RESULTS OF SONORAN DESERT TORTOISE SURVEY IN THE TONTO NATIONAL FOREST NEAR SUPERIOR, ARIZONA 2013

Prepared for:

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EXECUTIVE SUMMARY

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Mining, LLC (Resolution) to conduct biological baseline studies related to a proposed tailings alternative (Tailings Area) within the Tonto National Forest as outlined in a General Plan of Operations (GPO), and related to proposed baseline activities in support of mining exploration activities in the same general area (Baseline Activities Area) as described in a Plan of Operations (PoO). The Tailings Area is comprised of the proposed footprint of the tailings placement area, a Tailings Corridor to transport tailings from the West Plant Site to the tailings placement area, isolated borrow areas, and other related infrastructure. The Baseline Activities Area comprises the area where Resolution proposes to conduct baseline hydrologic and geotechnical testing and monitoring activities that include drilling for groundwater testing and monitoring, geotechnical testing and piezometer installations, excavation of test trenches, use of laydown yards, conducting roadway improvements and maintenance on existing Forest Service Roads, and the use of short-term temporary roads to access off-road locations.

Sonoran desert tortoise surveys were conducted within the Tailings and the Baseline Activities Areas. Surveys were conducted by two crews of two biologists working together over 13 days and one crew of two biologists working over one day, for a total survey effort of 54 person-days. Surveys were conducted from August 26 through 30, September 3 through 6, and September 9 through 13, 2013.

The purpose of these surveys was twofold. First, all of the survey transects provide baseline information that could be used to inform future studies and monitoring activities related to potential impacts to individuals or shelters. Second, the surveys within the Baseline Activities Area provided 100 percent coverage of those areas, with the exception of a few Baseline Activities Area components that were not surveyed. The 100 percent coverage of the Baseline Activities Area does not provide clearance for those areas, as the clearance surveys would have to be conducted immediately prior to the disturbance activities; however the surveys do provide information to assist development of an effective monitoring plan for when activities occur, while also providing information applicable to the first stated purpose of the surveys.

Survey transects in the Tailings Area were designed to accomplish two things: (1) focus on selected incised washes because they provide likely tortoise habitat, and (2) traverse broad geographical areas throughout the Tailings Area. To accomplish these goals, 10 triangular transects (transects that run around the perimeter of a three-sided area) were placed in a variety of areas, some of which included proposed borrow areas, and several of which included one leg of the triangular transects placed within a wash. Six of the triangular transects were 500 m on a side; the remaining four were 1,000 m on a side.

Survey in the Baseline Activities Area was designed to provide 100 percent coverage within most of the 16 drill sites (DS-A through DS-P), 41 geotechnical sites (GT-1 through GT-41), 34 test trenches (TP-1 through TP-34), and road segments identified in the PoO.

During pedestrian surveys within the Tailings and Baseline Activities Areas, WestLand biologists documented five live tortoises, one tortoise carcass, two tortoise scats, one tortoise track, 10 active shelters, and 37 suitable shelters. In the course of conducting other, non-survey activities, WestLand biologists and archaeologists documented a total of eight live tortoises, one carcass, and two suitable shelters. Observations were recorded throughout the Tailings and Baseline Activities Areas, but many were clustered along Bear Tank and Benson Springs washes, and along unnamed washes between Roblas and Bear Tank canyons. The results of this and previous Sonoran desert tortoise surveys indicate that tortoises are distributed throughout the entire area. The results also suggest that the distribution of tortoises is not uniform throughout the area, which is typical of tortoise populations.

1. INTRODUCTION

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Mining, LLC (Resolution) to conduct biological baseline studies related to proposed tailings alternatives (Tailings Area) within National Forest System Lands managed by Tonto National Forest (TNF) as outlined in a General Plan of Operations (GPO) (Resolution 2013a), and related to baseline activities in support of mining exploration activities in the same general area (Baseline Activities Area) as described in a Plan of Operations (PoO) (Resolution 2013b) (***Figure 1***). The Tailings Area is comprised of the footprint of the tailings placement area, a Tailings Corridor to transport tailings from the West Plant Site to the tailings placement area, isolated borrow areas, and other related infrastructure.

The Baseline Activities Area comprises the area where Resolution proposes to conduct baseline hydrologic and geotechnical testing and monitoring activities that include drilling for groundwater testing and monitoring, geotechnical testing and piezometer installations, excavation of test trenches, use of laydown yards, conducting roadway improvements and maintenance on existing Forest Service Roads, and the use of short-term temporary roads to access off-road locations. These activities are associated with Resolution's baseline environmental data gathering and studies to further the understanding of hydrology, geochemistry, and geotechnical conditions over an area covering a range of potential alternative sites for tailings. New disturbance for the various Baseline Activities is a combination of linear features and small parcels (1 acre or less).

The Tailings and Baseline Activities Areas are located adjacent to and north of US Highway 60, less than 1 mile (1.6 km) west of Superior in Township 1 South, Range 11 East in portions of Sections 13, 23 to 27, and 35 to 36; Township 1 South, Range 12 East in portions of Sections 19 to 21 and 28 to 33; Township 2 South, Range 11 East in portions of Sections 1 and 2; and Township 2 South, Range 12 East in portions of Section 6; Gila and Salt River Baseline and Meridian, Pinal County, Arizona (***Figure 1***). This area generally slopes downhill from the northeast to the southwest, and is dissected by numerous ephemeral washes. The highest elevation is 2,900 ft (884 m) at a ridge near the eastern boundary, and the lowest elevation is 2,240 ft (683 m) near the western boundary. Vegetation is characteristic of the Arizona Upland Subdivision of Sonoran Desertscrub (Turner and Brown 1982). The Tailings and Baseline Activities Areas contain several Forest Service Roads, historic mining features, and disturbance caused by Off-Highway Vehicle (OHV) usage.

Sonoran desert tortoise surveys were conducted on TNF lands within the Tailings and the Baseline Activities Areas. Surveys were conducted by two crews of two biologists working together over 13 days and one crew of two biologists working over one day, for a total survey effort of 54 person-days. Surveys were conducted from August 26 through 30, September 3 through 6, and September 9 through 13, 2013. The purpose of these surveys was twofold. First, all of the survey transects provide baseline information that could be used to inform future studies and monitoring activities related to potential impacts to individuals or shelters. Second, the surveys within the Baseline Activities Area provided 100 percent coverage of those areas, with the exception of a few Baseline Activities Area components that were not surveyed. The 100 percent coverage of the Baseline Activities Areas does not provide

clearance for those areas, as the clearance surveys would have to be conducted immediately prior to the disturbance activities, but the surveys provide information to assist development of an effective biological monitoring plan, while also providing information applicable to the first stated purpose of the surveys.

