



MONITORING WELL WORK PLAN
SUPPLEMENTAL ENVIRONMENTAL PROJECT

PASO ROBLES AREA GROUNDWATER SUBBASIN
SAN LUIS OBISPO COUNTY
CALIFORNIA

Prepared for
CITY OF PASO ROBLES

NOVEMBER 2020

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1.0 BACKGROUND

The Groundwater Sustainability Agencies (GSAs) for the Paso Robles Area Subbasin of the Salinas Valley Groundwater Basin include the County of San Luis Obispo, the Shandon-San Juan Water District, the City of Paso Robles, and the San Miguel Community Services District. These GSAs adopted a Groundwater Sustainability Plan (GSP) for the Subbasin¹, which has been submitted to the California Department of Water Resources (DWR) in compliance with the Sustainable Groundwater Management Act (SGMA).

The GSP identified a need to expand the network of stream gages and monitoring wells within alluvial deposits associated with the major drainages in the Subbasin. Per the recommendations set forth in the GSP, *“Definitive data delineating any interactions between surface water and groundwater or a lack of interconnected surface waters is a data gap that will be addressed during implementation of this GSP”*.

The Supplemental Environmental Project (SEP) will begin expanding the network of both stream gages and adjacent monitoring wells in order to better assess the potential for interconnected surface water and groundwater across the Subbasin. Long-term plans in the original proposal included a minimum of three monitoring wells (paired or nested) at each existing and future stream gage site in the Subbasin². One well would be completed within the alluvial aquifer, one completed a short distance below the base of the alluvial aquifer into the Paso Robles Formation, and at least one to be completed deeper into the Paso Robles Formation at elevations similar to production wells in the general vicinity of each individual site.

Under the current SEP phase, monitoring wells are planned for two sites with existing U.S. Geological Survey stream gages. Additional stream gages are also planned as part of the current SEP phase and are described in the Stream Gage Siting Memorandum. This work plan describes the recommended locations and preliminary design of monitoring wells at the following existing stream gage sites: Salinas River at 13th Street Bridge in the City of Paso Robles, and Estrella River at Airport Road in the unincorporated County area.

¹ Montgomery & Associates, 2020. Paso Robles Subbasin Groundwater Sustainability Plan dated January 31, 2020.

² SEP Grant Proposal in City of Paso Robles Request for Proposal dated April 7, 2020.



2.0 SITE SELECTION PROCESS

Ten locations were identified by the Subbasin GSAs that would help provide hydrologic and hydrogeologic data with appropriate monitoring equipment installations³. These locations represent sites where a stream gage, coupled with a set of nested or paired monitoring wells, would help to fill in data gaps related to surface water and groundwater interaction throughout the Subbasin. The original locations are shown in Appendix A.

Two of these ten sites (Site 1 and Site 9) currently have U.S. Geological Survey stream gages installed and have been selected by the GSAs to have monitoring wells installed as part of this SEP project. Given the compressed schedule for project completion by the end of the year, and limited funding for this SEP phase, construction of two monitoring wells at each site (four total) is anticipated. An option for a third well at the Airport Road site is included if the budget permits, along with an alternate well site at the 13th Street Bridge, pending results of test hole drilling (details in Section 4).

3.0 DRILLING METHODS AND DESIGN CONSIDERATIONS

For siting and design purposes, SEP monitoring wells are classified as Shallow, Intermediate, or Deep. Shallow wells would be used to monitor water levels and water quality in the alluvial deposits, Intermediate wells are those completed in the Paso Robles Formation aquifers immediately below the alluvial deposits, and Deep wells are those completed at greater depth in the Paso Robles Formation aquifers used locally for water supply.

Individual monitoring wells (rather than nested wells) are proposed for the SEP to allow the use of appropriate drilling methodology and to accommodate recommended casing diameters. The Shallow (alluvial) wells would be constructed using the hollow stem auger (HSA) drilling method. HSA is more cost effective for shallow monitoring well construction, does not require water or drilling mud, and provides useful depth to water information during drilling. Continuous core samples are collected from the borehole for lithologic logging. Upon reaching the intended depth, the hollow stem stabilizes the sides of the borehole and allows installation of the recommended Shallow monitoring well casing design (4-inch diameter Sch 40 PVC).

The Intermediate and Deep wells are planned to be drilled using the mud-rotary method and cased with 4-inch diameter Sch 40 PVC. Formation lithology is logged from drill cuttings that are separated from the drilling fluid using a shaker table and desander cones. Wellhead completions will consist of a 12-inch diameter, traffic-rated and water-tight monitoring well box with cement apron. An example of a typical monitoring well at ground surface is shown in Figure 1.

³ Monsoon Consultants, 2019. Figure 1 - Paso Robles Groundwater Basin - Proposed Monitoring Sites, Paso Robles GSP Data Gap Assessment dated September 6, 2019.



Figure 1. Typical 12-inch monitoring well box

The work areas and SEP project description were reviewed by environmental consultant SWCA for potential impacts to biological and cultural resources. Protective measures recommended by SWCA have been incorporated into the project description, which is included in Appendix B.

4.0 MONITORING WELL SITES

Monitoring wells are planned for existing stream gages on the Salinas River (Site 1) and the Estrella River (Site 9). Descriptions of the hydrogeologic setting, site layout and preliminary well designs are presented below.



4.1 Site 1 – City of Paso Robles 13th Street Bridge

The 13th Street bridge in the City of Paso Robles is near the eastern edge of the Subbasin and within the area of geothermal (hot water) resource potential. Geologic cross-sections from DWR⁴, along with Subbasin GSP Figure 4-2 (Base of Subbasin as Defined by the Base of the Paso Robles Formation) indicate the Subbasin is several hundred feet thick beneath the 13th Street Bridge. However, the log of test borings at the bridge site document hard shale immediately beneath the alluvial deposits. A drillers log from a well (26S/12E-33B1) at the old City yard on the east side of the bridge reported mostly shale beginning at 60 feet depth through 400 feet depth, with 1 gallon per minute (gpm) of artesian flow (“sulphurous water”). Several hot water wells are reported within a few thousand feet southwest of the bridge, the closest of which (26S/12E-33F) reported an artesian flow of 347 gpm with a surface temperature of 105 degrees Fahrenheit (well depth was 230 feet)⁵. A geothermal survey also showed higher than normal soil-air temperatures on the west side of the 13th Street Bridge⁶. Historical well records indicate shallow (alluvial) wells along North River Road near the 13th Street Bridge, with Paso Robles Formation logged in wells along Union Road (formerly Paso Robles Boulevard) to the east and Niblick Road to the southeast.

