Corona Mine Above Ground Facilities Improvement Plan

This above ground facilities improvement plan describes improvements to the infiltration trench for the Boilerhouse Adit, and surface water diversion at the Upper Corona Pit. Site features are shown on Figure 1.

Boilerhouse Adit

Improvements at the Boilerhouse Adit include replacing the manifold pipe at the portal, adding a settling/filtration basin for discharges, and replumbing the distribution system to the infiltration trench. These improvements are described below.

Infiltration Trench. An infiltration trench is used to prevent overland flow of mine drainage at the Corona Mine Boilerhouse Adit (Figure 1). Prior to trench construction, drainage from the adit flowed across and through mine waste. The trench receives all of the drainage from the adit and prevents contact of the mine drainage with waste rock or tailings. Infiltration of the drainage through native soil and rock also prevents overland flow of the mine drainage to surface water. Drainage is intercepted at the portal and routed through a pipeline into the trench. Multiple valves and check dams within the trench are used to direct drainage into specific trench segments to allow maintenance while continuing to control the drainage. Trench characteristics are summarized in Table 1 below.

Table 1: Corona Mine Boilerhouse Adit Infiltration Trench Characteristics

Location	Length (feet)	Depth (feet)	Bedrock	Drainage Flow (gallons per minute)
Corona Mine Boilerhouse Adit	435	3 to 4	Sandstone	5 to 150

Monitoring wells are adjacent to the Corona infiltration trench. The wells were constructed by drilling to the depth of refusal (7.5-15 feet below ground surface), installing a perforated polyvinylchloride well screen at the lower 5 feet threaded to a blank casing, and backfilling the borehole to the surface. Groundwater has been observed within only three of the wells (MW-3, MW-5, and MW-7) during the winter months despite their close proximity to the infiltration trench. In addition to monitoring wells, the slopes below the infiltration trench are periodically inspected for signs of seepage (aquatic vegetation, vigorous vegetation during the dry season, and wet or moist soil). One seasonal seep has been observed downhill from the Corona infiltration trench. This seep dries up during the annual summer dry period. Lack of groundwater in the monitoring wells, and lack of persistent moisture on the slopes below the infiltration trench are herein interpreted as evidence that the acid rock drainage inifiltrates to bedrock beneath the infiltration trench. Infiltrating water from the Corona trench was documented to ultimately migrate to the Corona Drain Tunnel (the drain tunnel crosses under the Corona infiltration trench about 430 feet beneath the trench bottom) based on results of a tracer test conducted in 2016. Thus, any impacts of the infiltrating water are detectable in the drain tunnel drainage.

Improvements to the existing infiltration trench at the Boilerhouse Adit will consist of replacing the existing pipe manifold at the portal, re-plumbing the distribution system, and installing a

settling/filtration basin to facilitate effective solids management. Re-plumbing will allow more effective operations under seasonal changes in flow, improved level controls between trench reaches, and facilitate isolating separate reaches of each trench for maintenance such as widening and sloping trench bottoms. In addition, access to the trenches will be improved to increase worker safety. Diversion of runoff from slopes above the trenches would also be completed at locations where concentrated flow enters the trenches.

Portal. The existing pipe manifold directs water via gravity into distribution pipes that conduct the water to the infiltration trench. The existing manifold is undersized resulting in backing up of water due to accumulation of solids, and the potential for overflow to the adjacent waste rock during peak flow events. The existing manifold will be replaced with a new concrete cast-in-place manifold equipped with multiple, valve controlled, 8-inch outlets. Associated piping will be connected to the outlet manifold.

Settling/Filtration Basin. A settling/filtration basin is necessary to allow capture and management of the iron oxide precipitate that periodically flushes from the adit. Capturing this precipitate will decrease plugging in the infiltration trench and will reduce the likelihood for overflow during peak flow events. Due to limited space at the adit and proximity to waste rock, the best location for the settling/filtration basin is at the existing south end of the infiltration trench about 100 feet north of the Boilerhouse Adit portal. This location was selected because it is lower than the portal, and is located adjacent to a road providing ready access for maintenance and monitoring.

