GEOTECHNICAL ENGINEERING REPORT
SIERRA VALLEY PRESERVE VISITOR CENTER

181 AUSTIN ROAD
APN 025-220-025
BECKWOURTH, PLUMAS COUNTY, CALIFORNIA

FEBRUARY 13, 2020

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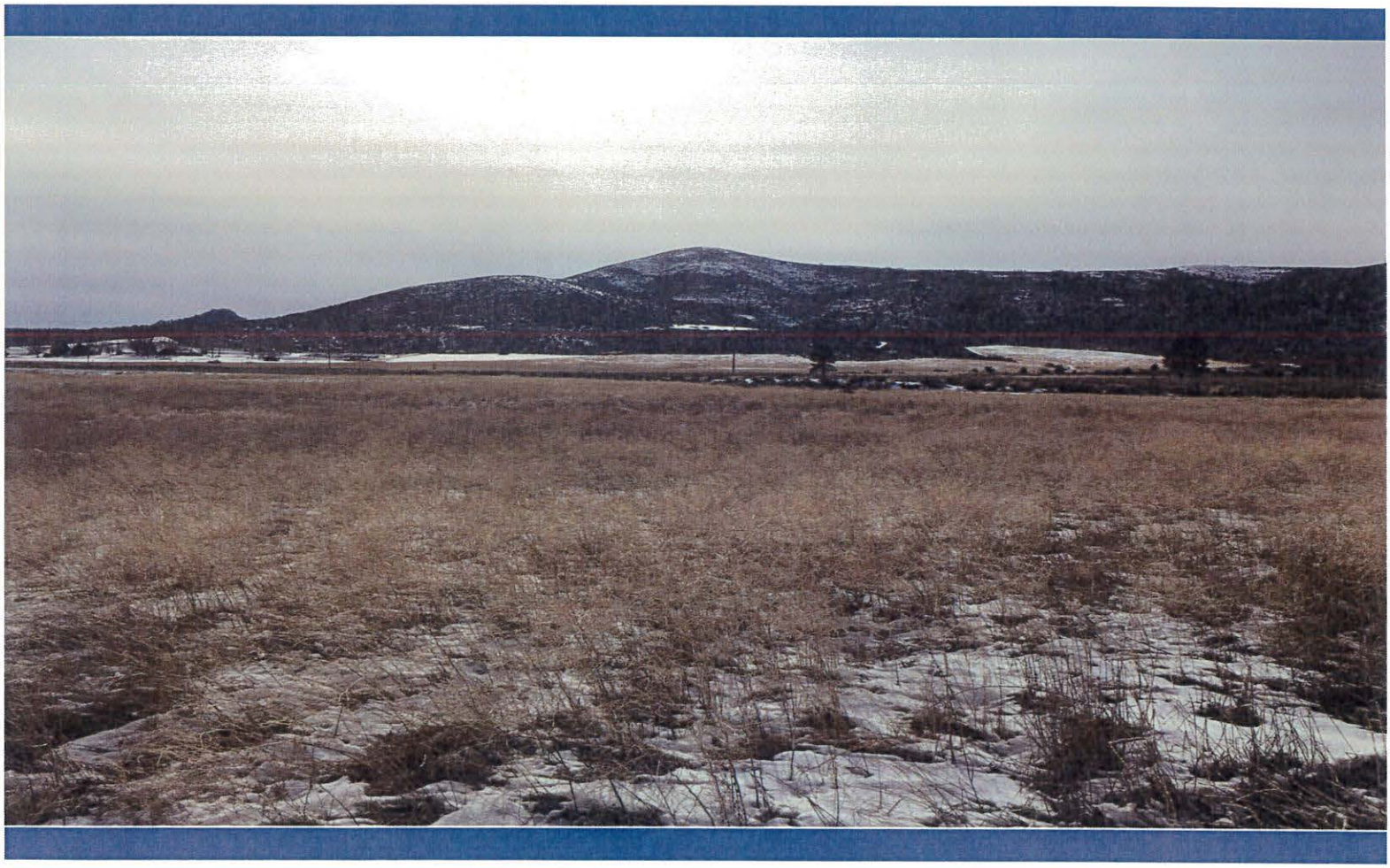

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PROJECT NO. 42686.00

EXHIBIT 8

Project No. 42686.00
February 13, 2020

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Reference: **Sierra Valley Preserve Visitor Center**
181 Austin Road
APN 025-220-025
Beckwourth, Plumas County, California

Subject: **Geotechnical Engineering Report**

This report presents the results of our geotechnical engineering investigation for the proposed Sierra Valley Preserve Visitor Center to be constructed at 181 Austin Road in Beckwourth, Plumas County, California. The project will involve construction of a new visitor center near the northwest corner of the preserve. The visitor center will consist of a single-story wood frame structure with conventional shallow spread footings. Other project elements will include removal of an existing metal structure and replacement with two small wood-frame structures on an existing foundation with a slab-on-grade floor. Appurtenant construction will include a new entry roadway with a roundabout, bus parking, drop off zone, and parking lot, underground utilities, a new on-site wastewater disposal system, a wildlife viewing platform, picnic area, and outdoor education circles. We understand that the new access road, roundabout, and parking lot will be unpaved and that the base material from the existing Austin Road will be reused. Asphalt concrete pavement may be used for an apron off of Highway A-23 and for a planned cart path.