Considering the above indications of shallow bedrock at Site 1 and geothermal activity west and southwest of the bridge, only two monitoring wells are proposed, a Shallow and Intermediate well. Constructing a Deep well is not recommended at this site given the geothermal resource potential. The Shallow well would be located in the River Walk area (City of Paso Robles property), on the east side of the River and south of the bridge, while the proposed Intermediate well is located on City of Paso Robles property northeast of the bridge (Figure 2). An alternate site is also provided for the Intermediate well on Navajo Avenue (Figure 3), in the event bedrock is too shallow at the proposed location and the Paso Robles Formation would not be saturated.

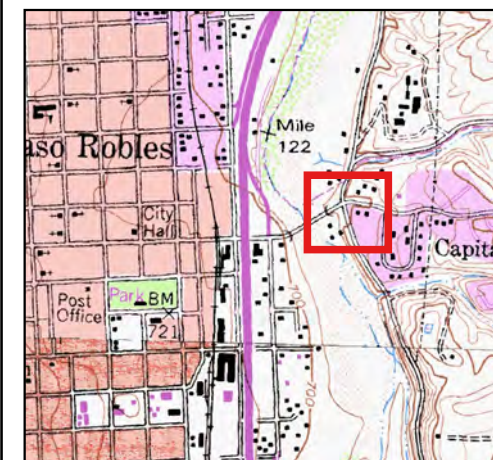
Depth to water in the Shallow well is estimated at approximately 25 feet (stream invert elevation). Depth to water in the Intermediate well is estimated from the Spring 2019 water level contour map in the 2019 Annual Report⁷ at 60 feet depth, and at 130 feet depth for the alternate Intermediate well. Preliminary design for the Shallow and Intermediate wells (with alternate) at Site 1 are shown in Appendix C.

⁴ DWR, 1981, Water Quality on the Paso Robles Are, Southern District Memorandum Report, June 1981.

⁵ California Division of Mines and Geology, 1983, Resource investigation of Low- and Moderate-Temperature Geothermal Areas in Paso Robles, California, Open File Report 83-11.

⁶ GSi/Water, 1983, Geothermal Resource Assessment of the Paso Robles Area, September 1983.

⁷ GSI Water Solutions, 2020, Paso Robles Subbasin First Annual Report (2017-2019), Draft Final dated February 26, 2020.



Explanation

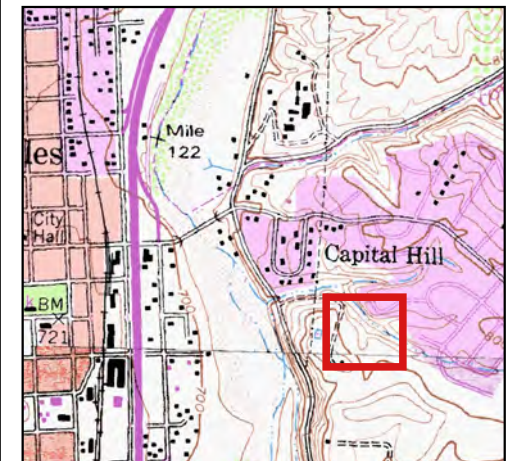
- Well Site
- Work Area
- USGS Stream Gauge



0 25 50 75 100 ft

Figure 2
Site 1 - 13th Street Bridge
Monitoring Well Locations
Supplemental Environmental
Project
City of Paso Robles

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Explanation

- Well Site
- Work Area



0 25 50 75 100 ft

Figure 3
Site 1 - 13th Street Bridge
Alternate Intermediate
Monitoring Well Location
Supplemental Environmental
Project
City of Paso Robles

Cleath-Harris Geologists



4.2 Site 9 – Airport Road at Estrella Road

The Airport Road site is immediately east of a paved crossing of the Estrella River approximately 5 miles north of the intersection of Airport Road and Highway 46, and 3 miles north of the Paso Robles Municipal Airport. Geologic cross-sections from Fugro⁸, along with Subbasin GSP Figure 4-2 (Base of Subbasin as Defined by the Base of the Paso Robles Formation) and an oil well log in the vicinity (3,000 feet south of crossing) indicate the Subbasin is 1,800-2,700 feet thick beneath the site vicinity. Wells in the site vicinity are up to 890 feet deep wells and tap aquifers in both the Intermediate and Deep zones targeted for monitoring.

Three monitoring wells are proposed, a Shallow, Intermediate, and an optional Deep well. All the wells would be on private property on the north side of the Estrella River (Figure 4). Funding limitations may necessitate drilling the Deep monitoring well in a future project phase.

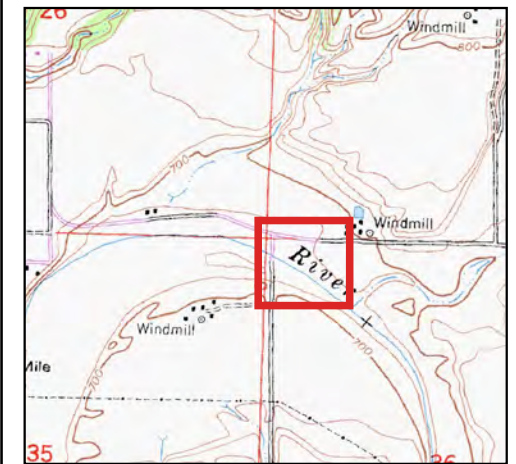
The alluvium tapped by the Shallow well is anticipated to be dry under most conditions, becoming saturated during periods of flow in the Estrella River. Depth to water in the Paso Robles Formation is estimated from the Spring 2019 water level contour map in the 2019 Annual Report at approximately 140 feet depth, although there is likely to be a vertical hydraulic gradient with a lower water level in the Deep well (estimated at 200 feet depth), compared to the Intermediate well.