Based on estimates of sludge volume (about 4 cubic yards per year), the settling/filtration basin is designed as follows:

Previous testing on Corona sludge demonstrated that the majority of the sludge settling occurs within the first one hour and suspended materials are nearly absent following two days of settling in a stagnant system. Extended residence times would result in better water clarity, less suspended material and would provide more sludge holding capacity. Because space is limited on the site, the settling pond at the portal will be constructed as large as practical and be equipped with an infiltration drain to facilitate solids removal through filtration.

The settling/filtration basin will be approximately 40 feet long, 20 feet wide, and 5 feet deep. The effluent will be designed to exit at the bottom of the settling/filtration basin through pipes configured to distribute flow to the infiltration trenches. Prior to entering the pipes the water will pass through a sand layer, and a geomembrane to remove the iron oxide precipitates. It is expected that the filtration system will plug and blind off over time. In order to maintain flow through the filtration system for extended periods of time, it will be designed in a manner to allow for sequential vertical plugging starting at the lower central portion of the filter. As the sludge blinds off the flow, the water level will rise in the basin, exposing fresh surfaces for filtration. This process will allow water to continuously pass through the filter until the entire filter is blinded off. At this point the sludge should be removed from the basin. A cleanout to allow back-flushing will also be provided to ensure that the pipes remain open.

The settling/filtration basin will provide increased settling times to capture solids during lower flow periods, and will pass through unfiltered flow during higher flow periods. A design is provided in Figure 2. The drain would report to the infiltration trench.

Replumbed Distribution System. Piping will be reconfigured to minimize maintenance requirements and allow distribution of drainage to one, some, or all of the trench segments at any given time.

Maintenance consists of cleaning out accumulated solids. To facilitate solids removal, the new pipe will be equipped with cleanouts to allow solids removal. The pipes will be sloped so that solids will drain to the settling/filtration basin. Eight-inch acid-resistant HDPE pipe will be used and equipped with six-inch laterals. Laterals will be equipped with junction boxes to allow inspections and facilitate flow control. Flow control will be attained through use of stand-pipes and plugs. Stand pipes will provide for distributing flows among trench segments, while plugs will allow isolation of a segment for maintenance.

The pipe will conduct raw unfiltered drainage to the settling/filtration basin, filtered drainage will report via the drains at the end of the basin to distribution piping. Distribution piping will conduct the filtered drainage to the desired infiltration trench segments.

