Fact Sheet

State 401 Certification Decision

Rosemont Copper Project

ACOE Application No. SPL-2008-00816-MB

Proposed Action under Review

On January 17, 2012, Rosemont Copper Company (RCC) submitted an application to the Arizona Department of Environmental Quality for a Clean Water Act (CWA) Section 401 Water Quality Certification (Certification) of a CWA Section 404 permit. The CWA 404 permit proposes the discharge of fill material into Barrel Canyon and associated tributaries including Wasp Canyon, McCleary Canyon, Trail Canyon and other unnamed ephemeral washes, during the construction and operation of the proposed Rosemont Copper Project (Project). Most of these discharges will result from the development of the pit and construction of the waste rock storage areas, dry stack tailings facilities and ancillary mining facilities. Note: changes have been made to the project design, subsequent to the submittal of the application for the CWA 401 Certification, during the development of the Final Environmental Impact Statement (FEIS)[1]. These changes modify certain activities proposed in the CWA §404 application and the Army Corps of Engineers (COE) Public Notice No. SPL-2008-00816-MB, issued for public comment from December 6, 2011 through January 19, 2012. This Certification is based on activities described in the COE Public Notice, except as modified by the selected action in the USDA Forest Service Draft Record of Decision and Finding of Nonsignificant Forest Plan Amendment for the Rosemont Copper Project (ROD)[6] and FEIS. These modifications include: removal of the heap leach facility and process, elimination of fill in McCleary Canyon and the removal of the flow-through drain systems under the waste rock storage areas and dry stack tailings facilities.

State 401 Water Quality Certification

Section 401 of the CWA authorizes States to review applications for federal permits or licenses that would allow any discharge to waters of the U.S., including wetlands. The State can approve, conditionally approve, deny or waive certification of the federal permit or license. The State makes its certification decision by reviewing the proposed activities to determine whether the activities, as proposed, or with conditions, will result in State surface water quality standards being maintained and protected in the receiving waters. In addition, States may look at whether the activities will violate effluent limitations, new source performance standards, toxic pollutants, and other water quality requirements of State law or regulation. The federal permit or license cannot be granted by the

federal agency until a certification decision has been received from the State. If the State denies the §401 certification, the federal agency cannot issue the permit or license.

Scope

The Arizona Department of Environmental Quality (ADEQ) is the state agency designated for all purposes of the CWA including Section 401. However, Arizona Revised Statutes (A.R.S.) §49-202(C) limits the department's review under §401 to determine whether the effect of the discharge will comply with the surface water quality standards. In addition, the department's review can extend only to activities conducted within the ordinary high water mark of navigable waters. A.R.S. §49-202(D) also limits the department's ability to place conditions on the certification to those required to ensure compliance with A.R.S. §49-202(C).

Therefore, ADEQ's review of this application is limited to the actual fill activities proposed in the CWA §404 application to the COE, as modified by the FEIS and ROD, that are being conducted within the ordinary high water mark and impacts, as a direct result of these fill activities, on downstream surface waters including Davidson Canyon Wash and Lower Cienega Creek.

Background

In response to the Draft Environmental Impact Statement for the Rosemont Copper Project, released for public comment on October 21, 2011, ADEQ provided comments to the U.S. Forest Service[2] regarding the scarcity of hydrogeologic data on which the both groundwater and surface water modeling was based; and the predicted reduction in sediment yield, peak stormwater flows and overall stormwater runoff volume from the watershed. ADEQ recommended that: (1) additional monitoring of flow, water quality and physical integrity be conducted in Davidson Canyon Wash and Lower Cienega Creek before, during and after mining operations; (2) the EIS should discuss how the potential reductions in sediment and flow, and thus assimilative capacity will be monitored and mitigated such that there will be no degradation to either downstream Outstanding Arizona Water (OAW); and (3) the U.S. Forest Service consider requiring replenishment water of comparable quality and quantity to offset the predicted water loss as a result of the mine's operation and during post-closure.

In order to issue a State 401 water quality certification, ADEQ must be satisfied that any modifications to hydrology, sediment transport or water quality, as a result of the proposed activities under the §404 permit, will not result in adverse water quality impacts to the downstream OAWs. As part of its certification process, ADEQ may impose additional controls, conditions or mitigation measures, on indirect discharges that occur upstream of or to tributaries of an OAW to maintain and protect existing water quality in a downstream OAW. Mitigation measures, required by the Forest Service under the ROD and FEIS, were also evaluated. A listing of the mitigation measures evaluated in support of this Certification decision are listed in Attachment A.

Surface Water Quality Standards & Antidegradation

Barrel Canyon Wash and the associated tributaries (McCleary, Wasp and Trail Canyon Washes) are unlisted, ephemeral tributaries with designated uses of Aquatic and Wildlife - (ephemeral) and Partial Body Contact (A.A.C. R18-11-105(1)). As ephemeral waters, Barrel Canyon and the associated tributaries are considered Tier 1 waters under Arizona's antidegradation criteria (A.A.C. R18-11-107.01(A)). Under Tier 1, regulated discharges shall not cause a violation of surface water quality standards and there can be no degradation of existing water quality where surface water quality standards are not currently being met.

Cienega Creek was one of the original OAWs designated by ADEQ in 1992. The OAW reach extends approximately 28.3 miles from its confluence with Gardner Canyon to the U.S.G.S. gaging station #09484600 at 32° 02' 09"/110° 40' 36". The OAW portion of Cienega Creek has designated uses of Aquatic and Wildlife – (warm water); Full Body Contact; Fish Consumption; and Agricultural Livestock Watering.

The lower portion of Davidson Canyon Wash was designated as an OAW by ADEQ in January, 2009 and begins approximately 13 river miles downstream from the Project. Davidson Canyon Wash has four distinct segments. Headwaters to its confluence with an unnamed spring at 31° 59' 32.5"/110° 38' 43.56" is ephemeral. The OAW begins with this spring and flows northward till it flows into Lower Cienega Creek near Marsh Station Road. The Davidson Canyon Wash OAW is divided into three segments. The first and third segments are spring fed and have designated uses of Aquatic & Wildlife – (warm water); Full Body Contact, Fish Consumption and Agricultural Livestock Watering. The middle segment has designated uses of Aquatic and Wildlife – (ephemeral); Partial Body Contact, and Agricultural Livestock Watering (See Figures 1 and 1a).

As OAWs, Tier 3 antidegradation rules (A.A.C. R18-11-107(D)) apply, which states, "existing water quality shall be maintained and protected in a surface water that is classified as an OAW under R18-11-112. Degradation of an OAW is prohibited." Antidegradation criteria requires the department conduct the antidegradation review of an individual 404 permit as part of the 401 water quality certification process if the discharge has the potential to degrade existing water quality in an OAW (A.A.C. R18-11-107.01(D)).