Review of logs for wells in the site vicinity indicate potentially confining clay layers between approximately 220 feet and 360 feet depth. Therefore, the zones monitored by the Intermediate well should not extend past 220 feet depth, and the Deep well should monitor zones below 360 feet depth. Preliminary design for the Shallow, Intermediate, and Deep wells at Site 9 are shown in Appendix D.

5.0 SUMMARY

Two existing stream gage sites were selected for monitoring well installation under this SEP to help fill data gaps in the Subbasin with respect to surface water and groundwater interaction. Hydrogeologic reviews indicate that Site 1 (13th Street Bridge) is suitable for Shallow and Intermediate well installation. Deep monitoring well construction at Site 1 is not recommended due to the potential for geothermal resources at depth. Site 9 is suitable for Shallow, Intermediate, and Deep monitoring well installation, although the Shallow well is likely to be dry during most parts of the year. Information showing a lack of connectivity between surface water and groundwater, if apparent, is also needed to fill data gaps. Proceeding with the SEP monitoring well sites, with the Shallow and Intermediate wells as a priority under the current phase, is recommended.

⁸Fugro West and Cleath & Associates, 2002, Paso Robles Groundwater Basin Study, August 2002.



Explanation

- Well Site
- Work Area
- USGS Stream Gauge

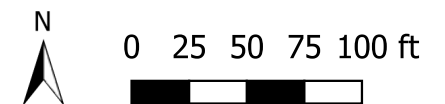


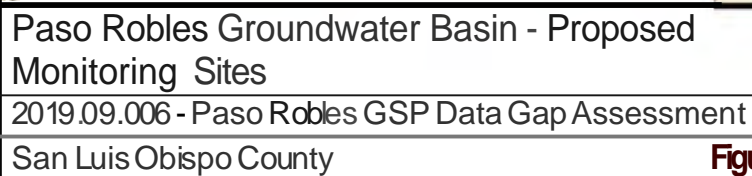
Figure 4
Site 9 - Airport Road
Monitoring Well Locations
Supplemental Environmental
Project
City of Paso Robles

Cleath-Harris Geologists



APPENDIX A

Paso Robles Groundwater Basin Proposed Monitoring Sites





APPENDIX B

SEP Project Description

MWs and Stream Gages SEP
PROJECT DESCRIPTIONS FOR CEQA ANALYSIS & DOCUMENTATION

MONITORING WELL INSTALLATION

Alluvial Monitoring Wells (HSA borings)

Alluvial borings will be drilled using the hollow stem auger (HSA) drilling method. The HSA method is a clean drilling method, as it does not require water or drilling mud. Continuous core samples are collected during drilling to allow for recording of material penetrated. Upon reaching the intended depth, the hollow stem stabilizes the sides of the borehole and allows installation of the monitoring well casing (4-inch diameter Schedule 40 PVC). The soil boring/casing annulus is filled with sand opposite the well perforations and sealed with bentonite clay opposite the blank casing while the augers are simultaneously removed. With a 10-inch diameter boring and a completion depth of up to 70 feet, approximately 1.5 cubic yards of formation materials or less are expected to be generated for each proposed boring. Drill cuttings from the HSA operations will be spread on site.

A log of the core samples will be prepared and analyzed before decisions on elevation zones of perforated pipe are finalized. The well will be developed by bailing. Discharge water will be allowed to percolate on site (natural groundwater with some sediment).

The site will be clearly marked and the test hole covered to prevent access when contractor is not present. Traffic control will be provided if required by the encroachment permit.

Depending upon site specific requirements a typical wellhead, Figure 2 (see Appendix 2) shall consist of a 12" diameter traffic-rated water-tight well box in the center of a minimum 36" by 4" thick cement concrete pad. The pad surface shall have a gentle slope to drain water. The lid of the well box should be labeled "Monitoring Well".

Paso Robles Formation Monitoring Wells (Mud-Rotary Drilling)

The Paso Robles Formation monitoring wells will be drilled and constructed using conventional mud-rotary drilling equipment. The equipment includes the drilling rig, mud tank, water truck, service rig, pipe trailer, dump truck, and backhoe. The equipment requires a drilling area of approximately 80' by 40'.

These deeper monitoring wells would be also be constructed with 4-inch diameter Schedule 40 PVC well casing in a 10-inch borehole with a 50-foot minimum depth annular cement grout sanitary seal. Minimal site grading is anticipated for construction activities that may include making a pad for the drilling equipment and forming berms to control fluids on-site. Drilling fluid will include the use of drilling clay and additives to maintain down-hole fluid properties. Drilling cuttings and drilling fluids will be removed from the site for disposal.

The estimated depth of a Paso Robles Formation intermediate zone monitoring well would depend on the geologic conditions but at 13th Street we estimate that it would be 140 feet deep (210 feet deep at the alternative site) and at the Estrella River crossing at Airport Road it would be 220 feet deep. No deep well is planned for the 13 Street site. A deep well at Airport Road would be 500 feet deep. The drilling cuttings volume would be roughly 20 cubic yards for two intermediate and one deep well.

MWs and Stream Gages SEP
PROJECT DESCRIPTIONS FOR CEQA ANALYSIS & DOCUMENTATION

A log of the drill cuttings samples will be prepared and analyzed before decisions on elevation zones of perforated pipe are finalized. The wells will be developed by air lifting. Discharge water will be contained and safely disposed of on site after settling or taken to a City discharge site.

The site will be clearly marked and the test hole covered to prevent access when contractor is not present. Traffic control will be provided if required by the encroachment permit.