At the request of Plumas County Environmental Health Department (PCEHD), we installed three piezometers (P-1 through P-3) that will need monthly monitoring. We understand that monthly groundwater elevations will be collected by representatives of the current landowner (Feather River Land Trust). In accordance with PCEHD standards, we plan to complete percolation tests at the site in the Spring of 2020. The results of percolation rate testing will be submitted under separate cover.

Groundwater was encountered in Test Pit TP-4 at a depth of approximately 10 feet bgs. Near-surface soil layers will likely become seasonally saturated. Due to the gentle topography, positive surface water drainage will be particularly important across the site. Depending on final site grades, rainfall, and/or irrigation practices, perched groundwater could collect in crawlspaces, cause moisture migration through concrete slabs-on-grade, cause degradation of asphalt concrete pavements, and contribute to frost heave and other adverse conditions.

We have provided recommendations to reduce the potential for these adverse effects in the *Recommendations* section of this report.

The existing foundation that currently contains a metal structure appears to contain steel reinforcement near the bottom of the footing. The floor slab and is approximately 6 inches thick. The surface of the slab and foundation did not appear to have signs of distress or cracks associated with differential movement. Therefore, it is our opinion that the existing foundation is suitable for support of lightly loaded structures. Final site grading should be planned so that surface water is directed away from all foundations. Ponding of surface water should not be allowed near structures. We have provided foundation design criteria for the existing foundation and recommendations for surface water drainage in the *Recommendations* section of this report.

With the exception of the aforementioned issues, our professional opinion is that the site is suitable for the proposed development using conventional earthwork grading and foundation construction techniques. No highly compressible or potentially expansive soil conditions were encountered during our subsurface exploration. Specific recommendations regarding the geotechnical aspects of project design and construction are presented in the following report.

The findings presented in this report are based on our subsurface exploration, laboratory test results, and experience in the project area. We recommend retaining our firm to provide construction monitoring services during earthwork and foundation excavation to observe subsurface conditions encountered with respect to our recommendations provided in this report. As plans develop, we should be consulted concerning the need for additional services.

Please contact us if you have any questions regarding this report or if we can be of additional service.

Sincerely,
NV5

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1 INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed Sierra Valley Visitor Center to be constructed at 181 Austin Road in Beckwourth, Plumas County, California. We performed our investigation in general accordance with our revised January 6, 2020 proposal for the project. A copy of the proposal is included as Appendix A of this report. For your review, Appendix B contains a document prepared by the Geoprofessional Business Association entitled *Important Information about This Geotechnical-Engineering Report* (GBA 2019). This document summarizes the general limitations, responsibilities, and use of geotechnical engineering reports.

1.1 PURPOSE

The purpose of our work was to explore and evaluate the subsurface conditions at the project site and to provide our geotechnical engineering conclusions and recommendations for project design and construction.

At the request of Plumas County Environmental Health Department (PCEHD), we installed three piezometers (P-1 through P-3) that will need monthly monitoring. We understand that monthly groundwater elevations will be collected by representatives of the current landowner (Feather River Land Trust). In accordance with PCEHD standards, we plan to complete percolation tests at the site in the Spring of 2020. The results of percolation rate testing will be submitted under separate cover.

Our findings are based on our subsurface exploration, laboratory test results, and our experience in the project area. We recommend retaining our firm to provide construction monitoring services during earthwork and foundation excavation to observe subsurface conditions encountered with respect to our recommendations.

1.2 SCOPE OF SERVICES

To prepare this report we performed the following scope of services:

- We performed a site reconnaissance, literature review, and subsurface exploration involving test pits excavated with a mini-excavator.
- We logged the subsurface conditions encountered and collected bulk soil samples for classification and laboratory testing.
- At the request of Plumas County Environmental Health Department (PCEHD), we installed three piezometers at the site.
- We performed laboratory tests on selected soil samples obtained during our subsurface investigation to evaluate material properties.
- Based on our subsurface exploration and the results of our laboratory testing, we performed engineering analyses to develop geotechnical engineering recommendations for project design and construction.

1.3 SITE DESCRIPTION

The Sierra Valley Preserve is located near the northwest corner of Sierra Valley. The Preserve consists of 2,525 acres of open space land with critical wetland habitats. The project site is located near the northwest corner of the preserve and comprises approximately 32-acres of partially developed land. The approximate location of the site is shown on Figure 1, Site Vicinity Map. The proposed project will involve construction of a new visitor center at the site. A plan view of the project site is shown on Figure 2, Test Pit and Piezometer Location Plan.

The project site is surrounded by the Sierra Valley Preserve. Tracks associated with the Western Pacific Railroad border the subject parcel to the north. A-23, a paved road, borders the southwest edge of the parcel. The Middle Fork Feather River crosses the center of the preserve and is located approximately 1,500 feet east of the site. An access road (Austin Road) extends off of A-23 and provides access to the site. Existing structures are located near the center of the site and include a metal-sided structure with a slab-on-grade floor and a wooden barn perimeter. We understand that an existing on-site wastewater treatment system is located immediately adjacent to and northwest of the metal building. An existing residence is located immediately adjacent to and southeast of the site. We understand the residence also contains an on-site wastewater treatment system and is part of the preserve.