There are no direct discharges to either OAW as part of this proposed §404 application. However, Arizona's *Draft Antidegradation Implementation Procedures (April, 2008)*[3] states that new or expanded discharges, upstream of an OAW, are prohibited where the proposed discharge would degrade existing water quality of the downstream OAW. To assess whether the proposed discharge will result in the lowering of water quality in the downstream OAW, the following factors were considered:

- Changes in ambient concentrations of a pollutant or a water quality characteristic predicted at the appropriate critical flow conditions and the nature, persistence and potential effects of the pollutant or water quality characteristic;
- Changes in loadings and the nature, persistence and potential effects of the pollutant or water quality characteristic;
- Reduction in available assimilative capacity;
- Degree of confidence in the various components of any modeling technique utilized and
- Potential for cumulative effects.

As part of the certification review process, ADEQ also considers what other regulatory programs provide measures of protection including the AZPDES 2010 General Permit for Stormwater Discharges Associated with Industrial Activity – Mineral Industry (AZMSG2010-003) program.

Certification Decision

ADEQ published its Notice of Preliminary Decision to Issue a State Water Quality Certification for the Rosemont Copper Project in the ***Arizona Daily Star*** on February 21, 2014 and accepted written comments on this preliminary decision until April 7, 2014. The original public notice closed on March 24, 2014 but, in response to numerous requests, ADEQ extended the comment period for an additional two weeks.

After consideration of the factors above and comments received in response to the public notice, ADEQ finds that if the applicant adheres to the conditions of the CWA §404 permit, the conditions and mitigation required in this State 401 Certification, the mitigation measures required by the ROD[6] and requirements of the 2010 Mining MSGP, the Rosemont Copper Project will not cause or contribute to exceedances of surface water quality standards nor cause water quality degradation in the downstream receiving waters including Davidson Canyon Wash and Lower Cienega Creek, both of which are Outstanding Arizona Waters.

FACTORS CONSIDERED IN ADEQ's CERTIFICATION DECISION

Factor: Change in ambient concentrations of a pollutant or a water quality characteristic predicted at the appropriate critical flow conditions and the nature, persistence and potential effects of the pollutant or water quality characteristic

Conclusion: Existing ambient water quality in the OAWs generally meets surface water quality standards. Ambient stormwater quality in Barrel Canyon and the associated tributaries, representing background conditions pre-mining, exceeds surface water quality standards for several parameters including copper, lead, and silver. Under current conditions, these exceedances do not appear to be impacting water quality in the downstream OAWs. The U.S. Forest Service is requiring monitoring of surface water and groundwater to determine impacts from the Project's activities and the installation

of lysimeters in the waste rock and dry stack tailings piles to monitor for possible seepage from facilities. The AZPDES 2010 General Permit for Stormwater Discharges Associated with Industrial Activity – Mineral Industry (Mining MSGP) requires stormwater monitoring from each Project outfall (Mining MSGP Part 6.2.1 & Part 8.G.8.2) and should monitoring data show exceedances of surface water quality standard, the permittee is required to implement corrective actions to address the exceedances (Mining MSGP Part 3.1.1). Based on the Project design, the requirements of the FEIS/ROD, and the use of proper stormwater pollution control measures, ADEQ finds little potential for exceedances of surface quality standards to receiving waters (e.g., Barrel Canyon and associated tributaries) as a result of the proposed activities, and therefore, no impact on the downstream OAWs.

Ambient Surface Water Quality

There is a limited amount of water quality data to perform an antidegradation review on a pollutant by pollutant basis on the impacted streams. Rosemont, ADEQ and Pima County have collected limited baseflow data for Davidson Canyon Wash, near its confluence with Cienega Creek, as well as in Lower Cienega Creek. A review of the background surface water quality data in both Davidson Canyon Wash and Lower Cienega Creek finds that surface water standards were met at all times for all parameters with one exception. A pH sample taken in June 2008 in Lower Cienega Creek was slightly below the surface water quality standard. The sample result was 6.23 SU; the surface water quality standard requires not less than 6.5 SU (FEIS page 454)[1]. This standard applies to the Aquatic and Wildlife, warm water; Full Body Contact and Agricultural Livestock Watering designated uses.

Ambient Stormwater Quality in Barrel Canyon and associated tributaries

In anticipation of mining, Rosemont has been collecting background stormwater data on Barrel Canyon and associated tributaries, between July 2008 and September 2011, resulting in samples from 8 different locations on 16 different dates (See Figure 2). The surface water quality standards (SWQS) for Barrel Canyon and the associated tributaries were exceeded in the background stormwater samples for the following parameters at the following locations:

Summary of Background Stormwater Data (2008-2011)

Location(s)	SWQS Exceeded (# of times)
PSW-1 aka Upper Barrel Canyon	Pb (5)
PSW-2 aka Wasp Canyon	Cu (4) Pb (4) Se(1) Tl (1)
PSW-3 aka Factory 125, Junction, Rosemont Junction	Cu (5) Pb (8)
PSW-4 aka McCleary Canyon	Cu (1) Pb (4) Ag (1)
PSW-5 aka RP2, Compliance Check Point	As (3) Cu (7*) Pb (7) Ag(1)
PSW-6 aka Barrel Canyon @ Hwy 83	Pb (3)

*All exceedances were for total metals except one sample for dissolved copper at PSW-5

An analysis of the background samples shows applicable surface quality standards are currently being exceeded at times in Barrel Canyon and the associated tributaries. While Rosemont is not responsible for exceedances in background stormwater, any stormwater discharges from the facility, covered by

the 2010 Mining MSGP (discussed below), must not cause or contribute to exceedances of surface water quality standards or degradation of water quality in the receiving waters.

The U.S. Forest Service has included mitigation measure **FS-BR-22** which requires Rosemont to monitor surface water, alluvial and deep groundwater at sites in Barrel and Davidson Canyons to determine if there are impacts from pit dewatering on downstream surface waters. ADEQ reviewed and commented on the conceptual monitoring plans for both surface water[4] and groundwater[5]. Ten different monitoring locations are planned and monitoring equipment has been installed at several locations. The other locations will be established once Rosemont finalizes land ownership and/or access agreements. This data collection has been incorporated into the surface water mitigation plan that Rosemont is required to develop and implement as a condition of this Certification.

This monitoring data must be provided to the U.S. Forest Service on a quarterly basis (ROD Stipulation #15)[6] and Rosemont must report any non-compliant samples to the U.S. Forest Service within 72 hours of results. Additionally, Rosemont must provide an annual report to the Coronado (ROD Stipulation #16) [6] of all mining, reclamation and monitoring activities conducted during the previous year and a summary of applicable information including a complete data summary, any data trends, a status plan and plans for the coming year. Rosemont has agreed in a letter dated February 25, 2014[7], to provide copies of these reports directly to ADEQ when they submit them to the U.S. Forest Service. Several commenters requested ADEQ review whether the water quality in the mine pit lake that will form after cessation of mining, meets surface water quality standards. The pit lake is not a waters of the U.S., therefore, ADEQ did not review as part of the State 401 certification.