2. BACKGROUND

Until 2011, desert tortoises throughout the southwestern United States were considered a single species under the nomenclature *Gopherus agassizii*. Differences in the natural history of populations east and west of the Colorado River (the Sonoran and Mojave populations, respectively) were recognized, with few exceptions. Genetic analysis published in 2011 indicated that the Mojave and Sonoran populations of the desert tortoise were also genetically distinct, and it was suggested that the Sonoran population be elevated to species status under the nomenclature *Gopherus morafkai*, with the Mojave population retaining the *G. agassizii* moniker (Murphy et al. 2011). The U.S. Fish and Wildlife Service (USFWS) now recognizes the Sonoran desert tortoise as a separate species (USFWS 2012).

In 1990, the Mojave population of the desert tortoise was listed as threatened (USFWS 1990); this listing excluded the Sonoran population of desert tortoise. On October 9, 2009 the Sonoran population was petitioned for listing as a District Population Segment (DPS) with critical habitat (WildEarth Guardians and Western Watersheds Project 2008). On August 28, 2009, the USFWS published its 90-day finding that the Sonoran DPS warranted a status review to determine if it should be listed (USFWS 2009). At the end of the 12-month review period, the USFWS announced that listing of the Sonoran DPS was warranted but precluded by higher priority items, and the species was added to the USFWS list of candidate species (USFWS 2010). In a May 10, 2011 settlement between the USFWS and WildEarth Guardians (U.S. District Court, District Court for the District of Columbia 2011) the USFWS agreed to a listing schedule for 251 species. The Sonoran desert tortoise is one of 24 species in Arizona affected by the settlement agreement, and as outlined in the settlement agreement, the USFWS must issue a proposed listing rule or "not warranted" determination by the end of the U.S. federal government fiscal year 2015 (i.e. by September 30, 2015).

Within Arizona, Sonoran desert tortoises occur throughout much of the central and southwestern portions of the state, with core populations mainly in and at the base of mountain ranges. The northeastern-most range abuts the Salt River in Gila County, while the easternmost recorded populations are in the vicinity of the middle San Pedro River drainage in Cochise County. There are sparse, isolated records of tortoises in uncharacteristic environments in southeastern Cochise County, but they are suspected to be captive-release tortoises (Arizona Game and Fish Department [AGFD] 2010, Germano et al. 1994) or misidentified desert box turtles (*Terrapene ornata luteola*) (Germano et al. 1994), although they could represent locally present populations (Van Devender 2002). Tortoises have been recorded as far southwest as the Yuma Proving Ground, the Barry M. Goldwater Range, and the Cabeza Prieta National Wildlife Refuge (AGFD 2010). AGFD Heritage Data Management System (HDMS) records contain records from within 3 miles (4.8 km) of the Tailings and Baseline Activities Areas (AGFD 2011), and WestLand biologists have repeatedly observed Sonoran desert tortoises in this vicinity during field efforts conducted for various studies.

Sonoran desert tortoises do not tend to be distributed uniformly across a landscape; densities vary depending upon a variety of resources, such as the availability of suitable cover sites and other factors. Habitat for the Sonoran desert tortoise includes rocky slopes and bajadas in Mojave and Sonoran Desertscrub and a variety of biotic communities within or extending from the Sonoran Desert (AGFD 2010). Sonoran desert tortoises are found in the Arizona Upland and Lower Colorado River subdivisions of Sonoran Desertscrub, in desert grassland communities, and in ecotonal areas consisting of Sonoran Desertscrub with elements of Mojave Desertscrub and juniper woodland, interior chaparral, and desert grassland (Averill-Murray and Klug 2000). The Sonoran desert tortoise occurs at elevations from approximately 510 to 5,300 ft (155 to 1,615 m) (AGFD 2010).

Desert tortoises typically use underground structures for thermoregulation, protection, and nesting (USFWS 2010). The availability of soils where tortoises can dig underground shelters is an essential habitat feature for this species. Tortoises require loose soils to excavate shelters, typically under boulders. They commonly will use natural openings that lack soils for digging, including rock crevices and caliche or conglomerate caves along incised washes, although it is unlikely that any populations rely solely on this type of shelter. Desert tortoises will also rest under live or dead vegetation without constructing a shelter (AGFD 2010). In a study conducted by Meyer et.al (2010) in the San Pedro Valley southeast of the Analysis Area, calcium carbonate soils functioned as “salt licks” and were found to be an important factor in the distribution of desert tortoises. Tortoises were observed to congregate at these sites during the summer monsoon with the apparent primary purpose of ingesting limey soil. However, many populations of desert tortoises exist where these types of soils are not apparently available. Sonoran desert tortoises are herbivores that have been documented to eat over 199 plant species. The desert tortoise diet is reportedly comprised of roughly 53 percent herbaceous plants, 18 percent grasses, 22 percent woody plants, and 5 percent succulents (USFWS 2010). Tortoises obtain most of their water through their diet (AGFD 2010).

3. PREVIOUS SITE TORTOISE RESEARCH

In 2012, WestLand was retained by Resolution to prepare a Biological Evaluation (BE) that covered 12,870 acres and encompassed most of the Tailings and Baseline Activities Areas. The BE included screening analyses that evaluated the potential for occurrence of several species that are endangered, threatened, proposed for listing, or candidate for listing under the ESA, including the Sonoran desert tortoise. Sonoran desert tortoise surveys were conducted on 19 transects over seven days between September 24 and October 4, 2012. The transects were generally located along washes in the southern and central portion of the BE Analysis Area. This survey included observations of three live Sonoran desert tortoises, one tortoise carcass, 23 tortoise scat locations not associated with shelters, 15 active shelters (shelters with definite evidence of tortoise use), and 31 suitable shelters (shelters with the potential for tortoise use, but with no evidence of tortoise use).