The site is located at 39.8105°N latitude and 120.3852°W longitude (WGS84 datum). A small knoll is located in the area of existing and proposed improvements. The top of the knoll sits at an elevation of approximately 4,882 feet above mean sea level (MSL). The bottom of the knoll lies at an elevation of approximately 4,871 feet MSL. In the area of the existing barn, the site slopes gently down in a general west to east direction. In the area of the existing metal structure, the site slopes gently down in a south to north and west to east direction. Surface water drainage consists of overland flow in a general north and east direction.

1.4 PROPOSED IMPROVEMENTS

Information about the proposed project was obtained from our site visit, conversations with David Arkin and Jason Pignolet of Arkin Tilt Architects (ATA), and review of conceptual site plans prepared by ATA. As currently proposed, the project consists of constructing a new visitor center near the center of the site in the area of the existing barn. In addition, the existing metal building with a slab-on-grade floor will be removed and two new small wooden structures will be built on the slab floor. Appurtenant construction will include a new entry roadway with a roundabout, bus parking, drop off zone, and parking lot, underground utilities, a new on-site wastewater disposal system, a wildlife viewing platform, picnic area, and outdoor education circles. We understand that Austin Road will be abandoned and the new access road, roundabout, and parking lot will be unpaved. Base material form the existing Austin Road will be reused. Asphalt concrete pavement may be used for an apron off of A-23 and for a planned cart path.

The new buildings will be single-story wood-frame structures. The new visitor center will be supported on conventional shallow spread footings. Based on the results of our subsurface investigation, the existing metal building foundation consists of contains shallow spread

footings with a slab-on-grade floor that should be suitable for support of lightly loaded structures. Structural loads were not available; assumed maximum wall and column loads will be about 2 kips per linear foot and 60 kips, respectively. We anticipate average cut and fill depths will be about 2 feet and are not expected to exceed about 3 feet. No detailed grading plans were available for our review.

2 LITERATURE REVIEW

We reviewed available geologic and soil literature in our files to evaluate geologic and anticipated subsurface conditions at the project site.

2.1 SITE GEOLOGY

We reviewed the *Geologic Map of the Portola 15' Quadrangle, Plumas County, California*, by T.L.T. Grose, California Division of Mines and Geology, 2000. The geologic map indicates that the site is underlain by Quaternary aged lake deposits that are comprised of silt, sand, and clay of pluvial Sierra Valley Lake. Based on our subsurface investigation, described below, near-surface soil conditions are consistent with the mapped geology.

2.2 REGIONAL FAULTING

The project is located in a potentially active seismic area. To evaluate the location of mapped faults relative to the project site, we reviewed the following maps:

- *Fault Activity Map of California <http://maps.conservation.ca.gov/ cgs/fam/>;* by Charles W. Jennings and William A. Bryant, California Geological Survey, Geologic Data Map No. 6, 2010.

The potential risk of fault rupture is based on the concept of recency and recurrence. The more recently a particular fault has ruptured, the more likely it will rupture again. The California State Mining and Geology Board define an "active fault" as one that has had surface displacement within the past 11,000 years (Holocene). Potentially active faults are defined as those that have ruptured between 11,000 and 1.6 million years before the present (Quaternary). Faults are generally considered inactive if there is no evidence of displacement during the Quaternary period.

The referenced geologic maps show several active and potentially active faults located near the project site, including the Mohawk Valley Fault Zone (active, approximately 11 miles southwest), the Last Chance Fault Zone (potentially active, approximately 17 miles east), the Honey Lake Fault Zone (active, approximately 20 miles northeast), the Polaris Fault (active, approximately 22.5 miles south-southeast), the Dog Valley Fault (active, approximately 27 miles southeast), and the Grizzly Valley and Hot Springs Fault Zone (pre-Quaternary, on or near the site), as described below. Earthquakes associated with these faults may cause strong ground shaking at the project site.

2.3 POTENTIAL SEISMIC HAZARDS

Primary hazards associated with earthquake faults include strong ground motion and surface rupture. No faults are mapped as crossing or trending towards the site; therefore, the potential for surface rupture at the site is considered low. It should be noted that a splay of the Hot Springs Valley Fault is shown approximately 500 feet southwest of the site on the Fault Activity Map of California (Jennings and Bryant, 2010). The Grizzle Valley and Hot Springs Fault Zone is shown as a pre-Quaternary fault (inactive) and concealed (dotted) beneath lake deposits in

the project area. Earthquakes centered on regional faults in the area, such as the Mohawk Valley Fault and Honey Lake Fault, would likely result in higher ground motion at the site than earthquakes centered on smaller faults that are mapped closer to the site.

Secondary seismic hazards include liquefaction, lateral spreading, and seismically induced slope instability. These potential hazards are discussed below.