Upper Corona Pit

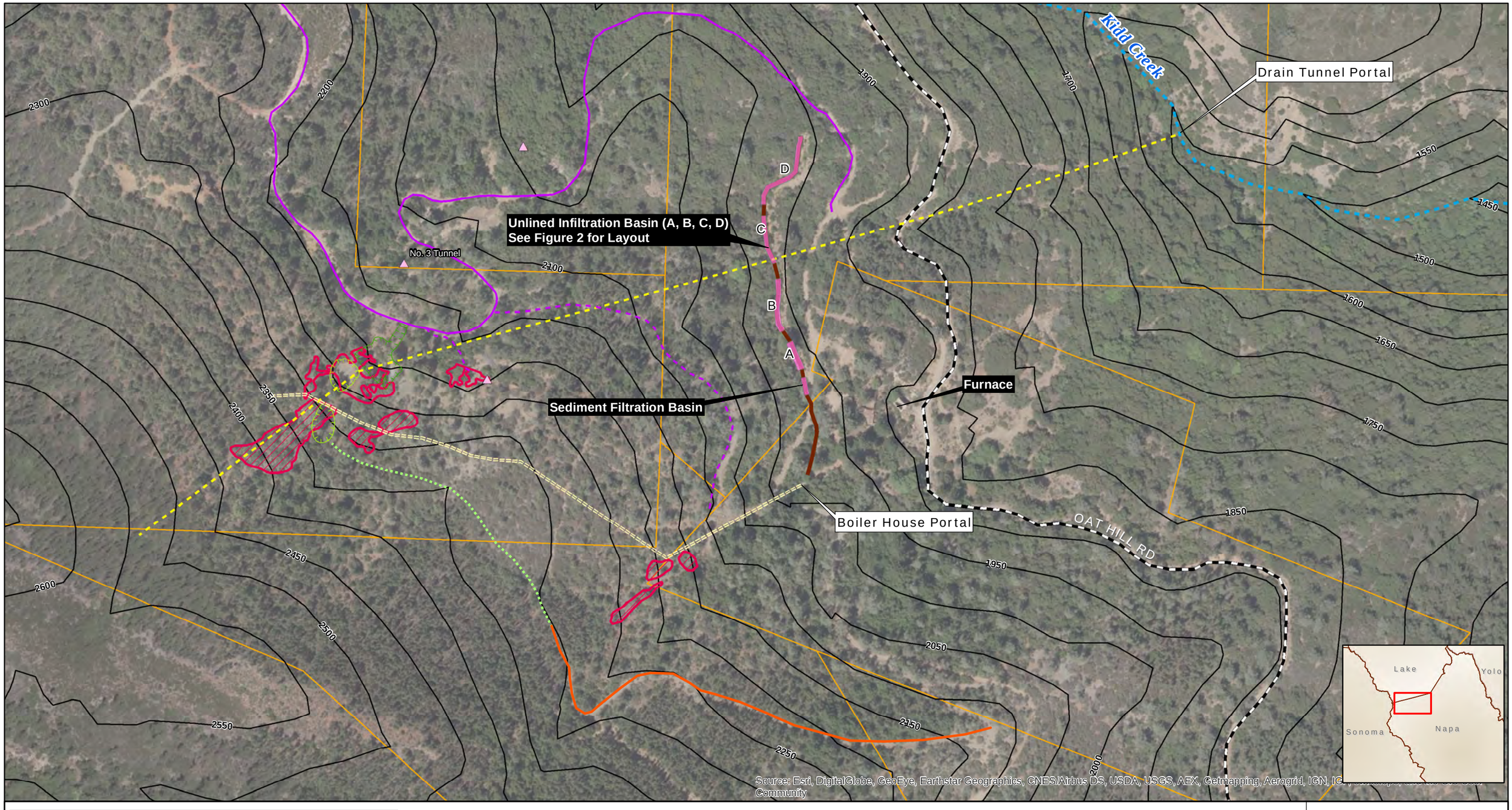
An open pit is located at the upper Corona Mine (Figure 3). The pit was developed by removing the material from above an adit (former No. 1 Tunnel). This pit is located above underlying stopes and adits, some of which have caved in creating collapse features at the surface near the pit (Figure 3). Significant quantities of surface water runoff have been observed running down a rock channel/drainage along the east side of the open pit. Some of the runoff also enters the Pit and infiltrates to subsurface mine workings (no corresponding flow was observed exiting the pit).

Figure 4 shows a photograph of the runoff as it infiltrates to the subsurface. Inspection of slopes and roadcuts below the infiltration area did not identify associated runoff; thus, this water is considered herein to infiltrate to the underlying mine workings via cracks and fractures in the rock.

To prevent the surface water runoff from entering the underlying mine workings and contributing to acid drainage, runoff from the drainage will be intercepted and conducted through a pipe down the hill to the road. At the road, a lined road-side ditch or drainage with culverts where needed will be installed along the road to conduct the water to a spreading area where the runoff will be diffused along a vegetated slope (Figure 3).

The diverted water will be intercepted before contacting any mine waste and will be isolated from contact with mine waste by containment in pipes and lined roadside channels. The water will be conducted to vegetated slope where it will infiltrate into soil and underlying unmineralized sandstone, or flow overland to an existing natural drainage.

Access to construct the storm water runoff diversion at the drainage will be via a trail constructed from the end of an existing fire break (Figure 1). Before clearing the trail, a plant survey will be conducted in late April to ensure that any special status plant species are avoided by the access trail and subsequent use to perform the work.



Legend

- Proposed Access Trail
- Exisitng Fire Break
- Parcel Lines
- Collapse Feature
- Pit
- Ore Body/Stope
- Stope
- Adit
- Boiler House Portal
- Drain Tunnel
- 50ft Contour
- Creeks
- Roads
- Private Road
- Proposed Access Road
- Boiler House Adit

0 100 200 400

Feet

Corona Mine

Figure 1: Project Features

Source: Bing Maps aerial imagery web mapping service; Napa County GIS Department 2011; Burleson Consulting 2012.