4. METHODS

Survey locations were determined differently for the Tailings Area and the Baseline Activities Area. For the Tailings Area, using broad-based on-the-ground and map-related analyses, a survey strategy was

designed to encompass areas where conditions most closely resembled known potentially suitable Sonoran desert tortoise habitat (steep rocky slopes, incised washes, and boulders providing shelter sites). Survey transects in the Tailings Area were designed to accomplish two things: (1) focus on selected incised washes because they provide likely tortoise habitat, and (2) traverse broad geographical areas throughout the Tailings Area. To accomplish these goals, 10 triangular transects (transects that run around the perimeter of a three-sided area) were placed in a variety of areas, some of which included proposed borrow areas, and several of which included one leg of the triangular transects placed within a wash (***Figure 2***). Six of the triangular transects were 500 m on a side; the remaining four were 1,000 m on a side. The triangles were laid out with the acknowledgement that terrain would require the surveyors to vary from the transects as laid out. While the transects were placed to encompass areas within the Tailings Area that resembled known suitable tortoise habitat, the configuration of transects and the patchy nature of suitable tortoise habitat ensured that areas not closely resembling suitable tortoise habitat would also be sampled.

Survey in the Baseline Activities Area was designed to provide 100 percent coverage within most of the 16 drill sites (DS-A through DS-P), 41 geotechnical sites (GT-1 through GT-41), 34 test trenches (TP-1 through TP-34), and road segments identified in the PoO (***Figure 3***).

Using the survey strategy designed for the project, transects traversed all types of terrain found within the Tailings and Baseline Activities Areas, including washes, hill tops, ridge lines, rocky hillsides, upland plateaus, and floodplains.

Pedestrian surveys for Sonoran desert tortoises were conducted on August 26 through 30, September 3 through 6, and September 9 through 13, 2013. Surveyors who were familiar with detection and identification of desert tortoises, tortoise shelters, and tortoise sign such as scat (fecal material), tracks, and carcasses (skeletal remains) walked all transects. Shelters were scored as either “active” or “suitable.” Active shelters were considered to be those with live tortoises, carcasses, scat, or tracks inside the shelter. Suitable shelters were those that could harbor tortoises based on the shelter size, depth, and accessibility, but that had no evidence of being used by tortoises. Global Positioning Systems (GPS) devices were used to navigate, record observations of tortoises and tortoise sign, and map the surveyors’ routes. The GPS tracks depicting the transects surveyed are shown in ***Figures 2 and 3***.

In order to provide a metric for the areal coverage of the current survey effort, effective survey widths were estimated for each of the various types of tortoise sign. Although we define an effective width of survey coverage, we did not use this to calculate the density of tortoises or their sign. This width is included primarily to provide a sense of the area that we consider covered during the surveys.

To estimate effective survey widths for each sign type, WestLand reviewed the results of Averill-Murray and Averill-Murray (2002) from their desert tortoise survey of the Ironwood Forest National Monument. Using a relatively rigorous methodology and extensive field effort, Averill-Murray and Averill-Murray derived an effective survey distance of 8.8 m (29 ft) from the transect centerline, or a total effective survey width of 18 m (58 ft), for the detection of live tortoises. Based on the Averill-Murray and Averill-Murray study, WestLand estimated an effective survey width of 18 m (58 ft) for live tortoises, carcasses,

and the various shelter types. For tortoise scat and tracks, WestLand assumed an effective transect width of 1.8 m (6 ft). This estimate was based on the relative difficulty of spotting scat and tracks.

Wherever surveyors noted any tortoises, shelters, or tortoise sign along transects, they took photographs and recorded the data point locations, soil conditions, vegetation characteristics, and potential shelter substrates. Potential shelter substrates included washes with hard cover (boulders, caliche or conglomerate banks, cliffs, etc.), upland sites with hard cover, animal shelters, and limestone features.

For the purposes of this analysis, any intact shelter of dimensions to fit an adult tortoise was considered suitable. All observations were recorded on data forms. Representative habitat photographs were taken at appropriate locations along survey transects. To avoid double-counting, scat, tracks, and carcasses associated with active shelters are not counted separately in tables or figures in this report. When a live tortoise was found inside of a shelter, the tortoise and the active shelter were recorded as separate observations. Selected photographs of tortoise observations and habitat are provided in ***Appendix A***.

5. RESULTS

Results from surveys are reported in this section, along with additional "non-survey" observations recorded by WestLand biologists and archaeologists while conducting other activities or while traveling to and from survey areas. ***Figure 4*** depicts these observations in relation to the proposed Tailings Area; ***Figure 5*** depicts the observations in relation to the proposed Baseline Activities.

During pedestrian surveys within the Tailings and Baseline Activities Areas, WestLand biologists documented five live tortoises, one tortoise carcass, two tortoise scats, one tortoise track, 10 active shelters, and 37 suitable shelters. During non-survey activities, WestLand biologists and archaeologists documented a total of eight live tortoises, one carcass, and two suitable shelters. All tortoise observations have been summarized below in ***Table 1***. Observations are grouped by location (if located near a proposed Baseline Activity) or by type; non-survey observations are grouped together at the end of the table. Surveyed areas with no tortoise observations are omitted from the table; for example, test trench locations are omitted as no tortoise observations were made in those locations.

Observations were recorded throughout the Tailings and Baseline Activities Areas, but many were clustered along Bear Tank Canyon, a tributary of Bear Tank Canyon, and a tributary of Potts Canyon, the latter two being separated from each other by Benson Spring Canyon.

Previous Sonoran desert tortoise surveys in the area (WestLand 2013) also documented tortoise observations along Bear Tank and Benson Springs washes, and a between Roblas and Bear Tank canyons. Most of the previous observations, however, were along Rice Water Canyon, Happy Camp Canyon, and between Happy Camp and Silver King canyons.