Potential for Seepage from Waste Rock Facility and Tailings Piles to WUS

While seepage is not expected to occur from the waste rock facility or dry stack tailings, seepage modeling was conducted in the laboratory and consisted of samples being leached through simulated material. While Table 105 in the FEIS shows potential exceedances of several parameters in the predicted tailings seepage water, the hardness values associated with those sample results are significantly lower than are regularly observed in similar mining operations and in ambient stormwater samples collected by Rosemont in Barrel Canyon and associated tributaries (FEIS pages 475-477)[1]. Given these observations, in the event that seepage would migrate to downstream surface waters, it is unlikely that it would exceed surface water quality standards for Barrel or Trail Canyons.

The placement of waste rock will be contained by perimeter buttresses, including the perimeter of the dry-stack tailings storage areas, to provide structural and erosional stability of the tailings pile (COE Public Notice page 3). Tailings will be stored using a dry stack technique which minimizes airborne releases and water seepage. Building the buttresses and encapsulating the dry stack tailings in waste rock is expected to be beneficial for two reasons: prevention of infiltration of precipitation through the tailings and utilization of large volumes of acid-neutralizing waste rock. This is a required mitigation

measure in the FEIS (**OA-GW-02)**, is a design feature in the preliminary Mining Plan of Operation and is also a requirement under the APP. The methods for stacking and placing both waste rock and tailings was reviewed and permitted under the Aquifer Protection Permit (APP) P-106100 issued by ADEQ in April, 2012. ADEQ establishes APP permit limits based on aquifer water quality standards (A.R.S. Title 18, Chapter 11, Article 4). A narrative aquifer water quality standard also requires that "a discharge shall not cause or contribute to a violation of a water quality standard established for a navigable water of the state" (A.A.C. R18-11-405(B)).

To address the possibility of seepage from the waste rock facility, the U.S. Forest Service has included mitigation measure **FS-GW-01,** which requires placement of lysimeters or other collection equipment within the waste rock facility in order to monitor for the presence of seepage and allow for analysis of any leachate prior to it reaching the aquifer or surface waters. This data will be included in the quarterly monitoring reports and the annual report which are to be provided simultaneously to the U.S. Forest Service and ADEQ. Should the seepage reach surface waters, an individual AZPDES permit would be required and discharges would have to meet the appropriate surface water quality standards and antidegradation requirements.

Stormwater Runoff from the Project

For purposes of stormwater management, the open pit and plant site are closed systems with direct rainfall contained on site in the lined process water/temporary storage pond, lined settling basin, or the pit. Other stormwater design features include two diversion channels. The pit diversion channel will divert unimpacted stormwater around the west and south sides of the open pit (COE Public Notice Figs 3, 6, 7). Water in the channel will be directed to the perimeter containment area located along the west side of the waste rock storage area. The pit diversion channel is designed to convey the local and general probable maximum precipitation (PMP) event. The permanent diversion channel No. 1 will be constructed on the northeast side of the pit and divert unimpacted stormwater from the upgradient watershed into McCleary Canyon Wash. This channel is also designed to convey the local and general PMP.

During mining operations and post-closure, both the waste rock facility and dry stack tailings facilities will be exposed to surface runoff that can reach downstream surface waters. To control runoff from these facilities, Rosemont will employ sediment control structures to temporarily capture stormwater for the purpose of slowing velocities, reducing total suspended sediments, and to serve as a location for sample collection for monitoring purposes prior to releasing flows downstream. Downstream of the waste rock facility at the toe of the slope, separate sediment control structures will be constructed on both the Barrel Canyon and the Trail Creek drainages.

As a component of the APP application, Rosemont conducted Synthetic Precipitation Leaching Procedure (SPLP) testing on a variety of core samples representing the major anticipated waste rock

types. SPLP is an EPA testing method to determine the mobility or "leachability" of contaminants in liquids, soils and wastes. According to the FEIS, the predicted water quality for runoff from waste rock does not exceed any applicable surface water quality standards in Barrel Canyon Wash or the associated tributaries except for dissolved silver (FEIS, pages 472-473). From the SPLP testing, the predicted concentration of dissolved silver in stormwater runoff from the waste rock facility may be 0.0025 mg/l or 2.5 ug/l (Table 105, FEIS page 476)[1].

ADEQ reviewed the same data and finds little likelihood that dissolved silver will exceed SWQS. The applicable SWQS for Barrel Canyon and tributaries are Aquatic and Wildlife – ephemeral (acute), and Partial Body Contact. Many of the surface water quality standards for metals, in the dissolved fraction, are based on water hardness at the time of sampling. As noted earlier, ADEQ has reviewed the stormwater data collected from Barrel Canyon and tributaries. Of the 37 samples collected for dissolved silver, 26 had both a dissolved silver concentration and a hardness value reported. Of these 26 samples, three had laboratory detection limits greater than the applicable SWQS. None of the remaining 23 samples exceeded the applicable SWQS for dissolved silver based on the in-stream hardness at the time of sampling. If the predicted dissolved silver concentration in stormwater runoff from the waste rock facility is 2.5 ug/l and it exceeded surface water quality standards; that would suggest a water hardness of approximately 85 mg/l as $CaCO_3$, which is very low water hardness for stormwater particularly in a hard rock mining area. Of the 30 samples collected that also had corresponding hardness data, the average hardness was 611 mg/l, with 60% of those samples having a hardness of 350 mg/l or greater. Contrary to the FEIS discussion on page 472-473, ADEQ does not find it likely that dissolved silver will exceed surface water quality standards in runoff from the waste rock facility.

The 2010 Mining MSGP Subpart G applies to stormwater discharges associated with industrial activity from metal mining facilities where stormwater has come into contact with any overburden, raw material, intermediate product, finished product, byproduct, or waste product located on the site of operation. Under the 2010 Mining MSGP, Rosemont must select, design, install and implement control measures, as appropriate, to ensure discharges meet applicable surface water quality standards. The permit requires development of a Stormwater Pollution Prevention Plan (SWPPP) describing controls during the construction and the active mining phases.

The 2010 Mining MSGP requires Rosemont to conduct stormwater monitoring at Project outfalls for metals and other water quality characteristics outlined in Table 8.G-8.2. Parameters include: pH, hardness, antimony, arsenic, beryllium, cadmium, copper, iron, lead, mercury, nickel, selenium, silver, and zinc. While the 2010 Mining MSGP does not require facilities discharging stormwater to ephemeral waters to monitor for total suspended solids (TSS) or turbidity, under Part 6.2.4 ADEQ can require additional discharge monitoring if there is evidence that a pollutant may be causing or contributing to exceedances of a surface water quality standard. The SWPPP identifies the waste

rock/dry stack tailings storage facility as a major source of pollutants that may be transported in sediment during the construction phase. The waste rock facility will remain a potential pollutant source during active mining and until reclamation. Therefore, upon review of the Rosemont SWPPP, ADEQ is requiring Rosemont to monitor for TSS and turbidity, in addition to the parameters in Table 8.G-8.2, in both McCleary and Barrel Canyons.