Depending upon site specific requirements a typical wellhead, Figure 2 (see Appendix 2) shall consist of a 12" diameter traffic-rated water-tight well box in the center of a minimum 36" by 4" thick cement concrete pad. The pad surface shall have a gentle slope to drain water. The lid of the well box should be labeled "Monitoring Well".

Site Access, Equipment, and Management

Proposed access routes to each construction site are shown on Figures A1 and A2. While access is primarily along existing paved and dirt roads, traction mats would be used if need by the hollow-stem auger (HSA) drill rig to traverse any soft or sandy alluvial material near channels.

Well Drilling Permits and Utility Clearance

Prior to mobilizing in the field, a drilling permit will be obtained from San Luis Obispo County Environmental Health Services. Additionally, underground utility clearance will be obtained from Underground Service Alert.

Schedule

The proposed field activities are currently scheduled to take place in Fall/Winter 2020. Total cumulative duration of work is not expected to exceed 14 days at each site.

Prevention and Mitigation of Potential Impacts

The City has reviewed field conditions and the proposed work with our environmental consultant. The following measures and activities will be incorporated into the proposed work to prevent and mitigate potential impacts:

- Limited site grading will be conducted as part of this activity.
- Approximately eight cubic yards of material (total) will be generated from the intermediate Paso Robles Formation monitoring well boreholes and will be collected and disposed offsite at a City facility. If the optional deep Airport Road well or the alternate 13th Street Bridge well is drilled, add up to 12 more cubic yards.
- No fueling will occur within 100 feet of any channel.
- Inadvertent impacts to the site from personnel and equipment will be prevented through flagging and/ or fencing.
- Equipment will be inspected for presence of non-native invasive species.
- Potential fuel or oil contamination will be prevented, as needed, from leaking onto ground using drip pans, tarps, plastic sheeting, etc.
- Emergency spill containment materials and kit will be available on site.
- Prior to beginning activities adjacent to a stream bank all contractors and other persons visiting the site shall receive training from a qualified biologist.

MWs and Stream Gages SEP
PROJECT DESCRIPTIONS FOR CEQA ANALYSIS & DOCUMENTATION

- Drilling will not occur during or within 24 hours following a significant rainfall event, defined as ¼-inch or more of rain in a 24 period unless a qualified biologist completes a daily survey of the project area during the significant rainfall event and the 24 hours following the event.
- The activities would be overseen and documented by a monitor.
- A nesting bird survey will be conducted by a qualified biologist no more than two weeks prior to the start of any construction activities between February 15 and September 15 to determine the presence/absence of nesting birds. If active nest sites are found, work will be scheduled in a way that avoids those sites until a qualified biologist determines that all young have fledged and are no longer reliant upon the nest or parental care for survival.
- In the unlikely event that archaeological resources are exposed during project implementation, work will stop in the immediate vicinity, and a qualified archaeologist will be retained to evaluate the find and recommend relevant mitigation measures. In the event that human remains are discovered, State of California Health and Safety Code Section 7050.5 shall be followed.



Truck-mounted HSA drilling rig



Rotary Water Well Drilling Equipment: Filippini & Thompson Drilling

MWs and Stream Gages SEP
PROJECT DESCRIPTIONS FOR CEQA ANALYSIS & DOCUMENTATION

A site visit has been conducted by the City and its consultants to confirm site conditions and access routes. It was determined that mobilization drilling rigs to all sites will not cause disturbance to banks, trees or vegetation. The sites will be returned to their existing grade. No drilling mud will be discharged as part of these activities. Upon completion of work at each site, any wastes generated from drilling operations (e.g., trash, excess materials) will be removed and properly disposed.

STREAM GAGE INSTALLATION

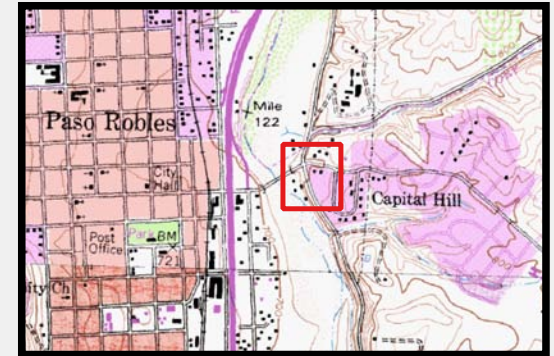
Once the sites have been selected, stream gages will be installed. Radar type systems are planned.

A radar type stream gage is typically mounted on a bridge and includes a datalogger, a VHS transmitter, a Pulse Radar water level sensor, a solar panel and voltage regulator, an antenna, a battery, a system enclosure and an antenna pole.



Radar Sensor Stream Gage: County of San Luis Obispo

Installation of the stream gage equipment is planned to be led by County Public Works personnel who have installed other stream gages in the County and will likely be maintaining the gages.



Explanation

- Work Site
- Well Access Route
- Proposed Monitoring Well

0 60 120 180 ft



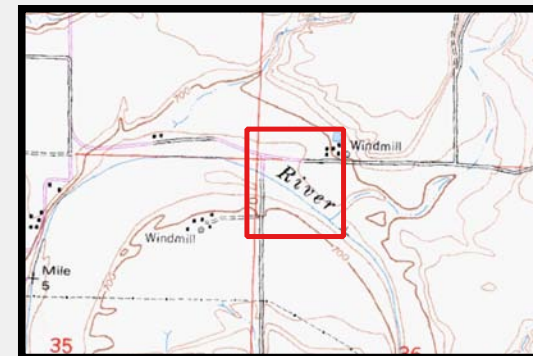
Figure B1
Well Site Access Routes
Site 1 - 13th Street Bridge