2.3.1 Soil Liquefaction

Liquefaction is a phenomenon where loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup. Cyclic loading, such as that caused by an earthquake, typically causes an increase in pore water pressure and subsequent liquefaction. Based on the results of our subsurface investigation, near-surface soil at the site consists of medium dense to very dense granular soil and hard fine-grained soil types. This soil profile will have a low potential for liquefaction.

2.3.2 Lateral Spreading

Lateral spreading is the lateral movement of soil resulting from liquefaction of subadjacent materials. Since we anticipate that there is a low potential for liquefaction of soil at the site, the potential for lateral spreading to occur is also considered low.

2.3.3 Slope Instability

Slope instability includes landslides, debris flows, and rockfall. No landslides, debris flows or rockfall hazards were observed in the project area. Due to the gentle topography of the site and general surrounding area the potential for slope instability is considered low.

3 SUBSURFACE EXPLORATION

We performed our subsurface exploration to characterize typical subsurface conditions at the site.

3.1 FIELD EXPLORATION

We explored subsurface conditions at the site on January 15, 2020 by excavating six exploratory test pits to depths ranging from 8 to 10.5 feet below the ground surface (bgs). Test pits were excavated with a Volvo RX3W86 track-mounted mini-excavator equipped with a 36-inch bucket. Test pit locations were selected based on locations of proposed improvements and site access.

An engineer from our firm logged the soil conditions exposed in the test pits, visually classified soil, and collected bulk soil samples for laboratory testing. Soil samples were packaged and sealed in the field to reduce moisture loss and were returned to our laboratory for testing. Upon completion, test pits were backfilled with the excavated soil.

In addition to our test pits, and at the request of the Plumas County Environmental Health Department (PCEHD), we installed three piezometers (P-1 through P-3) extending to depths of approximately 8 to 8.5 feet bgs. The piezometers consisted of 4-inch diameter, perforated, PVC pipe with a bottom cap and removable top cap. Each PVC pipe was wrapped with filter fabric and placed inside the ends of Test Pits TP-2, TP-3B, and TP-5. Excavated soil was then backfilled around each pipe and compacted using the mini-excavator bucket. The ground surface around each piezometer was mounded to reduce the potential for surface water infiltration.

The approximate locations of our test pits and piezometers are shown on Figure 2, Test Pit and Piezometer Location Plan. Log so the piezometers are included in Appendix C.

3.2 SUBSURFACE SOIL CONDITIONS

Test Pits TP-1 and TP-6 were located within proposed parking and driveway areas. Test Pits TP-2, TP-3B, and TP-5 were located in proposed leach field areas for septic system design. Test Pit TP-4 was located in the proposed visitor center area and Test Pit TP-3A was excavated at the edge of the existing slab-on-grade foundation to evaluate footing conditions and depth.

Near-surface soil encountered in our test pits consisted of 2 to 6 inches of loose silty sand (SM) containing organic material (topsoil). Underlying the silty sand topsoil, our test pits encountered medium dense to very dense silty Sand (SM), clayey Sand (SC), and poorly graded Sand (SP) to the maximum depth explored of approximately 10.5 feet below the ground surface (bgs). Hard, lean Clay with sand (CL) was encountered in Test Pits TP-4 and TP-5 at depths of 4.5 to 10.5 feet bgs and 1.5 to 4 feet bgs, respectively.

The cast-in-place foundation exposed in Test Pit TP-3A was measured to extend approximately 7 inches out from the exterior wall of the metal building and the footing was approximately 6 inches thick. Steel reinforcing (rebar) was observed near the bottom of the footing exposed in

the test pit. Based on our visual observations of the slab inside the metal structure, no obvious signs of significant distress or cracking were noted.

More detailed descriptions of the subsurface conditions observed are presented in our Test Pit and Piezometer Logs in Appendix C.

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered in Test Pit TP-4 at a depth of approximately 10 feet bgs. Fluctuations in soil moisture content and groundwater levels should be anticipated depending on precipitation, irrigation, runoff conditions, and other factors. Based on our experience in the project area, seasonal saturation of near-surface soil should be anticipated, especially during and immediately after seasonal snowmelt.

Dense granular soil was encountered beneath topsoil throughout most of the site (approximately 6 inches bgs). In addition, hard fine-grained soil was encountered in Test Pits TP-4 and TP-5 at depths ranging from approximately 1.5 to 4.5 feet bgs. Depending on final site grades, rainfall, irrigation practices, and other factors, perched groundwater will likely seasonally develop above onsite dense and fine-grained soil. Due to the relatively level nature of the site, we anticipate that seasonally perched groundwater will be at or near the ground surface and surface water likely locally ponds. Perched groundwater may cause moisture intrusion into foundation crawlspaces or through concrete slab-on-grade floors, degradation of asphalt concrete pavements, and other adverse conditions. Mitigation measures such as gravel underdrains, elevated building pads, trench drains, water barriers, or other methods may be required to intercept shallow groundwater or reduce potential adverse effects on project features.

We recommend the project civil engineer in conjunction with NV5 review the subsurface information available within this report and revealed during site preparation in order to develop appropriate surface and subsurface drainage plans. The contractor should prepare detailed as-built drawings of the subsurface drainage system.