If surface water quality exceedances occur, corrective actions will be required under the terms of the 2010 Mining MSGP. Possible corrective actions may include further segregation of waste rock, construction/implementation of additional stormwater control measures and/or stormwater treatment.

ADEQ authorized Rosemont's coverage[8] under the 2010 Mining MSGP in February 2013 contingent on submittal of the SWPPP 60 days prior to anticipation commencement of construction and/or mining operations. ADEQ received the original SWPPP on November 12, 2013 and supplemental information on January 14, 2014. The SWPPP describes pollution control measures to be taken during exploration, construction, operation and reclamation activities at the Project. The SWPPP is under review. In addition to the requirements of the 2010 Mining MSGP, the U.S. Forest Service has included the following mitigation measures: **FS-SW-01, FS-SW-02, OA-SW-01**

Factor: Changes in loadings and the nature, persistence and potential effects of the pollutant or water quality characteristic

Conclusion: Additional studies contracted by the U.S. Forest Service after the DEIS review concluded that the proposed fill activities will not have a significant impact on the geomorphology of Barrel and Davidson Canyons due to both physical and hydrologic characteristics of the watershed. The U.S. Forest Service will also require monitoring of sediment between the mine and State Route (SR) 83 to identify whether there are geomorphological changes due to the Project. ADEQ will receive copies of the monitoring and will require corrective action should impacts to geomorphology occur.

Sediment Delivery/Sediment Yield

Potential impacts on surface water quality due to the proposed fill activities include changes in downstream sediment yield caused by the loss of waters of the U.S. / watershed area and changes in downstream geomorphology due to changes in sediment yield. Ephemeral and intermittent streams provide natural erosion control and sediment control. Changes to sediment transport in streams can adversely affect water quality by increasing total suspended sediment in surface water flows and altering the physical integrity of the system, causing problems with scour or aggradation which have the potential to result in water quality degradation.

The U.S. Forest Service addressed concerns raised about sediment delivery through independent review. The Patterson and Annandale (2012) study concluded that, based on three variables (sediment

availability, channel geometry, and water flow), the proposed fill activities in Barrel Canyon and associated tributaries, will not have a significant impact on the geomorphology of Barrel and Davidson Canyons.

The study found that availability of loose sediment on the surface in Barrel and Davidson Canyons would continue to supply sediment to the streams as there is more sediment available than stormwater can transport. The estimated impact of the total change in flow and sediment load in lower Davidson Canyon would be within the normal variation of an ephemeral fluvial system. Secondly, the study found the presence of two grade control structures, between SR 83 and the beginning of the Davidson Canyon OAW, would prevent stream degradation as they would limit the extent of both upstream and downstream erosion. Lastly, the study states the nature of storm variability and inputs of sediment from various locations throughout the watershed at various times would continue to provide sediment to the downstream waters and it is reasonable to expect little change in the system as a result of the fill – especially in lower Davidson Canyon, located over 13 miles downstream of the activities (FEIS pages 465-466)[1].

The U.S. Forest Service mitigation measure **FS-SR-05** requires monitoring of sediment between the mine and SR 83 (the Barrel Canyon gage) to determine whether there is erosion and downstream geomorphological changes as a result of the Project. The federal review process determined that sediment load to Barrel Canyon and Davidson Canyon will decrease, but sediment concentrations in stormwater flow will remain the same compared to baseline (pre-mining) conditions. Rosemont has already established a surface water/groundwater monitoring station (BC-2) approximately 75 feet upstream of the SR 83 bridge over Barrel Canyon Wash. ADEQ worked with Rosemont to site a future second monitoring location approximately 800 feet downstream of Sediment Control Structure No. 1. The monitoring point near the sediment control structure will provide data related to potential impacts of fill activities occurring in upper Barrel Canyon below the dry stack/tailings facility. The station near the SR 83 bridge will provide data on the impact of mine operations on Lower Barrel Canyon above its confluence with Davidson Canyon.

Monitoring of sediment will begin in the pre-construction period and will continue through the reclamation and closure phase. Sediment transport monitoring will be conducted yearly for the first five (5) years and is proposed to be reduced, to once every five (5) years after that the initial five, throughout the remaining operational life of the mine. Ongoing review of the data by Rosemont and the agencies will determine whether the monitoring can and should be reduced.

Rosemont added the sediment monitoring plan to the Surface Water Mitigation Plan (discussed in more detail below) required by this Certification. ADEQ will receive copies of the monitoring and will require mitigation should impacts to geomorphology occur.

Factor: Reduction in available assimilative capacity

Conclusion: The long term trend of baseline surface flow volumes in both Davidson Canyon Wash and Lower Cienega Creek appears to be one of continual decline though the cause is not clear. There may be a variety of factors leading to this long-term trend including an increase in the number of domestic groundwater wells in the basin and persistent drought. The springs that feed the OAW stretch of Davidson Canyon Wash are strongly influenced by stormwater runoff from summer precipitation that infiltrates the alluvial aquifer. The FEIS selected action results in a predicted reduction in average annual runoff volume during the pre-mining and active mining phases of 30-40% and a change in average annual post-closure runoff volume of 17.2%. To address this potential reduction in flow, ADEQ is requiring Rosemont to develop and implement a surface water flow mitigation program. The draft Certification that was noticed for public comment in February, 2014, contained a condition that required Rosemont to develop a surface water mitigation plan within 180 days of the COE's issuance of the CWA 404 permit. Numerous commenters questioned why ADEQ would issue its certification prior to reviewing and approving the mitigation plan. As a result of comments and upon further review, ADEQ required Rosemont to develop and submit the mitigation plan for review and approval prior to finalizing the permitting decision. Following numerous meetings and revisions, ADEQ approved the plan in December, 2014. It is important to note that this plan is a living document and subject to revision as data is received, evaluated and as mitigation strategies are deployed.

Reduction in runoff volume

Predicted reductions in stormwater flows due to the fill activities could affect a number of downstream uses including: 1) a potential reduction in recharge to the alluvial aquifer which feeds the springs in Davidson Canyon Wash; 2) sustaining riparian vegetation; and 3) water available for use by livestock and wildlife. Potential loss of flow could translate to a potential loss of assimilative capacity and degradation to water quality and/or riparian areas.

Several reports document that the long-term trend of baseline surface flows – pre-mining, in both Davidson Canyon Wash and Cienega Creek, is in continual decline due to numerous factors including an increase in domestic groundwater wells in the basin and persistent drought. Pima County has been monitoring stream flow in Davidson Canyon since 2005 and along Lower Cienega Creek since the early 1990's.