Monitoring Well Work Plan
Appendix B




Paso Robles Groundwater Basin
Supplemental Environmental Project

City of Paso Robles

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Explanation

-  Work Site
-  Well Access Route
-  Proposed Monitoring Well

0 100 200 300 ft



Figure B2
Well Site Access Routes
Site 9 - Airport Road

Monitoring Well Work Plan
Appendix B

Paso Robles Groundwater Basin
Supplemental Environmental Project

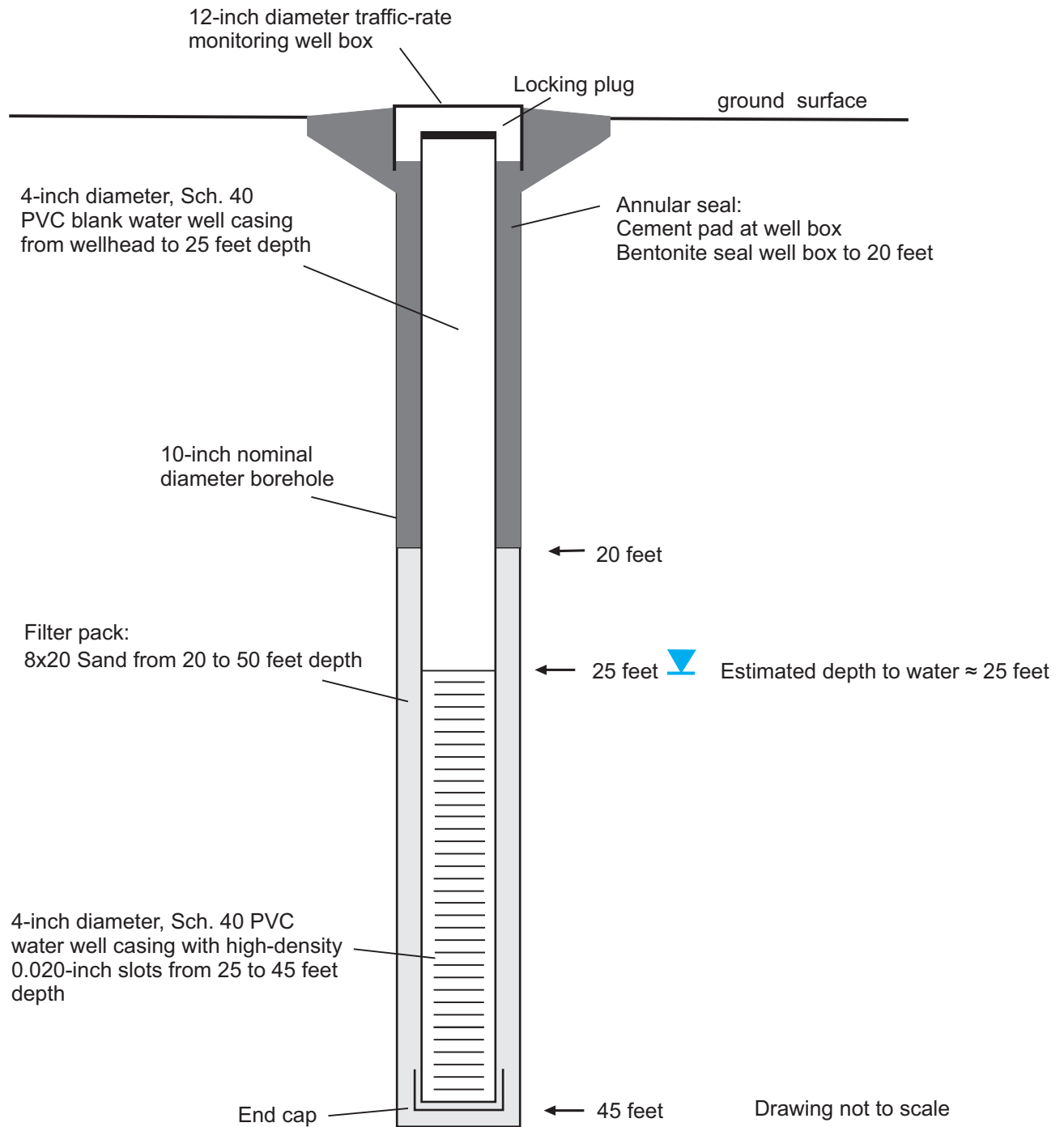
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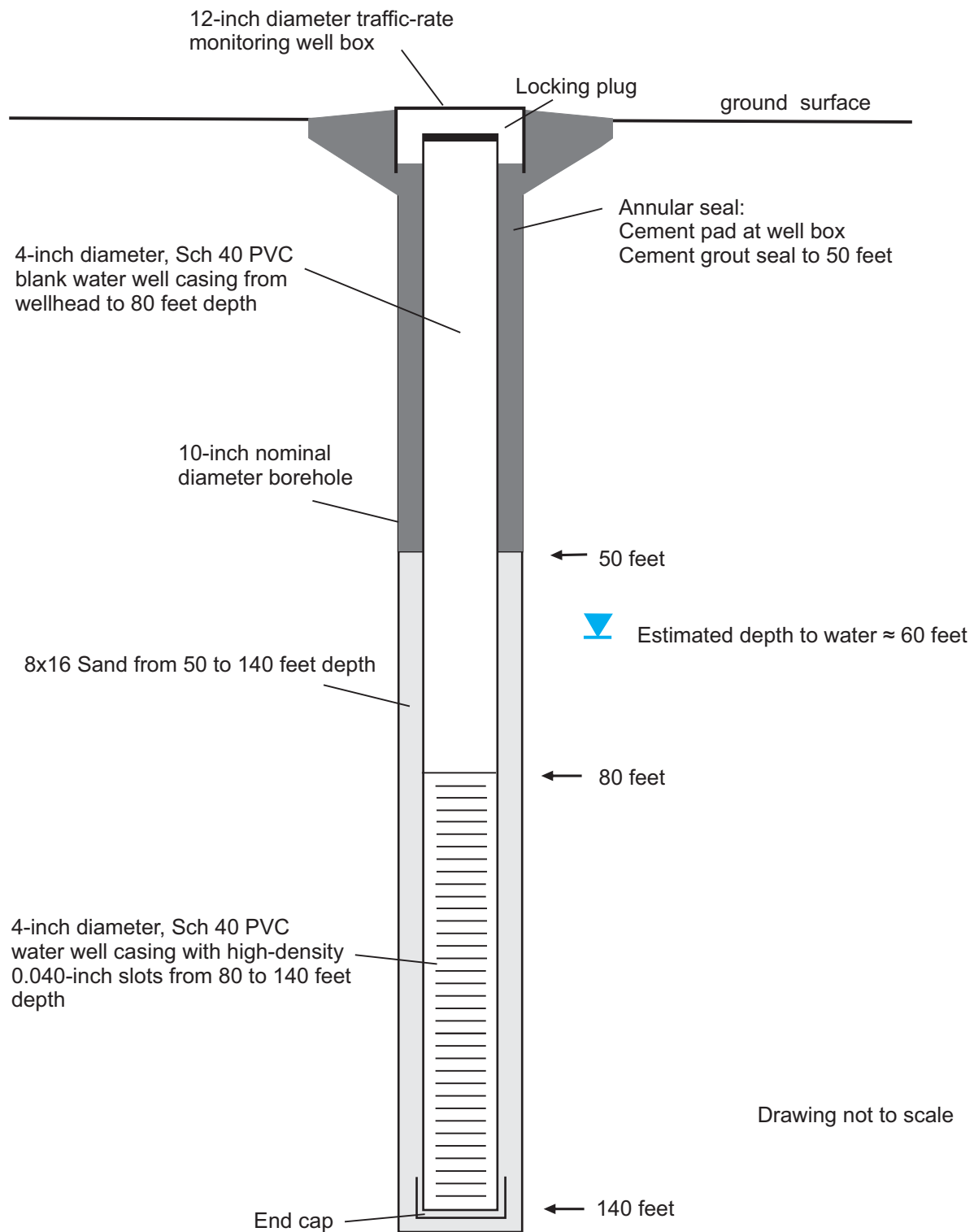
APPENDIX C