Table 1. Sonoran Desert Tortoise Observations

Observation Location or Type	Live Tortoises	Tortoise Carcasses	Tortoise Scat	Tortoise Tracks	Active Shelter	Suitable Shelter
DS-A/GT-34	-	-	-	-	-	1
DS-O/GT-35	-	1	-	-	-	-
DS-P	1	-	-	-	-	-
GT-20	1	-	-	-	1	3
GT-22	-	-	-	-	-	1
GT-30	-	-	-	-	-	1
GT-31	-	-	-	-	-	1
GT-36[1]	-	-	-	-	-	3
GT-38[2]	-	-	-	1	-	1
Transects	2	-	2	-	1	8
Wash bisecting GT-20[3]	1	-	-	-	3	6
Wash adjacent to FR 518	-	-	-	-	4	12
Wash bisecting GT-39	-	-	-	-	1	-
FR 1903	1	-	-	-	-	2
FR 2359	-	-	-	-	1	-
FR 2371	-	-	-	-	-	1
Non-survey observations	8	1	-	-	-	2
Total	**14**	**2**	**2**	**1**	**11**	**42**

[1] Includes two suitable shelters along the access road to GT-36
[2] Both the tracks and the suitable shelter were detected along the access road to GT-38
[3] Wash is an unnamed tributary of Bear Canyon up-gradient of GT-20

6. DISCUSSION

The results of Sonoran desert tortoise surveys that WestLand conducted in the Tailings and Baseline Activities Areas in 2012 and 2013 indicate that tortoises are distributed throughout the entire area. The results also suggest that the distribution of tortoises is not uniform throughout the area, which is typical of tortoise populations. The available literature indicates that habitat preferences for the Sonoran desert tortoise are usually local and vary considerably among study sites (Bailey 1992; Germano et al. 1994; Martin 1995; McLuckie 1995; Averill-Murray and Klug 2000; Meyer et al. 2010; Grandmaison 2012). Numerous factors can affect tortoise distribution within a study site, including the opportunity for shelter, forage availability, and slope orientation. These factors can vary considerably among different study sites. Typical Sonoran desert tortoise habitat generally includes boulder slopes that provide opportunity for shelter under the boulders, but some populations seem to rely considerably on the availability of caliche or conglomerate caves along washes (Averill-Murray et al. 2002). Suitable forage includes a wide variety of plant species, and tortoise diet can vary considerably from one population to another. Tortoise density has also been correlated with slope aspect in some populations, but the preferred aspect seems to differ among populations (Grandmaison 2012; Zylstra 2008; Martin 1995; Averill-Murray and Klug 2000). The surveys to date have been concerned almost entirely with identifying the distribution of tortoises, their sign, and shelters that could potentially be used by the species.

With the relatively limited effort that has been expended thus far to investigate the Tailings and Baseline Activities Areas tortoise population, at this point we can best discuss tortoise distribution in the area in terms of actual sign found. Survey results at this time provide confidence that tortoises may be

encountered in most locations throughout the area, and we are beginning to get a picture of areas where the density of tortoises is likely higher. Little confidence, however, can be placed on drawing conclusions regarding the distribution of tortoises in terms of expected densities across the Tailings and Baseline Activities Areas.

7. REFERENCES

Arizona Game and Fish Department (AGFD). 2010. *Gopherus agassizii*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game & Fish Department, Phoenix, AZ. 11 pp.

_____. 2011. Heritage Data Management System. On-line database search for special-status species recorded within 3 miles of designated Geophysical Study Area. Available at internet site: http://www.azgfd.gov/hgis/. Accessed May 25, 2011.

Averill-Murray, A., and R.C. Averill-Murray. 2002. *Distribution and density of desert tortoises at Ironwood Forest National Monument, with notes on other vertebrates*. Nongame and Endangered Wildlife Program Technical Report 193. Arizona Game and Fish Department, Phoenix, Arizona. 53p.

Averill-Murray, R.C., and C.M. Klug. 2000. Monitoring and ecology of Sonoran desert tortoises in Arizona. Nongame and Endangered Wildlife Program Technical Report 161. Arizona Game and Fish Department, Phoenix, AZ.

Averill-Murray, R. C., B. E. Martin, S. J. Bailey, and E. B. Wirt. 2002. Activity and behavior of the Sonoran desert tortoise in Arizona. Pp. 135–158 *in* T. R. Van Devender, ed. *The Sonoran Desert Tortoise*. University of Arizona Press, Tucson, Arizona.

Bailey, S. J. 1992. Hibernacula use and home range of the desert tortoise (*Gopherus agassizii*) in the San Pedro Valley, Arizona. Master's Thesis. University of Arizona, Tucson, Arizona.

Germano, D. J., R. B. Bury, T. C. Esque, T. H. Fritts, and P. A. Medica. 1994. Range and habitats of the desert tortoise. In *Biology of North American Tortoises*, R. B. Bury and D. J. Germano (eds.), pp. 73–84. Fish and Wildlife Research 13. U.S. Department of the Interior, National Biological Survey, Washington D.C.

Grandmaison, D. D., R. E. Schweinsburg, and M. F. Ingraldi. 2012. Assessment of desert tortoise movement, permeability, and habitat along the proposed State Route 95 realignment. Arizona Game and Fish Department, Phoenix, Arizona.

Martin, B. E. 1995. Ecology of the desert tortoise (*Gopherus agassizii*) in a desert-grassland in southern Arizona. Master's Thesis. University of Arizona, Tucson, Arizona.

Meyer, W. Walter, P.R. Ogden, K.E. Cline, E.L. Smith, G.B. Ruyle, F.K. Meyer, and J.A. Cordrey. 2010. An Eighteen Year Study of Population Dynamics, Diet, and Health of the Sonoran Desert Tortoise (*Gopherus agassizii*) in the San Pedro Valley of Southern Arizona. Technical Report submitted to the U.S. Fish and Wildlife Service in response to the 2009 Petition to List the Sonoran Desert Tortoise as an Endangered Species.

McLuckie, A. M. 1995. Genetics, morphology, and ecology of the desert tortoise (*Gopherus agassizii*) in the Black Mountains, Mojave County, Arizona. Master's Thesis. University of Arizona, Tucson, Arizona.

Murphy R. W., K. H. Berry, T. Edwards, A. E. Leviton, A. Lathrop, and J. D. Riedle. 2011. The dazed and confused identity of Agassiz's land tortoise, *Gopherus agassizii* (Testudines, Testudinidae) with the description of a new species, and its consequences for conservation. *ZooKeys* 113:39–71. doi: 10.3897/zookeys.113.1353.

Resolution Copper Mining. 2013a. General Plan of Operations, Volume I Environmental Setting and Project Description. Resolution Copper Mining LLC, Superior AZ

_____. 2013b. Plan of Operations; Baseline Hydrologic & Geotechnical Data Gathering Activities on Tonto National Forest, *Revised* (*In prep).* [Draft document submitted to Tonto National Forest in June, 2013]. Resolution Copper Mining, LLC, Superior AZ

Turner, R.M. and D.E. Brown. 1982. 154.1 Sonoran Desertscrub, pp. 181-221 *in* D.E. Brown, Ed. Biotic communities of the American Southwest United States and Mexico. Desert Plants Vol. 4 Nos. 1-4. University of Arizona, Tucson. 343 pp.