When nominated as an OAW by the Pima Association of Governments in 2003, Davidson Canyon was identified as a perennial, free-flowing reach[9]. A Pima County study in 2003 estimated Davidson Canyon's relative contribution of base flow to Lower Cienega Creek at Marsh Station Road ranged from 8- 24%[10]. Field visits conducted since 2010 have found that most of the reach has been dry. Based on data from 1968 through 1975, except for some small perennial sections, both Davidson Canyon Wash and Lower Cienega Creek were intermittent streams that flowed for limited portions of the year, with some perennial reaches in Upper Cienega Creek. (FEIS page 412)[1]. Currently, along Lower Cienega

Creek, a perennial reach occurs just upstream and downstream of its confluence with Davidson Canyon. Between 1990 and 2011, surface flows in Cienega Creek declined by 83 percent and the extent of flow declined by 88 percent (FEIS page 420)[1] and (Powell)[11]. Davidson Canyon Wash exhibits a similar drying trend.

The period of record for the USGS gage on Davidson Canyon (gage no. 09484590) was February 1968 to September 1975 but is no longer in service. The range of mean monthly flows corresponds to the monsoon season. The data also shows temporal variability and many months with no flow. While there were periods of perennial type flow (circa 1968); from 1990-2011, Pima County's study shows the Davidson Canyon gage only recorded flow on 95 separate days[11] over 21 years.

The Reach 2 and Escondido Springs, which supply the perennial sections of Davidson Canyon Wash are strongly influenced by stormwater runoff from summer precipitation which infiltrates the alluvial aquifer (FEIS page 535)[1]. Recognizing the importance of delivering unimpacted stormwater to the downstream watercourses to help recharge the shallow alluvial aquifers, the U.S. Forest Service mitigation measures require that stormwater diversion channels and facility locations be designed and located in order to maintain flow downstream as much as possible and to avoid contact of stormwater with processing facilities and ore stockpiles (**FS-SW-01**). The specific stormwater diversions for the selection action, the Barrel Alternative, are also designed to route more stormwater into downstream drainages post-closure (**FS-SW-02**).

While ADEQ is precluded by statute from requiring monitoring in a State 401 certification, the U.S. Forest Service is requiring Rosemont to conduct monitoring to determine if there are impacts from pit dewatering on downstream sites in Barrel and Davidson Canyons (**FS-BR-22**) in accordance with both surface water and groundwater monitoring plans[3,4] prepared by Rosemont and reviewed by ADEQ. Rosemont[7] has agreed to provide the quarterly monitoring reports and the annual report to ADEQ at the same time they are submitted to the U.S. Forest Service. ADEQ will review and track the data to ensure there is no degradation to downstream OAWs. In the event ADEQ finds conclusive evidence that degradation is or may occur, ADEQ will work with the COE on the necessary steps to address the issues. Such steps may include additional mitigation or may result in suspension, modification or revocation of the CWA 404 Permit.

The U.S. Forest Service mitigation measure **RC-SW-01** requires Rosemont to fund the U.S. Geological Survey for the continued operation and data gathering at the USGS flow gage on Barrel Canyon at SR 83 that will provide data on surface water flows downstream of the mine site for the life of the mine and for at least five years after closure.

The FEIS shows that the Barrel Alternative results in a predicted reduction in average annual runoff volume from the watershed, although downstream within the OAW reaches, the impacts from

activities would be attenuated as the contributing watershed becomes larger (FEIS page 429)[1]. The selected action results in the lowest predicted reduction of average annual runoff volume during pre-mining, active mining and post-closure phases of any of the action alternatives.

Reduction in runoff volume, if realized, could result in a potential loss of assimilative capacity and therefore, potential degradation of water quality in the OAW segments of Davidson Canyon Wash and Lower Cienega Creek. Similar to the U.S. Forest Service mitigation measure FS-SSR-01 where Rosemont must purchase water rights to compensate for impacts in the Cienega Creek watershed to offset predicted reductions in peak stormflows, ADEQ required Rosemont to develop and implement a surface water flow mitigation plan for Lower Davidson Canyon Wash and Cienega Creek to offset any predicted and/or observed reduction in runoff volume as a result of the certified activities.

The primary purpose of the surface water mitigation plan is to maintain aquatic and riparian resources at pre-project levels in the OAW portions of Davidson Canyon Wash and Lower Cienega Creek. The plan describes:

- the various monitoring programs (e.g., stormwater, streamflow, springs, groundwater, precipitation, and stream geomorphology) that will be conducted by Rosemont throughout the life of the Project and post-closure that will be used to evaluate water quality and quantity as well as monitor downstream resources [FS-BR-22; FS-SR-05; FS-SSR-02; RC-SW-01];
- how the data will be reviewed and evaluated;
- the development and use of a surface water model to predict possible changes;
- mitigation measures that could be employed to offset or replace project-related reductions in stormwater flow volume and sediment, should reductions be predicted or occur;
- how the mitigation measures will be evaluated for deployment;
- how the degree of success of the various mitigation measures will be evaluated; and
- reporting.

Mitigation measures currently proposed include revisions in stormwater management at the mine site (e.g., on-site flow diversion, installation of culverts, impoundments); assignment of water rights to protect the OAW segments in Davidson Canyon Wash; closure of stock ponds, tanks or wells on Rosemont owned or leased properties and identifying available water resources to provide water to the system to offset stormwater reductions. Water from any other source may require treatment to ensure it meets surface water quality established for the OAWs. As stated earlier, this mitigation plan is a living document that will need to be revised as data is collected and evaluated and measures, if needed, are implemented. How successful the measures are in offsetting a predicted or measured change will also factor into revisions needed to the plan.

Factor: Degree of confidence in the various components of any modeling technique utilized

Conclusion: As a result of the DEIS review, several agencies questioned the accuracy of the models in predicting impacts to downstream waters. The U.S. Forest Service contracted with Tetra Tech to perform additional hydrogeologic analysis of Davidson Canyon Wash, using observed field data rather than modeling predictions, to determine whether the source of the springs in the OAWs is the regional aquifer or the shallow alluvial aquifer. The Tetra Tech report concludes that flow from springs in lower Davidson Canyon originates from a localized source, specifically storm flows stored in shallow alluvial stream sediments, and therefore the impacts of drawdown by pit dewatering is unlikely to result in any noticeable loss of flows in Davidson Canyon or Cienega Creek.

Modeling and Field Data Observations

The proposed activities may have an effect on stream flow and by extension, water quality. In the FEIS, the impact of the project on stream flows was predicted primarily through groundwater modeling. For the most part, however, the threshold of accuracy for the available groundwater models (predictions of ± 5 feet) makes the analysis of groundwater drawdown on distant surface water highly uncertain. The analysis of impacts to stream flow reflects predicted impacts from relatively small amounts of groundwater drawdown, sometimes fractions of a foot, that are occurring decades, hundreds, or even 1,000 years in the future (FEIS page 501)[1].