Preliminary Design for 13th Street Bridge Monitoring Wells



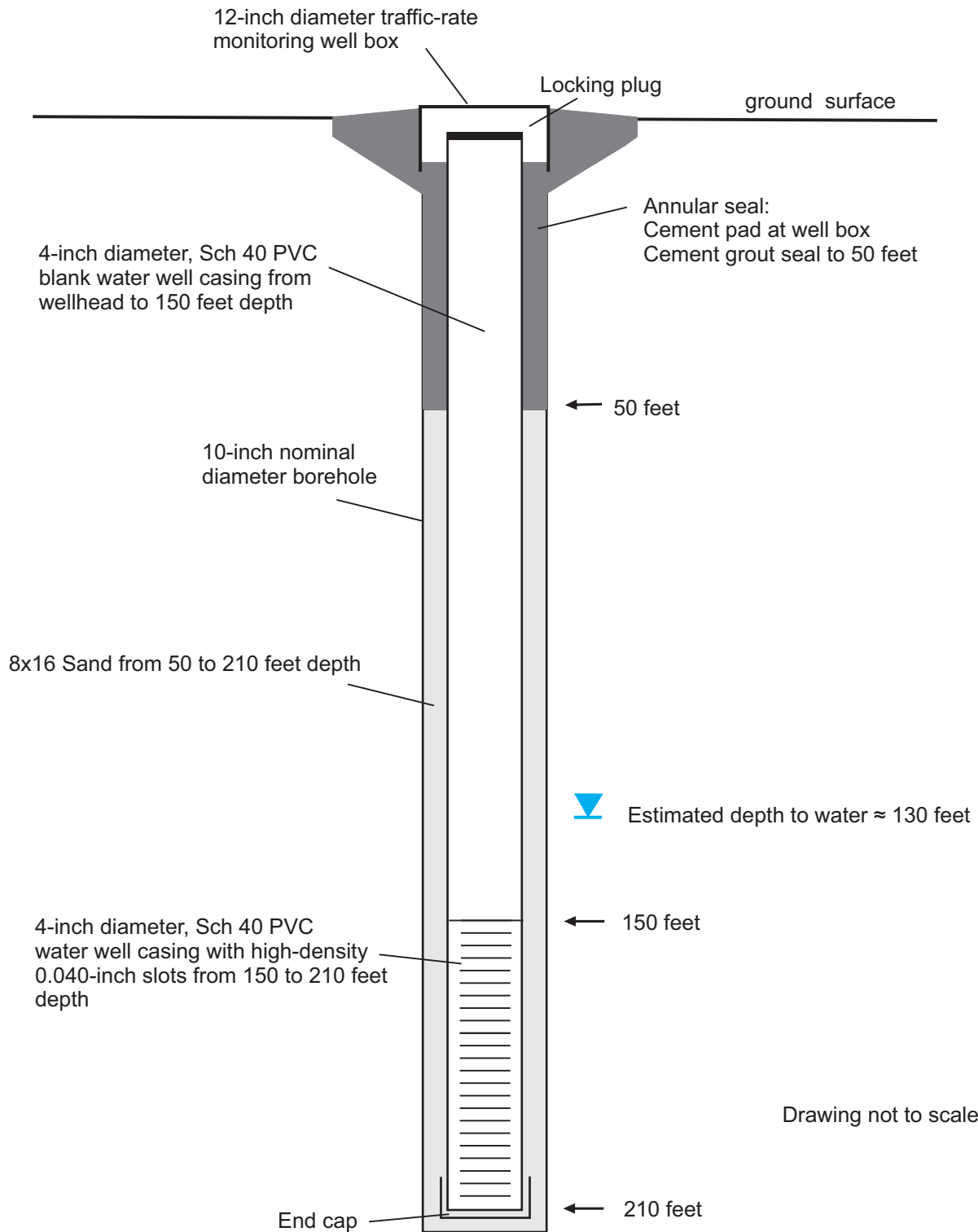
Shallow Well Preliminary Design
Site 1 - 13th Street Bridge
Supplemental Environmental Project
City of Paso Robles

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Intermediate Well Preliminary Design
Site 1 - 13th Street Bridge
Supplemental Environmental Project
City of Paso Robles