U.S. District Court for the District of Columbia. 2011. Case 1:10-mc-00377-EGS Document 31 Filed 05/10/11.

U.S. Fish and Wildlife Service (USFWS). 1990. Endangered and threatened wildlife and plants; determination of threatened status for the Mojave population of the desert tortoise; final rule.

_____. 2009. Endangered and threatened wildlife and plants; 90-day finding on a petition to list the Sonoran population of desert tortoise (*Gopherus agasizzii*) [sic] as a Distinct Population Segment (DPS) with Critical Habitat. Federal Register 74:44335–44344.

_____. 2010. Endangered and threatened wildlife and plants: 12-month finding on petition to list the Sonoran desert tortoise as threatened or endangered; proposed rule. Federal Register 75:78094–78145.

_____. 2012. U.S. Fish and Wildlife Service species assessment and listing priority assignment for Sonoran desert tortoise (*Gopherus morafkai*). Southwest Region of the USFWS. Published May 30, 2012.

Van Devender, T. R. 2002. Natural history of the Sonoran desert tortoise. Life in a rock pile. Pp. 3-28 *in* T.R. Van Devender (ed.), The Sonoran Desert Tortoise. Natural History, Biology, and Conservation. University of Arizona Press, Tucson.

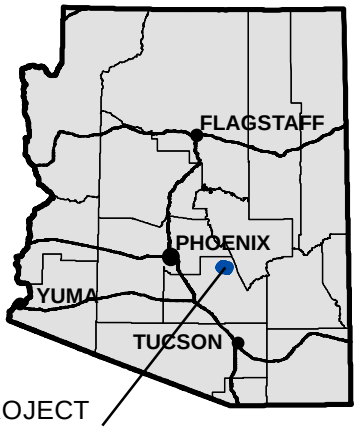
WestLand Resources, Inc. 2013. Biological Evaluation of the Near West Analysis Area. Prepared for Resolution Copper Mining LLC. WestLand Resources, Inc. Tucson, Arizona

WildEarth Guardians and Western Watersheds Project. 2008. Petition to list the Sonoran desert tortoise (Gopherus agassizii) as threatened or endangered under the Endangered Species Act. Report to the U.S. Department of the Interior, Fish & Wildlife Service.

Zylstra, E. R. 2008. Evaluation monitoring strategies and habitat for tortoises in the Sonoran Desert. Master's Thesis. University of Arizona, Tucson, Arizona.