Several agencies raised questions as to the degree to which the models used can accurately predict the severity of impacts to perennial and intermittent streams downstream of the proposed activities. The U.S. Forest Service looked at two components. First, the impact of predicted drawdown from the mine compared to existing baseline conditions in the OAWs. Other trends or factors that could increase the severity or probability of impacts occurring including:

- presence of T&E species,
- the long-term measured trend of declining surface flows in Lower Cienega Creek (pre-mining),
- reported changes in the species compositions of riparian communities from hydro- and meso-riparian communities to more xeric plant communities (pre-mining), and
- climate models predicting a trend of increasing temperatures, decreasing precipitation and increased periods of drought in the arid southwest.

Potential Impacts based on a Shallow Alluvial Source

Tetra Tech performed a detailed hydrogeologic analysis of Davidson Canyon Wash using observed field data rather than modeling (FEIS pages 534-535)[1]. Based on water quality data, geological mapping, observed groundwater levels and observed flow data, Tetra Tech drew several conclusions about the origin of surface flows in lower Davidson Canyon Wash beginning at Reach 2 Spring. The report concludes that it is likely that Reach 2 as well as Escondido Spring derives its water from ephemeral storm flows stored in shallow alluvial stream sediments that are forced to the surface by bedrock

constrictions in the stream channel. Further these springs are not likely connected to the regional aquifer that would be impacted by the mine pit dewatering.

These conclusions are based on several lines of evidence. Geological conditions were observed that would be conducive to forcing shallow alluvial water to the surface in the locations of Reach 2 and Escondido Springs. In addition, isotope signatures of water from these two springs reflect the influence of summer precipitation, in contrast to wells in the regional aquifer which reflect the influence of winter precipitation. Lastly, this stretch of Davidson Canyon Wash has actually been dry during the past few years, rather than being supported by perennial flow, as would be expected from a regional groundwater source (FEIS page 535)[1]. Following publication of the DEIS, the U.S. Forest Service undertook further investigation of impacts to the OAWs and hired SRK Consulting to review and weigh the evidence to determine the most likely source of water for flows in Davidson Canyon Wash. SRK concluded that while there is still some uncertainty, the available information, namely observed groundwater levels in a well located in lower Davidson Canyon Wash, observations of Reach 2 Spring on multiple, sequential field visits, and isotopic signatures of the spring water, suggests no connection between the Davidson Canyon Wash springs and the regional aquifer (FEIS page 535)[1].

ADEQ finds the weight of evidence supports that lower Davidson Canyon Wash is not hydraulically connected to the regional aquifer that would be impacted by the pit dewatering. Rather, the available evidence reinforces that the stream flow and springs arising in lower Davidson Canyon Wash are derived from a localized source, specifically storm flows stored in shallow alluvial stream sediments. Reductions in surface flow due to surface disturbance and the removal of portions of the upstream watershed could potentially reduce recharge to the shallow alluvial aquifer in lower Davidson Canyon Wash, impacting Reach 2 and Escondido Springs, and potential base flow between those springs and Lower Cienega Creek. Assuming the source of flows is alluvial, impacts of drawdown by pit dewatering is unlikely to result in any noticeable loss of flows in Davidson Canyon Wash.

As noted earlier, the predicted reduction in average annual runoff volume from the affected watershed is 30-40% during pre-mining and active operation of the mine and 17.2 % in post-closure as a result of capture of runoff by mine facilities. As a condition of the State 401 Certification, Rosemont has developed and submitted to ADEQ, for review and approval, a surface water mitigation plan designed to maintain aquatic and riparian resources at pre-project levels in Davidson Canyon Wash and Lower Cienega Creek. The plan includes, but is not limited to, a description of measures that will be taken to offset predicted reductions in surface water flow, in response to the project, along with a proposed schedule for implementation. The plan has been approved by ADEQ as a condition of Certification and Rosemont shall begin implementing the plan upon issuance of the CWA 404 permit, in accordance with the schedule set forth in the approved program. Should the results of required monitoring and/or revised hydrologic modeling (U.S. Forest Service Mitigation Measures **FS-BR-22, FS-BR-27, FS-GW-01, FS-SR-05**) indicate that water quality in Davidson Canyon Wash or Lower Cienega Creek is adversely affected by the activities certified herein, ADEQ may request that the COE suspend the CWA 404

Permit and require additional mitigation. Conclusive evidence of degradation or water quality exceedances could result in modification, suspension or revocation of the 404 Permit.

Predicted Effects on Lower Cienega Creek

The potential for reduction in perennial stream flow on Lower Cienega Creek would be driven by two factors: reduction in contribution from Davidson Canyon Wash and reduction in contribution from Upper Cienega Creek. Based on the analysis of Davidson Canyon Wash, the same conclusions would apply to Lower Cienega Creek below the confluence with Davidson Canyon Wash – reduction in surface flows would be minimal.

In consideration of uncertainty associated with predicting long-term impact of any hydrologic systems and the limitations identified in the groundwater models, four monitoring components have been incorporated into the U.S. Forest Service mitigation and monitoring plan: **FS-BR-22, FS-SSR-02, FS-SR-05, RC-SW-01**

Factor: Potential for Cumulative Impacts

Conclusion: As discussed above, existing water resources in the OAWs have been observed to be in decline. The causes for this decline may include: climate change, persistent drought and increases in groundwater pumping within the Davidson Canyon Wash / Cienega Creek basin (FEIS page 525)[1]. The springs that feed the OAW stretch of Davidson Canyon Wash are strongly influenced by stormwater runoff from summer precipitation that infiltrates the alluvial aquifer. By requiring Rosemont to develop and implement a surface water flow mitigation program, Rosemont will be replacing those flows that are being captured or truncated higher up in the watershed and providing them more directly to the OAWs.

Domestic Wells, Climate Change and Drought

Private domestic wells and upstream diversions in the watershed are primarily used for domestic and stock water uses and have sustainable yields from 1-3 gallons per minute on average. Estimates of groundwater use by wells in the Davidson Canyon/Cienega Creek Basin are approximately 400-500 acre-feet per year with most of this occurring in the Sonoita-Elgin area. Many of these wells may not tap the regional aquifer but rely on smaller, isolated pockets of alluvium or perched units not hydraulically connected to the regional system. This type of water use has steadily increased throughout the basin. In 1980, approximately 630 domestic or stock wells were known in the Cienega Basin. By 1990 that number had increased to more than 1,000 wells and by 2010, ADWR records show more than 1,800 exempt wells (FEIS page 527)[1]. Pima County actually holds a water right just upstream of the preserve, on its Bar V Ranch. The current lessee at Bar V Ranch periodically creates earthen dams in Davidson Canyon Wash to divert surface flows directly into a stock pond. While the impact of an individual well or stream diversion is generally small, the cumulative impact of these types of activities and uses could be substantial throughout the watershed. In addition, this area is not

within an AMA so there are few restrictions on drilling or pumping. The kind of growth in the area seen over the past 30 years is likely to continue into the future without some land use changes by county, state or federal land managers.