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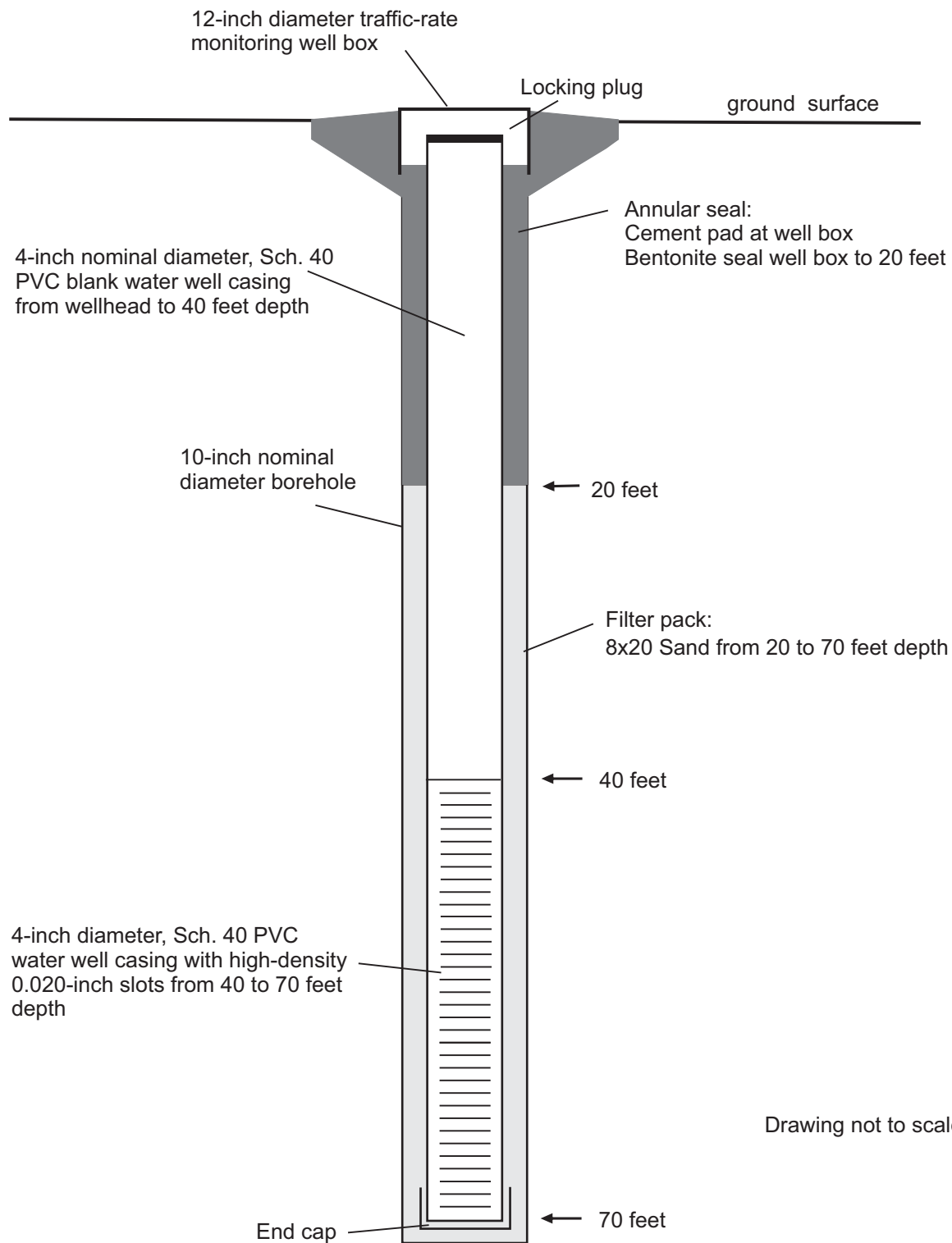


Alternate Site Intermediate Well
Preliminary Design
Site 1 - 13th Street Bridge
Supplemental Environmental Project
City of Paso Robles
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APPENDIX D

