a*	↔	
	Riparian/Wetland Habitat Structure	2	5	↑↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	3	4	↑	
	Native/Non-native Vegetation Species	5	5	↔	-0.58
	Total	24	38		-1.58

*Score not applicable for comparison with an ephemeral system

Total Adjustment:	-1.58
PM Justification:	

Attachment 12501.6 - SPD Mitigation Ratio Setting Checklist (See 12501-SPD for Revisions Sheet)

1	Date: 8/29/14	Corps File No.:	SPL-2011-1005-MWL	Project Manager:	MWL				
	Impact Site Name:	**Ephemeral Class 3**	ORM Resource Type:	River/Stream		Hydrology:	Ephemeral		
	Impact Cowardin or HGM type:	Riverine	Impact area :	20.73	acres	Impact distance:	92,895	linear feet	

		Mitigation Sites		
		LSPRWA ILF (Riparian Restoration Area)		
		Mitigation Site Name:	LSPRWA ILF	
		Mitigation Type:	Restoration	
		ORM Resource Type:		
		Cowardin/HGM type:	Riverine	
		Hydrology:	Intermittent	
2	**Qualitative impact-mitigation comparison**:	Starting ratio:	**1.0 : 1.0**	
		Ratio adjustment:	**-2.24**	
		Baseline ratio:	**1.00 : 3.24**	
		PM justification: See qualitative sheet for adjustment		
3	**Quantitative impact-mitigation comparison**:	NA	**:**	
4	**Mitigation site location**:	Ratio adjustment:	**1**	
		PM justification: Not within the HUC 6 or smaller watershed		
5	**Net loss of aquatic resource surface area**:	Ratio adjustment:	**1**	
		PM justification: No aquatic resources to be established		
6	**Type conversion:**	Ratio adjustment:	**-2.4**	
		PM justification: Dense riparian vegetation adjacent to intermittent aquatic resource is a rare and valuable resource in Arizona		
7	**Risk and uncertainty**:	Ratio adjustment:	**0**	
8	**Temporal loss**:	Ratio adjustment:	**1.8**	
		PM justification:		
9	**Final mitigation ratio(s):**	Baseline ratio from 2 or 3:	1.00 :	3.24
		Total adjustments (4-8):	1.4	
		Final ratio:	**1.00 : 1.00**	
		to Resource type:	River/Stream	
		Cowardin or HGM:	Riverine	
		Hydrology:		
		Total Acreage at Site[1]	n/a	acres / linear feet
		of Resource type:	0	
		Cowardin or HGM:	Riverine	
		Hydrology:	Intermittent	
		Mitigation Credits[2]:	20.73	acres / linear feet
10	**Final compensatory mitigation requirements:**	Starting impact:	20.73	acres
		Remaining impact:	0.00	acres
		Additional PM comments:		

Ripsey Wash - Ephemeral Class 3 Features

Function	Score
Hydrologic Connectivity	Moderate (3)
Subsurface Flow\Groundwater Recharge	Low (1)
Energy Dissipation	Low (1)
Sediment Transport/Regulation	Low (1)
Elements, Compounds, and Particulate Cycling	Low (1)
Organic Carbon Export/Sequestration	Low (1)
Aquatic Invertebrate Fauna	None (0)
Presence of Fish\Fish Habitat Structure	None (0)
Riparian/Wetland Habitat Structure	Low (1)
Age Class Distribution of Wooded Riparian or Wetland Habitat	Moderate (3)
Native/Non-native Vegetation Species	High (5)

LSPRWA ILF (Riparian Restoration Area)

	Function	Functional Score of Class 3 Ephemeral Impact	Functional Score from Mitigation	Overall Functional Loss/Gain	Ratio Adjustment
Physical	Hydrologic Connectivity	3	4	↑	
	Subsurface Flow\Groundwater Recharge	1	4	↑↑↑	
	Energy Dissipation	1	4	↑↑↑	
	Sediment Transport/Regulation	1	4	↑↑↑	-0.94
Chemical	Elements, Compounds, and Particulate Cycling	1	4	↑↑↑	
	Organic Carbon Export/Sequestration	1	4	↑↑↑	-0.47
Biotic	Aquatic Invertebrate Fauna	0	n/a*	↔	
	Presence of Fish\Fish Habitat Structure	0	n/a*	↔	
	Riparian/Wetland Habitat Structure	1	5	↑↑↑↑	
	Age Class Distribution of Wooded Riparian or Wetland Habitat	3	4	↑	
	Native/Non-native Vegetation Species	5	5	↔	-0.82
	Total	17	38		-2.24

*Score not applicable for comparison with an ephemeral system

Total Adjustment:	-2.24
PM Justification:	