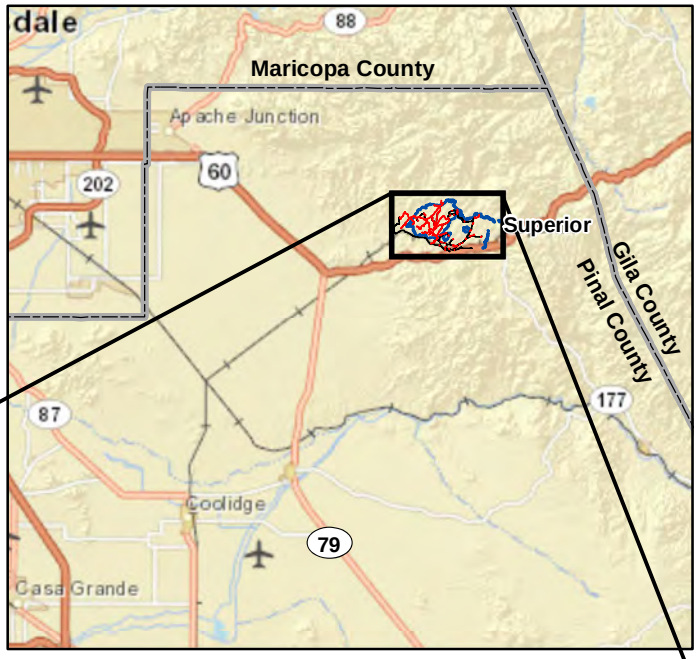
FIGURES

ARIZONA



PROJECT LOCATION

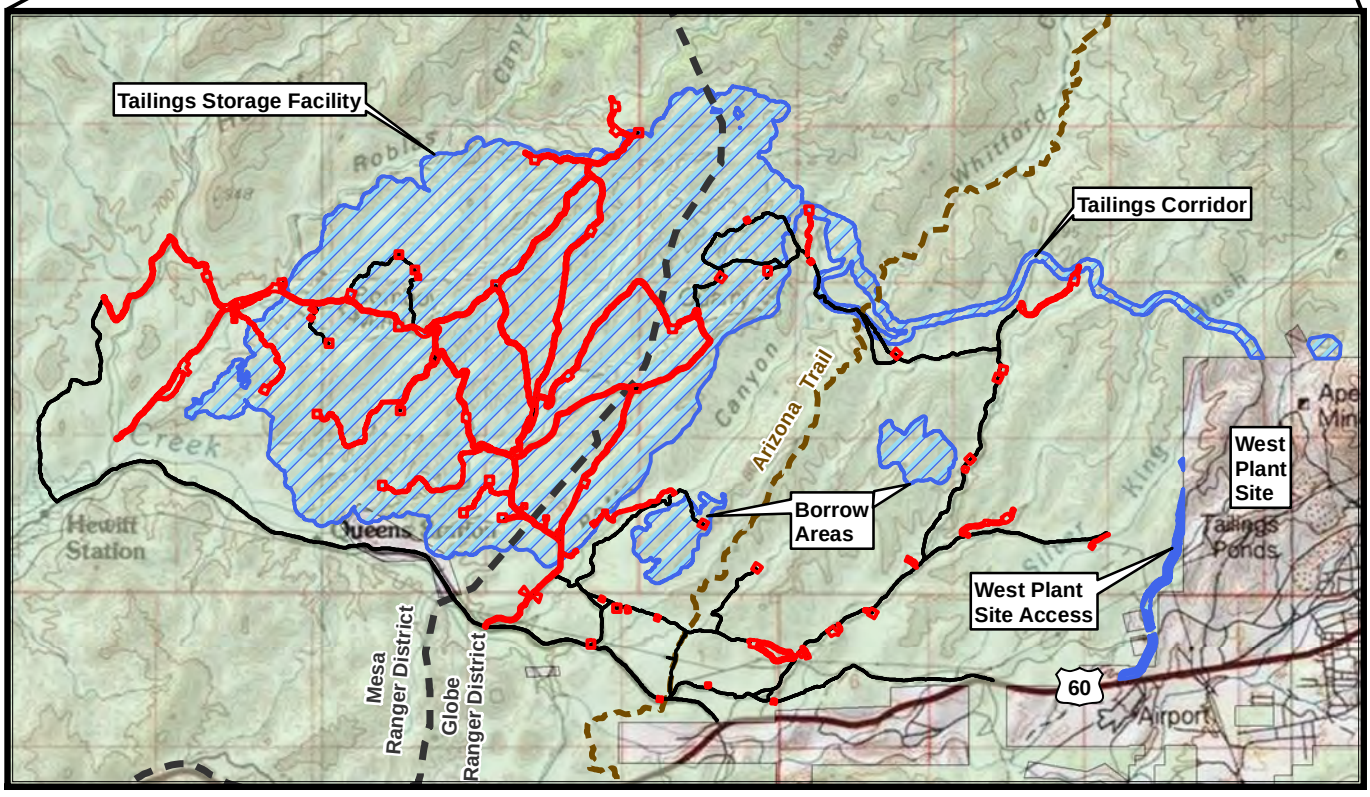
PORTION OF PINAL COUNTY



Approximate Scale 1 Inch = 15 Miles

Legend

- Baseline Activities Area
- Tailings Area
- Project Access Road



T1S, R11E, Portion of Sections 13, 21-28, & 33-36,
T1S, R12E, Portion of Sections 18-21, 26-34,
T2S, R11E, Portion of Sections 1, 2, & 3,
T2S, R12E, Portion of Sections 4, 5 & 6,
Pinal County, Arizona,
Mesa 1:100,000 USGS Quadrangle
ESRI Online & USFS Data

Surface Management (BLM 2011)

- Private Land (No Color)
- US Forest Service (USFS)

N

0 3,250 6,500 Feet

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RESOLUTION COPPER MINING

Sonoran Desert Tortoise Survey

VICINITY MAP

Figure 1

Path: M:\Jobs\800's\807.90\Near_West\Desert_Tortoise\mxd\ReportFig_4_25_2014\Fig2_Desert_Tort_Tailings_Survey_Area.mxd

GLOBE RANGER DISTRICT BOUNDARY
MESA RANGER DISTRICT BOUNDARY

Legend

- Survey Transect
- Tailings Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest (TNF) Forest Service Road (FR)
- Tonto National Forest Ranger District Boundary

Surface Management (Source: BLM 2011)

- Private Land (No Color)
- US Forest Service (USFS)

Image Source: Picketpost Mountain and Superior 7.5' USGS Quadrangles

N

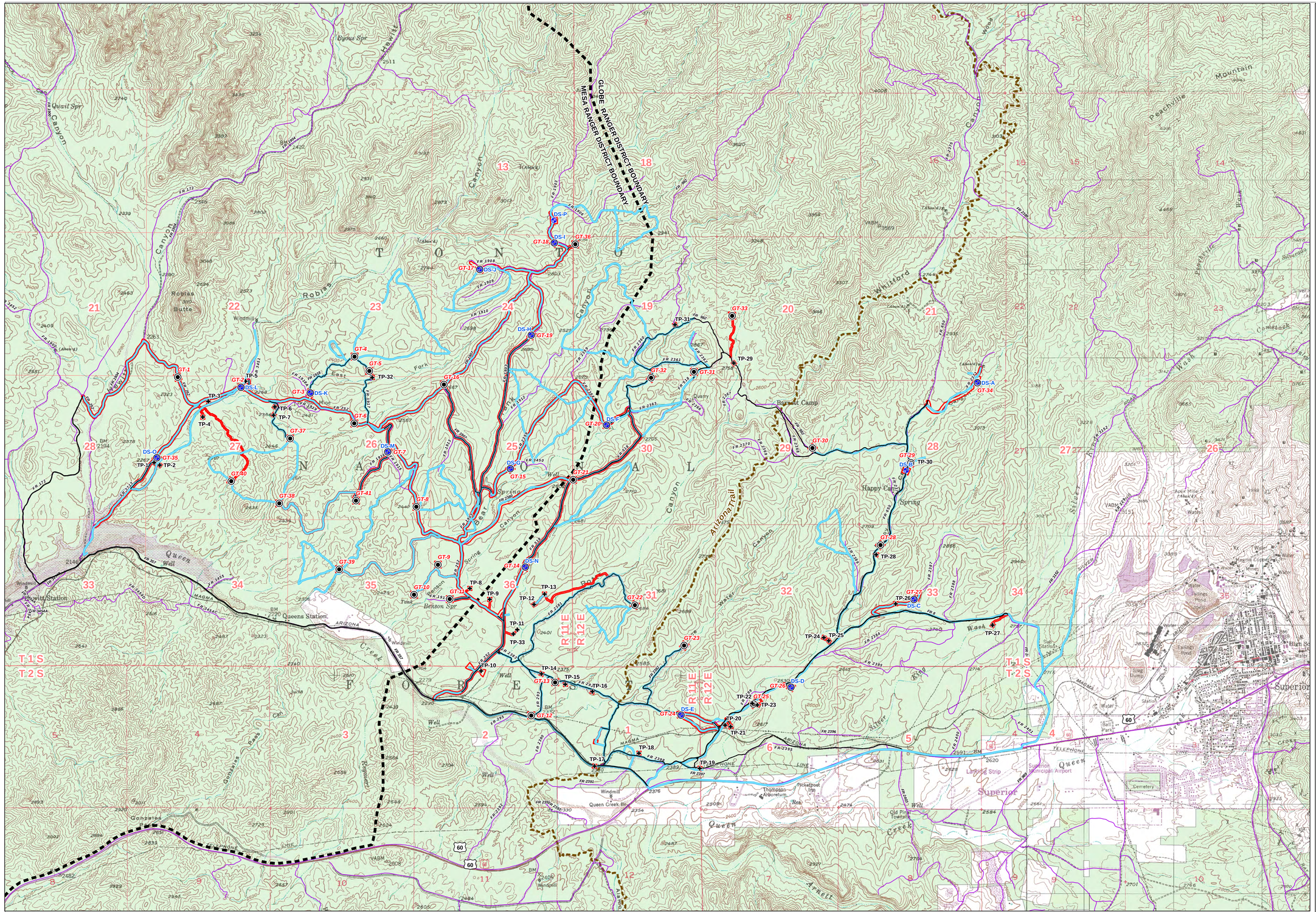
0 1,600 3,200 Feet

WestLand Resources, Inc.
Engineering and Environmental Consultants

RESOLUTION COPPER MINING
Sonoran Desert Tortoise Survey

TAILINGS AREA SHOWING SONORAN DESERT TORTOISE SURVEY TRANSECTS
Figure 2

Path: M:\Jobs\800's\807.90\Near_West\Desert_Tortoise\mxd\ReportFig_4_25_2014\Fig3_Desert_Tort_Baseline_Activities.mxd