Climate change in the Southwest is predicted to bring higher mean annual temperatures over the next 100 years, along with less winter precipitation, and increases in extreme rainstorms and flooding and longer period of drought. Models consistently suggest rising temperatures, but the effects on precipitation, especially seasonal timing of precipitation, are less consistent. The reaction of riparian vegetation to changing climate conditions will also influence water availability in riparian areas.

Arizona and the entire Southwest are in the midst of a multi-decadal drought that began, according to most experts, in the late 1990s and, with the exception of a few wet years, has yet to be alleviated. Pima County has documented significant long-term changes observed on the Cienega Creek Natural Preserve between 1990 and 2011. Measurements of drought severity indicate that drought conditions have been ongoing in the Cienega Creek basin since 1996 and are reflected in a noticeable reduction in the amount of stream flow, the geographic length of stream flow and the average depth to groundwater. The causes for these changes are likely varied, but persistent drought is one the leading stressors (FEIS page 525)[1].

ATTACHMENT A

FEIS Mitigation Measures

FS-BR-22	Monitoring to determine impacts for pit dewatering on downstream sites in Barrel Canyon and Davidson Canyon
FS-BR-27	Periodic validation and rerun of groundwater model throughout life of mine
FS-GW-01	Monitoring of waste rock for seepage
FS-SR-05	Sediment transport monitoring
FS-SSR-02	Seeps, springs and enhanced waters monitoring
FS-SW-01	Location, design and operation of facilities and structures intended to route stormwater around the mine and into downstream drainages
FS-SW-02	Stormwater diversions for Barrel Alternative designed to route more stormwater into downstream drainages post-closure
OA-GW-02	Reduction of the potential for acid generation and metal leaching from tailings and waste rock as required under the Aquifer Protection Permit
OA-SW-01	Detention and testing of stormwater: Requires the detention and testing of stormwater quality from perimeter waste rock buttress areas for water quality testing prior to flowing downstream of the mine site
RC-SW-01	Continued operation and data gathering of the USGS flow gage

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12. Rosemont Copper, "Surface Water Mitigation Plan", December, 2014
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Figure 1: Project Location Map