Preliminary Design for Airport Road Monitoring Wells



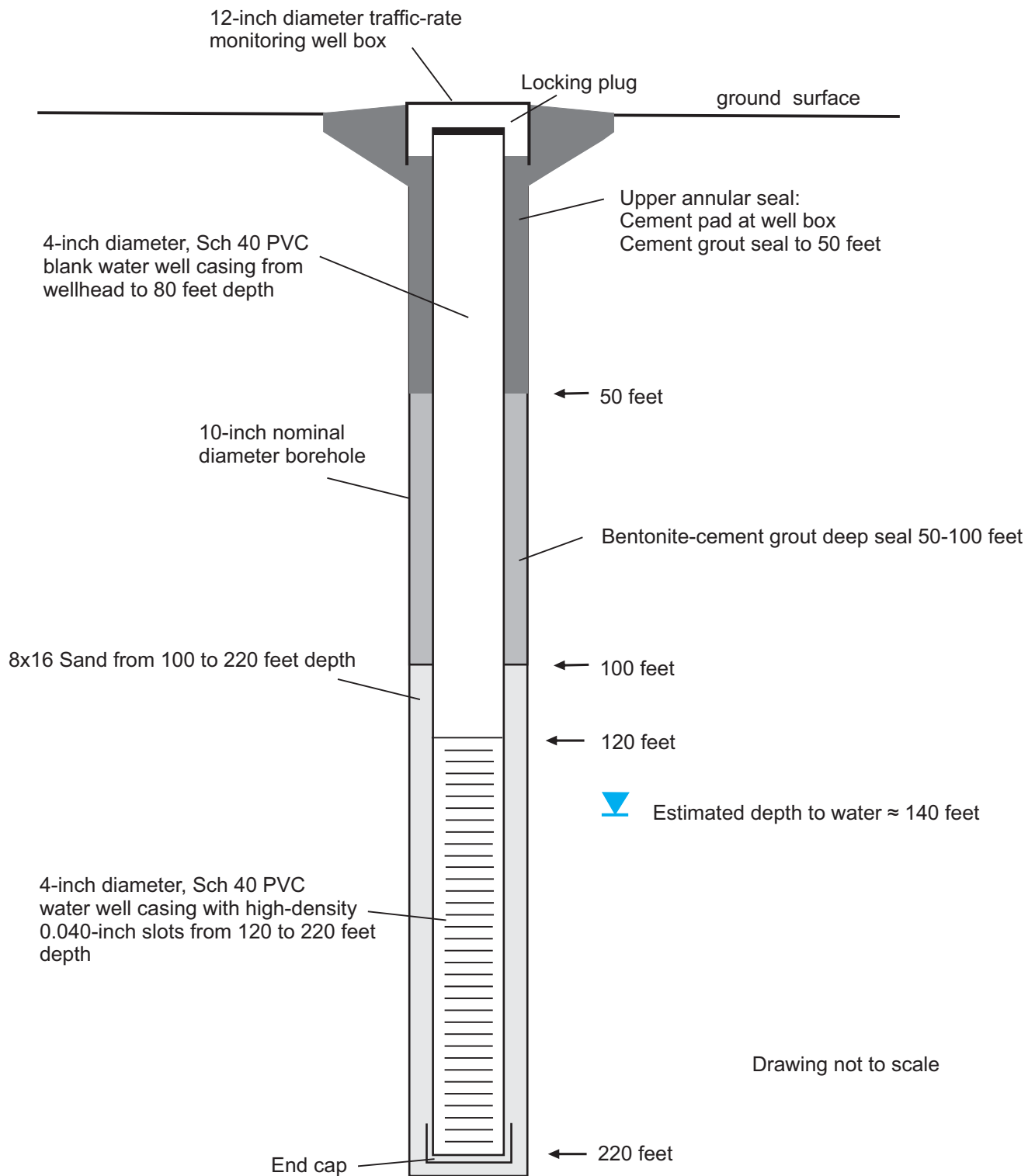
Drawing not to scale



Estimated depth to water >70 feet during most of year, but <70 feet with active streamflow

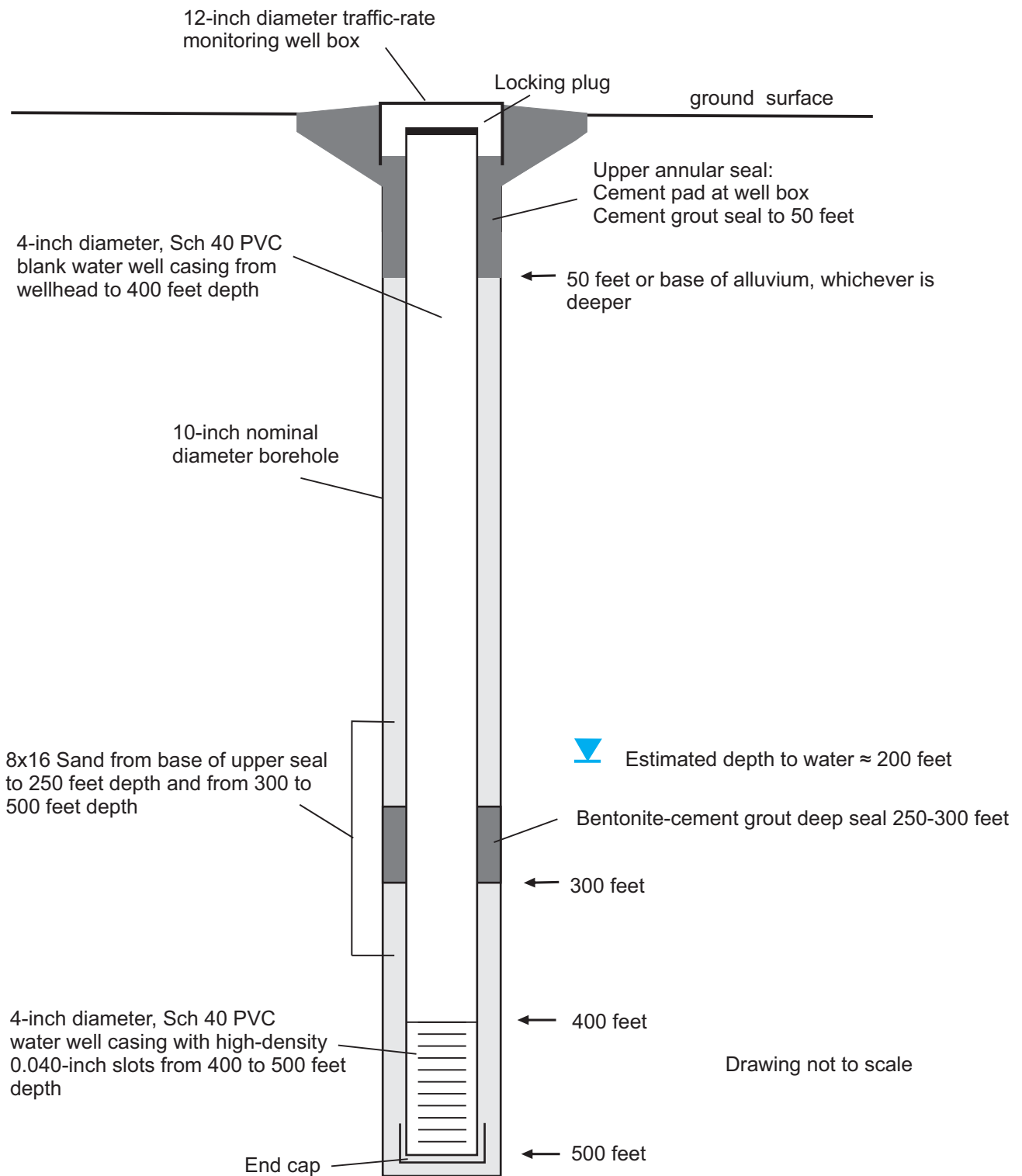
Shallow Well Preliminary Design
Site 9 - Airport Road
Supplemental Environmental Project
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Intermediate Well Preliminary Design
 Site 9 - Airport Road
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Deep Well Preliminary Design
Site 9 - Airport Road
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