Legend

- Test Trench Site (TP-1 through TP-33)
- Monitoring Well Drill Site (DP-A through DP-P)
- Geotechnical Drill Ste (GT-1 through GT-41)
- Existing Project Access (No Improvements Required)
- Survey Transect
- Tonto National Forest (TNF) Forest Service Road (FR)
- Baseline Activities Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

Surface Management (BLM 2011)

- Private Land (No Color)
- US Forest Service (USFS)

Image Source: Picketpost Mountain and Superior 7.5' USGS Quadrangles

N

0 1,600 3,200 Feet

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BASELINE ACTIVITIES AREA SHOWING SONORAN DESERT TORTOISE SURVEY TRANSECTS

Figure 3

Path: M:\Jobs\800's\807.90\Near_West\Desert_Tortoise\mxd\ReportFig_4_25_2014\Fig4_Survey_Observations.mxd

PHOTO 16
PHOTO 23
2 Suitable Shelters
2 Active Shelters
4 Suitable Shelters
3 Suitable Shelters
PHOTO 20
PHOTO 12
MAP INSET 1 1"=500'

PHOTO 15
2 Active Shelters
2 Suitable Shelters
PHOTO 14
PHOTO 13
2 Suitable Shelters
2 Suitable Shelters
MAP INSET 2 1"=500'

PHOTO 1
PHOTO 2
PHOTO 4
PHOTO 5
PHOTO 8
PHOTO 6
2 Suitable Shelters
PHOTO 3
PHOTO 24
PHOTO 18
PHOTO 19
PHOTO 16
PHOTO 23
2 Active Shelters
2 Suitable Shelters
4 Suitable Shelters
3 Suitable Shelters
PHOTO 17
PHOTO 20
PHOTO 12
SEE MAP INSET 1
PHOTO 11
PHOTO 21
PHOTO 22
2 Suitable Shelters
PHOTO 10
PHOTO 15
2 Active Shelters
2 Suitable Shelters
PHOTO 14
PHOTO 13
2 Suitable Shelters
2 Suitable Shelters
SEE MAP INSET 2
PHOTO 7
PHOTO 9
GLOBE RANGER DISTRICT/ MESA RANGER DISTRICT BOUNDARY

Legend

- Photo Point

Sonoran Desert Tortoise Observations

- Tortoise
- Active Shelter
- Sign of Tortoise (includes scat, tracks, or carcass)
- Suitable Shelter
- Survey Transect
- Tonto National Forest (TNF) Forest Service Road (FR)
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary
- Tailings Area

Image Source: Picketpost Mountain and Superior 7.5' USGS Quadrangles

Image Source for Inset Maps: Cooper Aerial Surveys Co., 2012 Imagery

N

0 1,600 3,200 Feet

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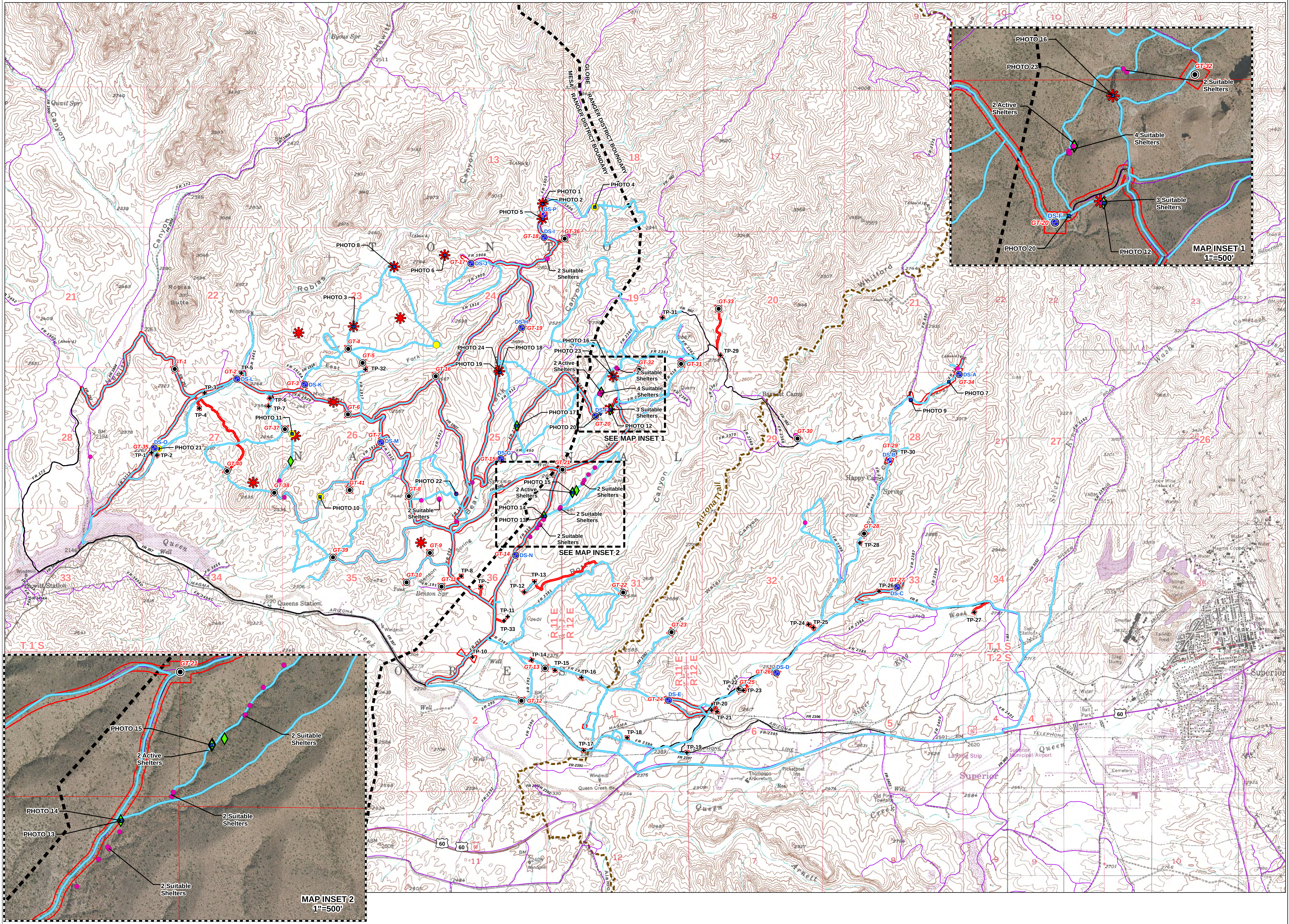
TAILINGS AREA SHOWING SONORAN DESERT TORTOISE SURVEY OBSERVATIONS
Figure 4