Burleson Consulting, Inc.

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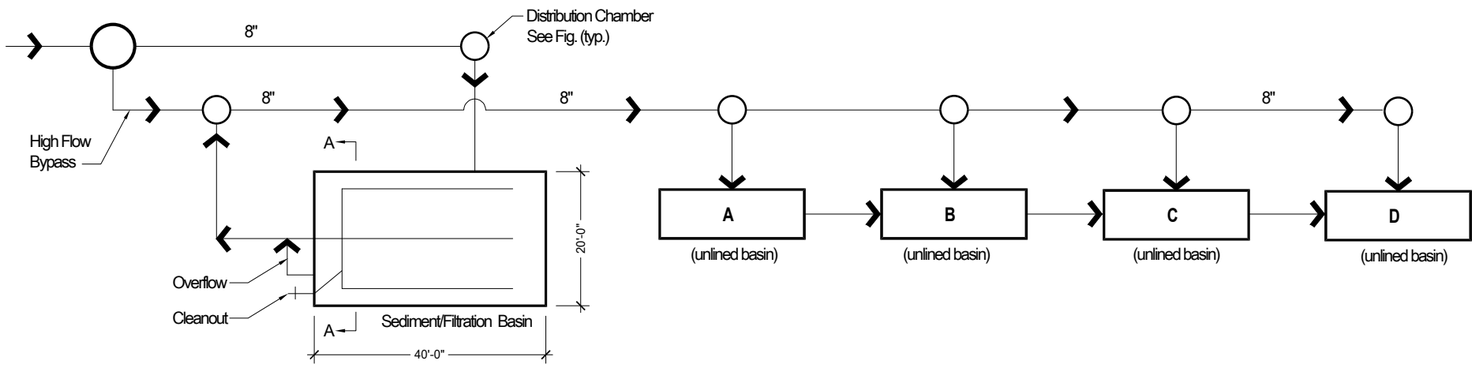
Notes:
-Infiltration trenches 6' X 75' (A, B, C & D) spaced apart to reduce mass saturation
-Low Flow Bypass to prevent slow Floc buildup in main pipe