4 LABORATORY TESTING

4.1 LABORATORY TESTING

We performed laboratory tests on bulk soil samples collected from our exploratory test pits to evaluate their engineering properties. We performed the following laboratory tests:

- Atterberg Limits / Plasticity (ASTM D4318)
- Sieve Analysis (ASTM D422)
- Expansion Index (ASTM D4829)
- Resistance Value (ASTM D2844)

Sieve analysis and Atterberg limits data resulted in Unified Soil Classification System (USCS) classifications of clayey Sand (SC) and lean Clay with sand (CL). Expansion index testing of a soil sample collected from Test Pit TP-4 at a depth of 4.5 feet bgs indicated that the soil has a low potential for expansion. Resistance value (R-value) testing was performed on soil samples collected from Test Pits TP-1 and TP-6 at depths ranging from approximately 2 to 8 feet bgs, which resulted in an R-value of 57. More specific soil classification and laboratory test data is included in Appendix D. USCS classifications and Atterberg indices are summarized below.

Table 4.1 – Summary of Laboratory Test Results

Test Pit Number	Depth (feet)	USCS Classification	Percent Passing #200 Sieve	Liquid Limit	Plasticity Index
TP-1	4.5 – 5	Clayey Sand (SC)	15	--	--
TP-2	1 – 1.5	Clayey Sand (SC)	25	--	--
TP-4	4.5 – 5	Lean Clay with Sand (CL)	--	29	13
TP-5	2 – 2.5	Lean Clay with Sand (CL)	81	39	22

5 CONCLUSIONS

The following conclusions are based on our field observations, laboratory test results, and our experience in the area.

1. Soil conditions encountered during our field investigation generally consisted of medium dense to very dense granular soil types and hard fine-grained soil types of low to medium plasticity. The soil should provide suitable foundation support for the proposed structures on conventional shallow spread foundations. No highly plastic, compressible, or potentially expansive soil was encountered.
2. Groundwater was encountered in Test Pit TP-4 at a depth of approximately 10 feet bgs. Near-surface soil layers will likely become seasonally saturated. Due to the gentle topography, positive surface water drainage will be particularly important across the site. Depending on final site grades, rainfall, and/or irrigation practices, perched groundwater will likely seasonally develop above onsite dense and fine-grained soil and could collect in crawlspaces, cause moisture intrusion through concrete slabs-on-grade, degradation of asphalt concrete pavements, and other adverse conditions. We have provided recommendations to reduce the potential for these adverse effects in the *Recommendations* section of this report.
3. The existing foundation that currently contains a metal structure appears to supported on a conventional spread footing with steel reinforcement. The surface of the slab foundation did not appear to have signs of distress or cracks associated differential movement. Therefore, it is our opinion that the existing foundation is suitable for support of lightly loaded structures. However, the slab-on-grade floor is likely not designed to support point loads or heavy wall loads. We have provided foundation design criteria for the existing foundation in the *Recommendations* section of this report.
4. With the exception of the organic surface soil, the granular site soil is generally suitable for reuse as structural fill. Near-surface clay soil will not be suitable for reuse as structural fill due to the high percentage of fines. Based on our previous experience in the area, uniformly moisture conditioning soil to within two percent of the optimum moisture content may be difficult. Additional compaction effort may be necessary to reach the specified compaction. Structural fill meeting the requirements outlined in the *Recommendations* section of this report should be used where structural fill is required. Moisture content, dry density, and relative compaction of structural fill should be evaluated by our firm at regular intervals during structural fill placement.
5. Three piezometers (P-1 through P-3) were installed across the site during our subsurface exploration, in accordance with Plumas County standards. We understand that the current property (Feather River Land Trust) will monitor the groundwater elevations in the piezometers on a monthly basis. In accordance with PCEHD standards, we plan to complete percolation rate tests in Spring 2020.

6. Site soil should provide adequate pavement support. However, seasonal saturation of near-surface soil should be considered in the design of pavement areas. Subdrains under pavement areas and/or v-ditches along the side of roads should be considered to reduce saturation.

6 RECOMMENDATIONS

The following geotechnical engineering recommendations are based on our understanding of the project as currently proposed, our field observations, results of our laboratory tests, engineering analyses, and our experience in the area.

6.1 EARTHWORK

The following sections present our recommendations for site clearing and grubbing, preparation for and placement of fill material, cut/fill slope grading, temporary excavations, utility trench construction, and construction dewatering.

6.1.1 Clearing and Grubbing

Areas proposed for fill placement, road and driveway construction, and building areas should be cleared and grubbed of vegetation and other deleterious materials. Existing vegetation, organic topsoil, and any debris should be stripped and hauled offsite or stockpiled outside the construction limits. Based on our subsurface exploration, we expect that 4 inches may be used as a reasonable estimate for average depth of stripping. Organic surface soil may be stockpiled for future use in landscape areas, but is not suitable for use as structural fill. We anticipate that the actual depth of stripping will vary across the site and may be greater in wooded areas.

Man-made debris and backfill soil in our exploratory test pits or any other onsite excavations should be over-excavated to underlying, competent material and replaced with compacted structural fill. Grubbing may be required where concentrations of organic soil or tree roots are encountered during site grading.