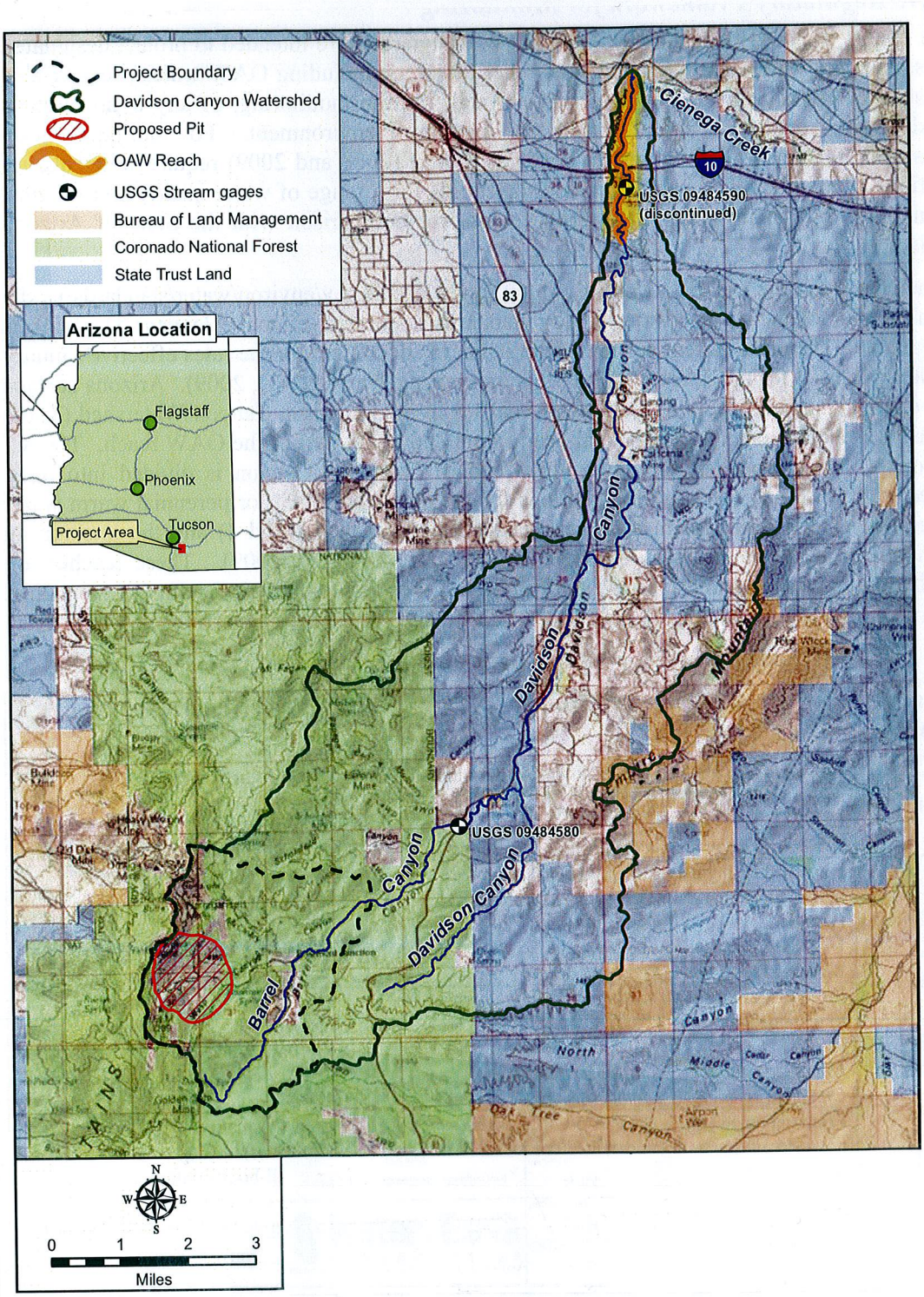

Figure 1a: Outstanding Arizona Waters & Reach Designations

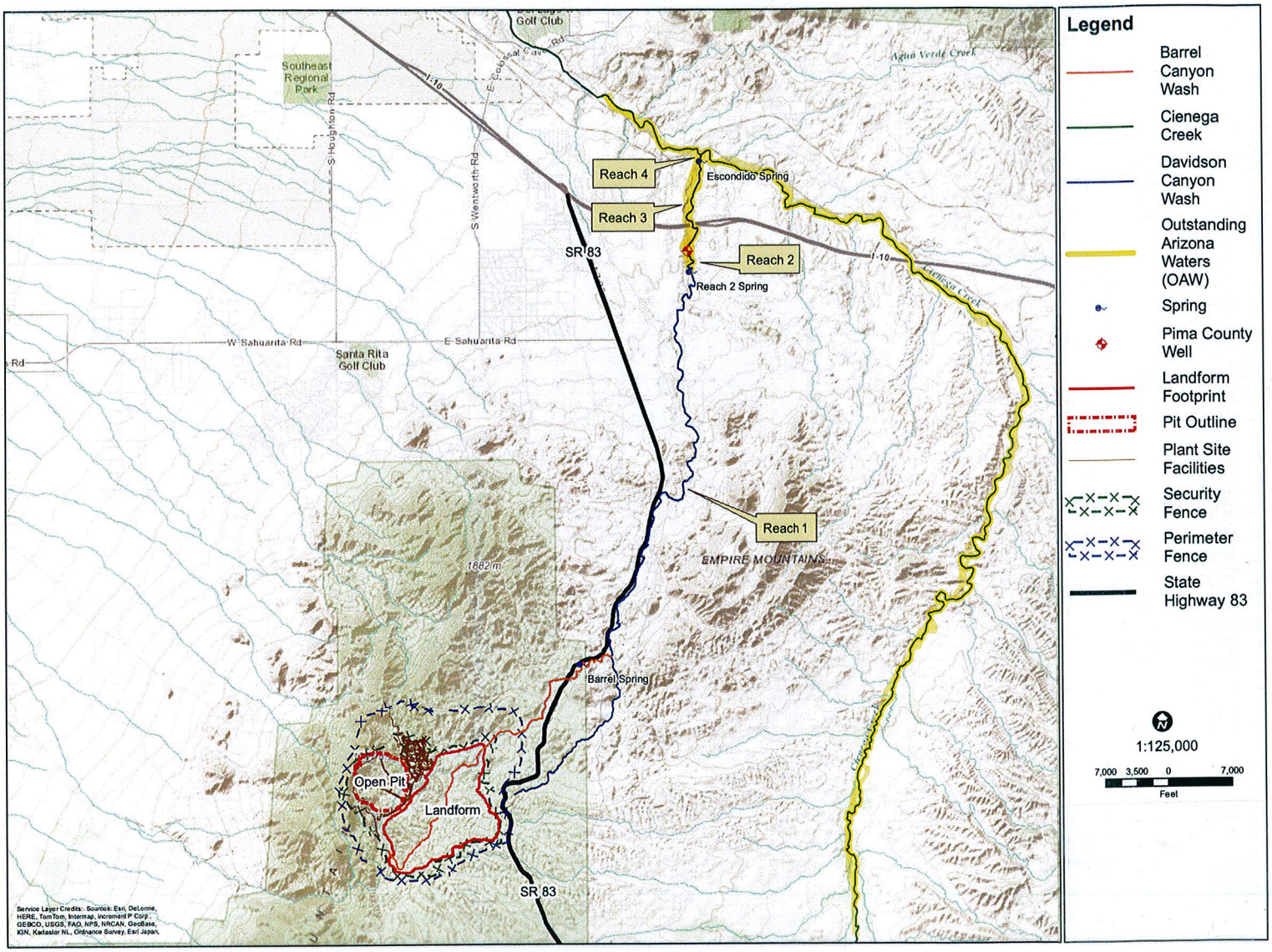
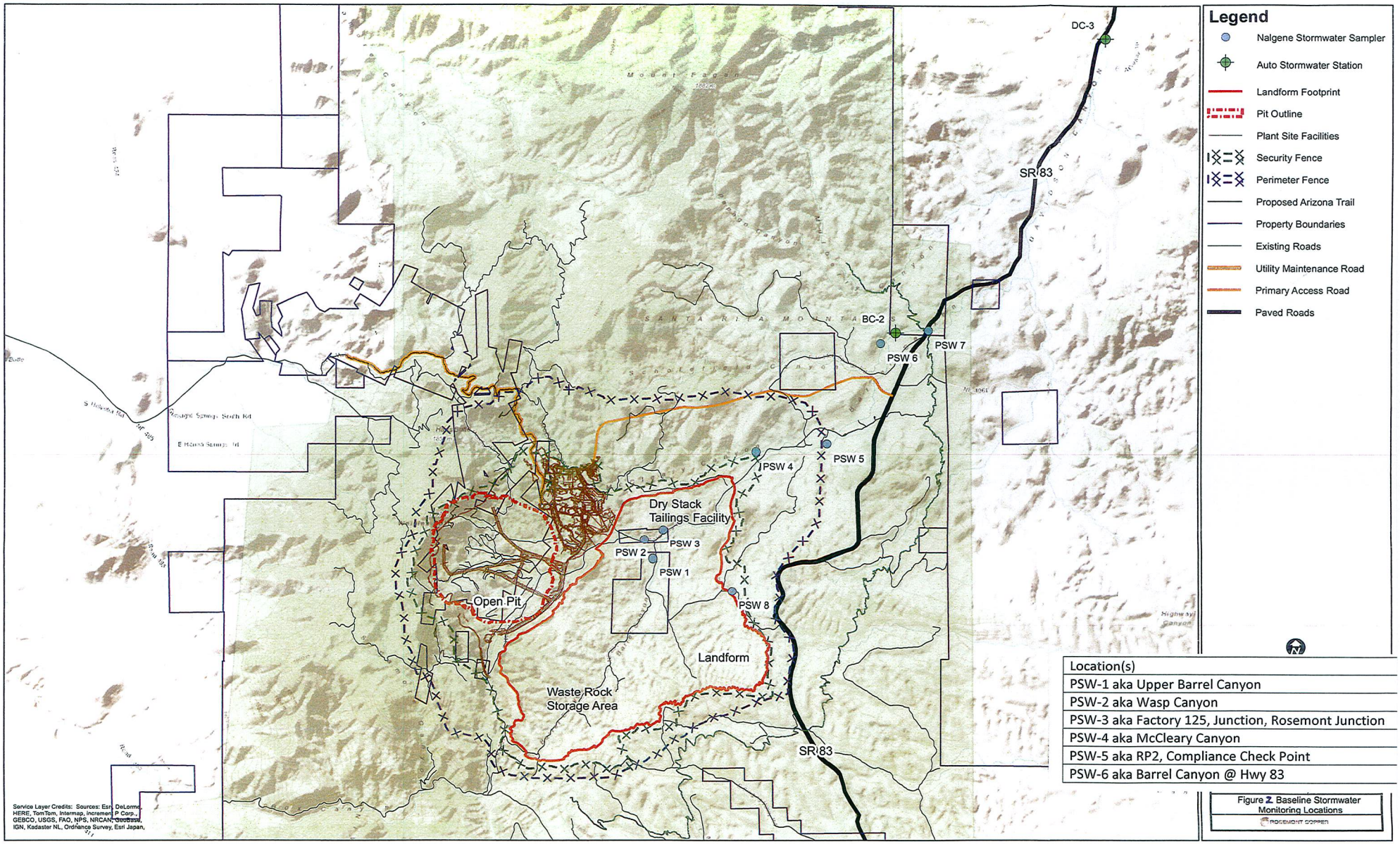
Figure 2: Baseline Stormwater Monitoring Locations