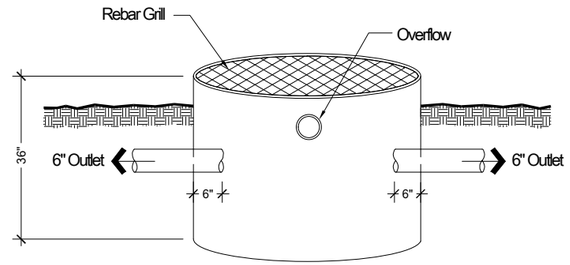
Infiltration Layout Diagram

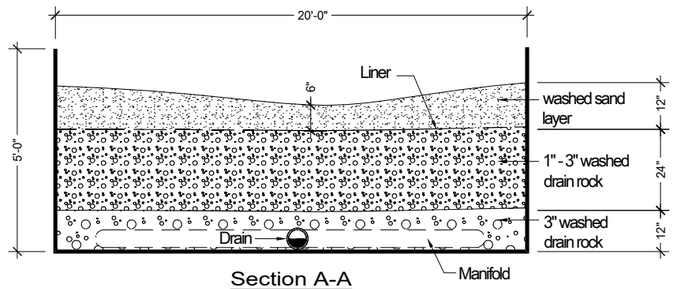
Not to Scale



Distribution Chamber

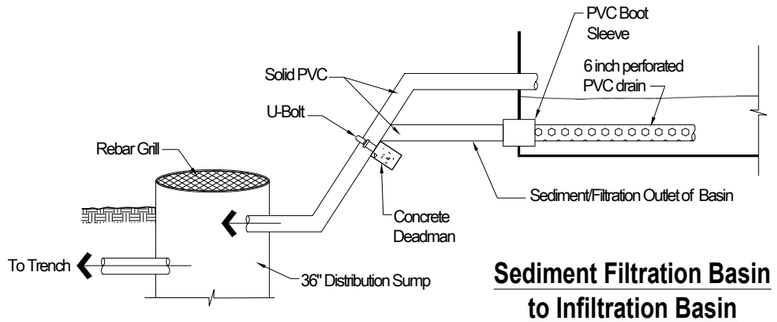
Section View - Not to Scale





Section A-A

Section View - Not to Scale

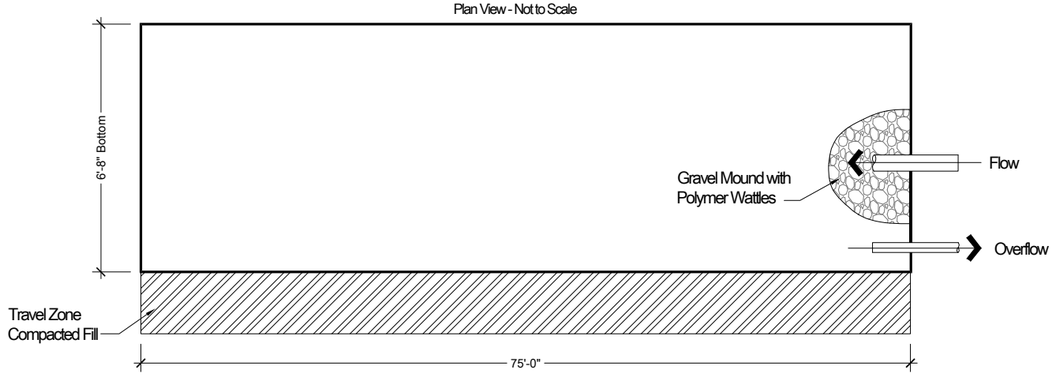


Sediment Filtration Basin to Infiltration Basin

Section View - Not to Scale

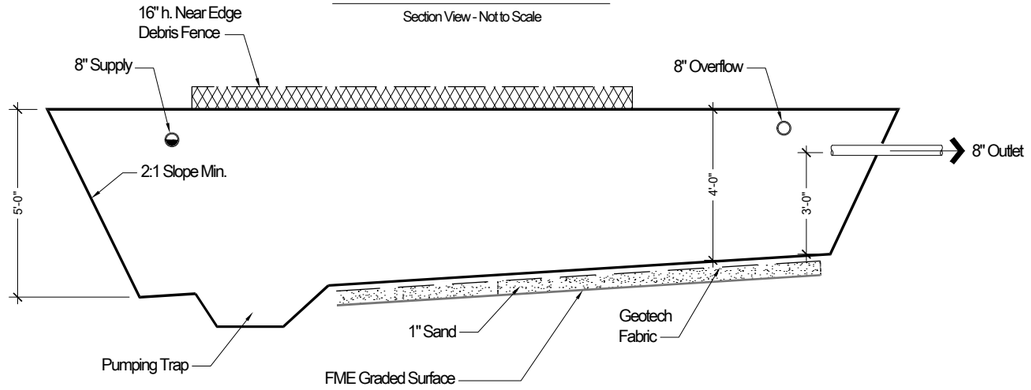
Infiltration Trench

Plan View - Not to Scale



Sediment Filtration Basin

Section View - Not to Scale



Twin Peaks Mine
Project Features
Infiltration Trench Improvements

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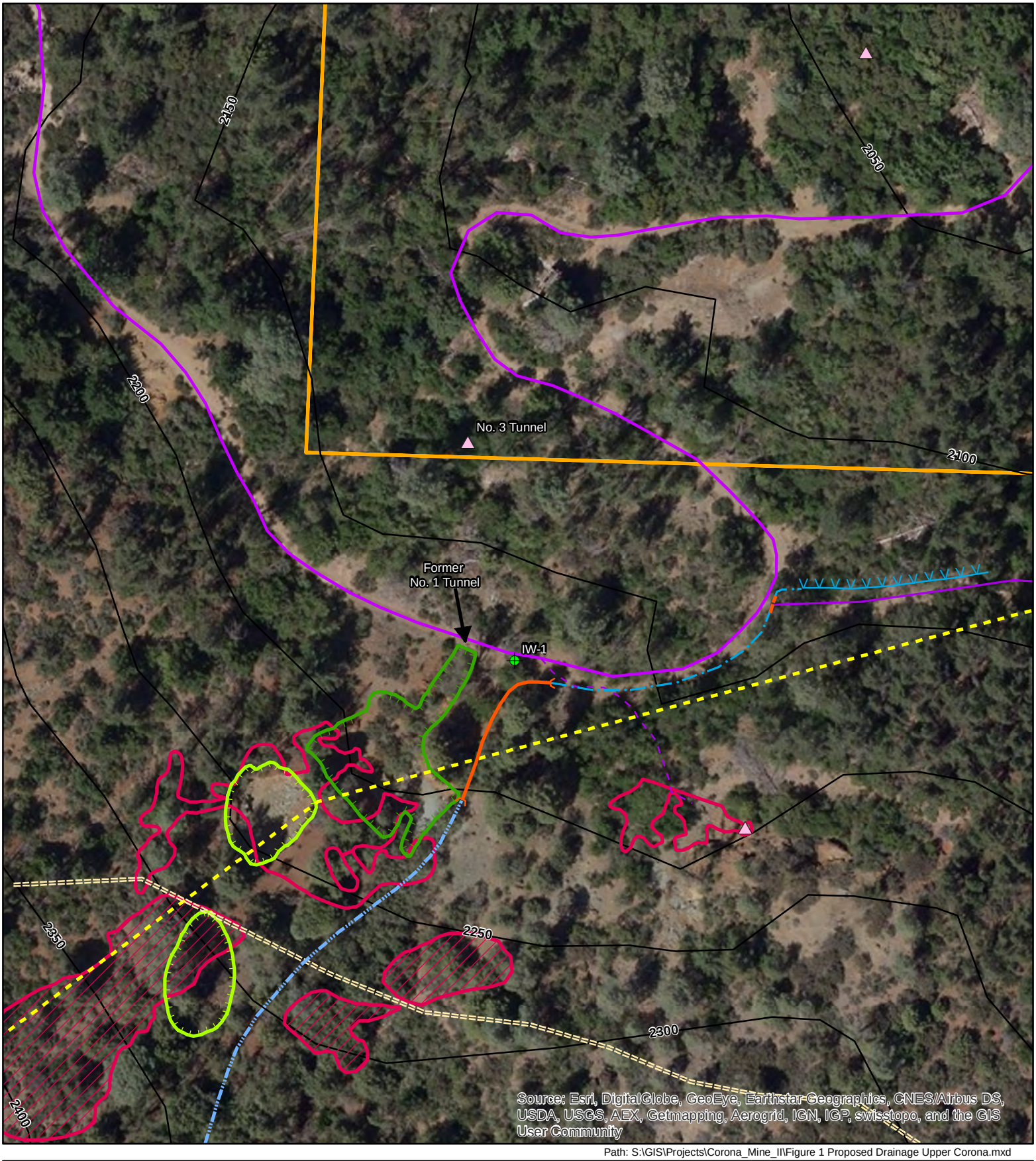