Although not encountered during our subsurface exploration, due to the developed nature of the site, existing fill may be present in areas outside of our test pits. Existing fill should be removed in areas that will support foundation elements. Existing fill should either be replaced with compacted structural fill or improvements may be founded directly on properly prepared underlying native soil. Existing fill material will be suitable for re-use as structural fill material provided any debris exceeding eight inches in maximum dimension and all organic or deleterious material are removed prior to placement. Preparation of the subgrade exposed by over-excavation and requirements for structural fill should be in accordance with recommendations provided below. We recommend that an NV5 representative be present during earthwork grading to observe the presence of existing fill and provide recommendations, as needed.

All rocks greater than 8 inches in greatest dimension (oversized rock) should be removed from the top 12 inches of soil, if encountered. Oversized rock may be used in landscape areas, rock faced slopes, or removed from the site. Oversized rock should not be placed in fill without prior approval by the project geotechnical engineer.

6.1.2 Preparation for Fill Placement

Prior to fill placement, all areas of existing fill material, man-made debris, or backfill soil should be removed to expose non-expansive native soil as discussed in the previous section.

Where fill placement is planned, the near-surface soil should be scarified to a depth of about 12 inches or to competent material and then uniformly moisture conditioned to within 2 percent of the optimum moisture content. Scarified and moisture conditioned soil should be recompacted with appropriate compaction equipment and proof rolled with a loaded, tandem-axle truck under the observation of an NV5 representative. Any areas that exhibit pumping or rutting should be over-excavated and replaced with compacted structural fill placed according to the recommendations below.

6.1.3 Fill Placement

All fill placed beneath structural improvements (e.g., foundation elements, pavements, and utility lines) and as part of a fill slope or retaining structure should be considered structural fill. Material used for structural fill should consist of uncontaminated, predominantly granular, non-expansive native soil or approved import soil. Structural fill should consist of granular material, nearly free of organic debris, with a liquid limit of less than 40, a plasticity index less than 15, 100 percent passing the 8-inch sieve, and less than 30 percent passing the No. 200 sieve. In general, the near-surface on-site granular soil has less than 30 percent passing the No. 200 sieve and meets the recommendations above. However, the fine-grained clay soil has greater than 30 percent passing the No. 200 sieve and does not meet the above recommendations. Selective grading may be required to keep the fine-grained soil separate from coarse grained soil for reuse as structural fill. The coarse grained site soil may be used for structural fill; however, uniformly moisture conditioning the soil to within two percent of optimum moisture content and compacting it to meet project specifications may be difficult. Based on our previous experience in the area, site soil may be above optimum moisture content even in late summer and may require air drying or additional compaction effort to reach the specified compaction. Moisture content, dry density, and relative compaction of fill should be evaluated by our firm at regular intervals during fill placement. Rock used in fill should be broken into fragments no larger than eight inches in diameter. Rocks larger than eight inches are considered oversized material and should be stockpiled for offhaul, later use in rock-faced slopes, or placement in landscape areas.

Imported fill material should be predominantly granular, non-expansive, and free of deleterious or organic material. Import material that is proposed for use on site should be submitted to NV5 for approval and laboratory analysis at least 72 hours prior to import.

If site grading is performed during periods of wet weather, near-surface site soil may be significantly above its optimum moisture content. These conditions could hamper equipment maneuverability and efforts to compact fill materials to the recommended compaction criteria. Fill material may require drying to facilitate placement and compaction, particularly during or following the wet season or spring snowmelt. Suitable compaction results may be difficult to

obtain without processing the soil (e.g., discing during favorable weather, covering stockpiles during periods of precipitation, etc.).

Compaction requirements (maximum dry density and moisture content) specified in this report reference ASTM D1557 – *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort*. Structural fill should be uniformly moisture conditioned to within 2 percent of the optimum moisture content and placed in maximum 8-inch thick, loose lifts (layers) prior to compacting. Structural fill should be compacted to at least 90 percent of the maximum dry density. The upper 8 inches of structural fill in paved areas should be compacted to at least 95 percent of the maximum dry density. Moisture content, dry density, and relative compaction of fill should be evaluated by our firm at regular intervals during fill placement. The earthwork contractor should assist our representative by preparing test pads with the onsite earth moving equipment.

Structural fill material with more than 30 percent rock larger than ¾-inch cannot be reliably tested using conventional compaction testing equipment. We recommend that a procedural approach, or method specification, be used for quality assurance during rock fill placement rather than a specified relative compaction. The procedural requirements will depend on the equipment used, as well as the nature of the fill material, and will need to be determined by the geotechnical engineer on site. Based on our experience in the area, we anticipate that the procedural specification will require a minimum of six passes with a Cat 563 or similar, self-propelled vibratory compactor to compact a maximum 8-inch thick loose lift. Processing or screening of the fill may be required to remove rocks larger than 8-inches in maximum dimension. Continuous observation by an NV5 representative will be required during fill placement to confirm that procedural specifications have been met.

6.1.4 Cut/Fill Slope Grading

Permanent cut and fill slopes at the subject site should be stable at inclinations up to 2H:1V (horizontal to vertical); however, we recommend re-vegetating or armoring all cut/fill slopes to reduce the potential for erosion. Steeper slopes may be possible at the site provided slopes are protected from excessive erosion using rock slope protection or similar slope reinforcement. Slopes steeper than 2H:1V (horizontal to vertical) should be evaluated on a case-by-case basis.