Path: M:\Jobs\800's\807.90\Near_West\Desert_Tortoise\mxd\ReportFig_4_25_2014\Fig5_Baseline_Survey_Observations.mxd



Legend

- Test Trench Site (TP-1 through TP-33)
- Monitoring Well Drill Site (DP-A through DP-P)
- Geotechnical Drill Ste (GT-1 through GT-41)
- Photo Point

Sonoran Desert Tortoise Observations

- Tortoise
- Active Shelter
- Sign of Tortoise (includes scat, tracks, or carcass)
- Suitable Shelter
- Survey Transect
- Existing Project Access (No Improvements Required)
- Tonto National Forest (TNF) Forest Service Road (FR)
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary
- Baseline Activities Area

Image Source: Picketpost Mountain and Superior 7.5' USGS Quadrangles

Image Source for Inset Maps: Cooper Aerial Surveys Co., 2012 Imagery

N

0 1,600 3,200 Feet

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BASELINE ACTIVITIES AREA SHOWING SONORAN DESERT TORTOISE SURVEY OBSERVATIONS

Figure 5

APPENDIX A

SELECTED PHOTOGRAPHS

Photo 1: This tortoise was observed in a wash bottom feeding on grass.

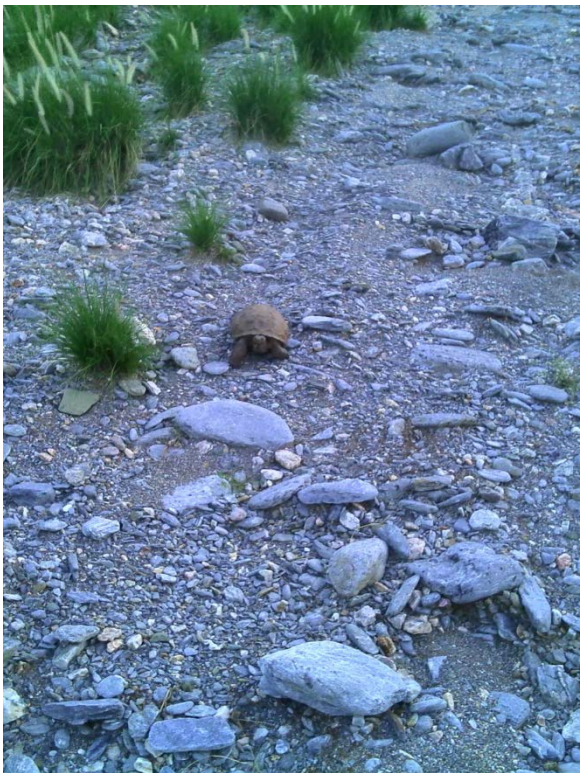

Photo 2: Large, sandy-bottom wash with a tortoise.

Photo 3: Juvenile tortoise with an AA battery for scale.

Photo 4: Skeletal remains found on a rocky hillside.

Photo 5: Juvenile tortoise.

Photo 6: This tortoise was observed by WestLand archaeologists.

Photo 7: Habitat photo exhibiting rock outcrop features.

Photo 8: Close-up of an adult tortoise.

Photo 9: A suitable shelter.

Photo 10: Tortoise tracks in the sand.

Photo 11: Tortoise scat.

Photo 12: Active shelter with tracks inside.

Photo 13: Active shelter with tortoise scat at entrance.

Photo 14: Close-up of tortoise scat.

Photo 15: Active shelter with tortoise tracks near the entrance.

Photo 16: Male tortoise.

Photo 17: Active shelter with tortoise tracks inside.

Photo 18: Tortoise that has been feeding on prickly pear fruit.

Photo 19: Habitat photo taken from a ridge top where a tortoise was observed.

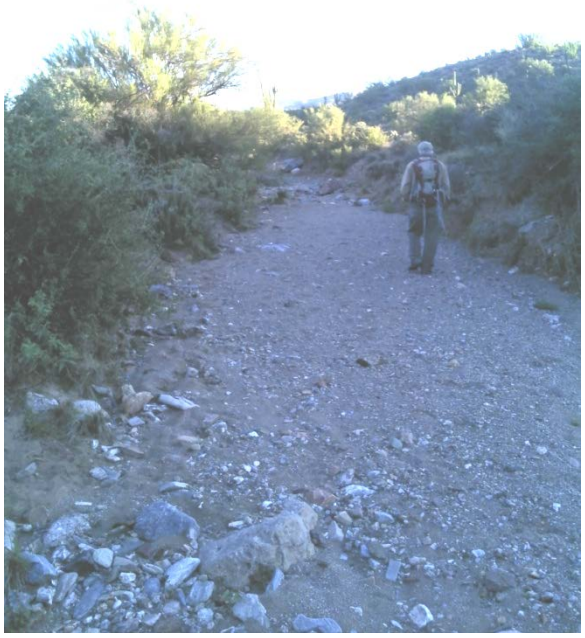

Photo 20: Suitable shelter substrate occurs along this unnamed wash.

Photo 21: Skeletal remains of a male tortoise.

Photo 22: Suitable shelter.

Photo 23. Backside view of adult tortoise.