Burleson Consulting,Inc.

Figure 2

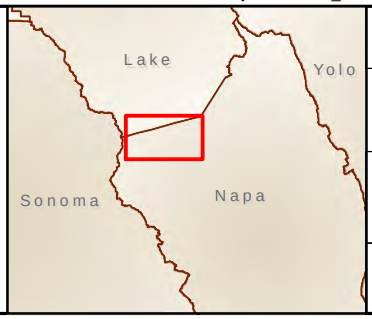


Path: S:\GIS\Projects\Corona_Mine_II\Figure 1 Proposed Drainage Upper Corona.mxd

Legend

- Proposed Spreading Area
- Proposed Drainage Pipe
- Proposed Lined Drainage
- Proposed Culvert
- Existing Drainage
- Injection Well
- Adit
- Boiler House Adit
- Drain Tunnel
- Private Road
- Proposed Access Road
- Collapse Feature
- Pit
- Ore Body/Stope
- Stope
- 50ft Contour
- Parcel Lines

0 65 130 260
Feet



Corona Mine

Figure 3: Proposed Drainage

Source:
Napa County GIS Department 2011;
Burleson Consulting 2017.

Burleson Consulting, Inc.

Figure 4. Drainage east of Upper Corona Pit, runoff infiltrates before reaching bottom of slope.