Fill should be placed in horizontal lifts to the lines and grades shown on the project plans. Slopes should be constructed by overbuilding the slope face and then cutting it back to design slope grades. Fill slopes should not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

Equipment width keyways and benches should be provided where fill is placed on side-slopes with gradients steeper than 5H:1V. The keyway should be excavated at the toe of the slope and extend into competent material. Benching must extend through loose surface soil into suitable material, and be performed at intervals such that no loose soil is left beneath the fill. NV5 should observe keyways and benches prior to fill placement.

The upper two to five feet of cut slopes should be rounded into the existing terrain above the slope to remove loose material and produce a contoured transition from cut face to natural ground. Scaling to remove unstable cobbles and boulders may be necessary. Fill slopes should be compacted as recommended for the placement of structural fill. The upper four to eight inches may be scarified to help promote revegetation.

6.1.5 Temporary Unconfined Excavations

Based on our understanding of the proposed project, temporary unconfined excavations deeper than four feet will likely not be necessary. However, the following criteria may be used for construction of temporary cut slopes at the site.

Table 6.1.5.1 – Unconfined Excavation Slopes

Temporary Slope Inclination (Horizontal to Vertical)	Depth Below Ground Surface (feet)
Near-Vertical	0-5

These temporary slope inclinations may require modification in the field during construction or where loose soil, groundwater seepage, or existing fill is encountered. The slope should be scaled of loose cobbles and boulders. Higher slopes should be covered with strong wire or fabric, firmly secured to prevent roll down of cobbles or other deleterious materials. The contractor is responsible for the safety of workers and should strictly observe federal and local Occupational Safety and Health Administration (OSHA) requirements for excavation shoring and safety. Some raveling of temporary cut slopes should be anticipated. During wet weather, surface water runoff should be prevented from entering excavations. To reduce the likelihood of sloughing or failure, temporary cut slopes must not remain over the winter.

6.1.6 Underground Utility Trenches

We anticipate that the contractor will be able to excavate underground utility trenches using conventional earthmoving equipment across the majority of the site. The Volvo mini-excavator used for our field exploration did not have difficulty excavating to depths on the order of 10.5 feet bgs.

We expect that some caving and sloughing of utility trench sidewalls will occur. OSHA requires all utility trenches deeper than five feet bgs be shored with bracing equipment or sloped back prior to entry.

Shallow subsurface seepage may be encountered in trench excavations, particularly if utility trenches are excavated during the spring or early summer. The earthwork contractor may need to employ dewatering methods as discussed in the *Construction Dewatering* section below to excavate, place, and compact trench backfill materials.

We recommend utility trench cutoff walls and relief drains be constructed where utility lines enter proposed structures for all utility lines that slope toward structures. We can provide details for cutoff-wall and relief-drain construction upon request.

Soil used as trench backfill should be non-expansive and should not contain rocks greater than 3 inches in maximum dimension. Trench backfill should consist of uniformly moisture conditioned soil and be placed in maximum 8-inch thick loose lifts prior to compacting. Unless otherwise specified by the applicable local utility district, pipe bedding and trench backfill should be compacted to at least 90 percent of the maximum dry density. Trench backfill placed within 8 inches of building subgrade and driveway areas should be compacted to at least 95 percent of the maximum dry density. The moisture content, density, and relative compaction of fill should be tested by NV5 at regular intervals during fill placement.

6.1.7 Construction Dewatering

During our subsurface exploration, groundwater was encountered in Test Pit TP-4 at a depth of approximately 10 feet bgs. If grading is performed during or immediately following the wet season or spring snowmelt, seepage may be encountered during grading. We should observe those conditions, if they are encountered, and provide site specific subsurface drainage recommendations. The following recommendations are preliminary and are not based on a groundwater flow analysis.

We anticipate that dewatering of excavations can be performed by gravity or by constructing sumps to depths below the excavation and removing water with pumps. To maintain stability of the excavation when placing and compacting trench backfill, groundwater levels should be drawn down at least two feet below the lowest point of the excavation.

If seepage is encountered during trench excavation, it may be necessary to remove underlying saturated soil and replace it with free draining, open-graded, crushed rock (drain rock). Soil backfill may be placed after backfilling with drain rock to an elevation higher than encountered groundwater.

6.2 SURFACE WATER AND FOUNDATION DRAINAGE

This section of the report presents our recommendations to reduce the possibility of surface water and near-surface groundwater entering below grade areas. Care should be taken to reduce water and moisture introduced into the building interior, including crawlspaces, during construction.

Based on our observations and past experience with geotechnical investigations in the project vicinity, there is a relatively high potential for seasonal saturation of near-surface soil and groundwater seepage into foundation areas. Near-surface fine-grained and dense soil was encountered in our test pits at depths of 0.5 to 1.5 feet bgs. Depending on final site grades, rainfall, irrigation practices, and other factors beyond the scope of this study, perched groundwater will likely seasonally develop above onsite fine-grained and dense soil. Near-surface groundwater may enter under-floor crawlspaces, migrate through concrete floor slabs, degrade asphalt concrete pavements, increase frost heave, and contribute to other adverse conditions.

Due to the relatively level nature of the site, we anticipate that surface water locally ponds across the site and seasonal perched groundwater may be at or near the ground surface. Final

site grading should be planned so that surface water is directed away from all foundations and pavements. Ponding of surface water should not be allowed near pavements or structures. Paved areas should be sloped away from structures a minimum of 2 percent and drainage gradients should be maintained to carry all surface water to a properly designed infiltration facility. The surface drainage system should generally be kept separate from the foundation (subsurface) drainage system. Surface water should not be infiltrated at elevations above the lowest foundation elements.

Drains should be constructed on the upslope side of exterior foundations and should be placed along continuous interior wall foundations and in crawlspace areas. Drains should extend to a properly designed infiltration facility. Recommended subsurface drain locations can be provided at the time of construction and when foundation elevations and configuration are known. Due to the gentle topography of the site, elevations of foundations and crawlspaces should be carefully planned so that it is possible to install gravity-fed drains that daylight a minimum of 10 feet from structures. Subsurface and foundation drain locations should be included on the project plans.

All foundation and slab-on-grade concrete should have a water to cement ratio of 0.45 or less. Underslab or blanket drains should be considered in slab-on-grade floor areas to reduce moisture transmission through the floor and help maintain subgrade support, particularly if the floor surface is lower than the adjacent exterior grade.

We recommend that the elevation of the interior subgrade in the crawlspace be higher than the exterior ground surface. If the design of the structure is such that the crawlspace must be lower than the surrounding grade, drains should be installed in the crawlspace area. The subgrade should be sloped to collect and divert water to drains that exit under or through the foundation (positive crawlspace drainage). If site grades do not permit gravity draining, this water should be collected in a sump and pumped to an infiltration facility. All vegetation and highly organic soil should be removed from the crawlspace area. Adequate ventilation should be provided in all crawlspace areas to promote drying. The project architect and owner should consider the need for an automated mechanical ventilation system. Care should be taken during construction to reduce the amount of moisture that gets sealed into crawlspaces.

Where utility trenches slope toward structures, potential flow paths through utility trench backfill should be plugged with a less permeable material at the exterior of the foundation. All utility pipes should have sealed joints.

Roof drip-lines should be protected from erosion with a gravel layer and riprap. Roof downspouts should be directed to a closed collector pipe that discharges flow to positive drainage. Backfill soil placed adjacent to building foundations should be placed and compacted such that water is not allowed to pond or infiltrate. Backfill should be free of deleterious material and placed and compacted in accordance with the above earthwork recommendations.

6.3 STRUCTURAL IMPROVEMENT DESIGN CRITERIA

The following sections provide design criteria for new and existing foundations, seismic design, slabs-on-grade, and pavement sections.

6.3.1 Foundations

New Foundations

Our opinion is that shallow spread foundations are suitable for support of the proposed new structure. The following paragraphs discuss foundation design parameters and construction recommendations.

Exterior foundations should be embedded a minimum of 18 inches below the lowest adjacent exterior finish grade for frost protection and confinement. The bottom of interior footings should be at least 12 inches below lowest adjacent finish grade for confinement. Reinforcing steel requirements for foundations should be determined by the project structural engineer.

Foundations founded in competent, undisturbed native soil or compacted fill may be designed using an allowable bearing capacity of 2,500 psf for dead plus live loads. Allowable bearing pressures may be increased by 33 percent for transient loading such as wind or seismic loads.

Resistance to lateral loads (including transient loads) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soil, and by passive soil pressure against the sides of foundations. Lateral resistance derived from passive earth pressure can be modeled as a triangular pressure distribution ranging from 0 psf at the ground surface to a maximum of 260d psf, where d equals the depth of the foundation in feet. A coefficient of friction of 0.30 may be used between poured-in-place concrete foundations and the underlying native soil. Lateral load resistance provided by passive soil pressure and friction may be used in combination without reduction.

Total settlement of individual foundations will vary depending on the plan dimensions of the foundation and actual structural loading. Based on anticipated foundation dimensions and loads, we estimate that total post-construction settlement of footings designed and constructed in accordance with our recommendations will be on the order of ½ inch. Differential settlement between similarly loaded, adjacent footings is expected to be less than ¼ inch, provided footings are founded on similar materials (e.g., all on structural fill, native soil, or rock). Differential settlement between adjacent footings founded on dissimilar materials (e.g., one footing on soil and an adjacent footing on rock) may approach the maximum anticipated total settlement. Settlement of foundations is expected to occur rapidly and should be essentially complete shortly after initial application of loads.

Loose material remaining in footing excavations should be removed to expose firm, unyielding material or compacted to at least 90 percent relative compaction. Footing excavations should be moistened prior to placing concrete to reduce risk of problems caused by wicking of moisture from curing concrete. NV5 should observe footing excavations prior to reinforcing steel and concrete placement.

Existing Foundation

The existing foundation at the metal building appears to be a continuous concrete perimeter foundation with a floor slab approximately 6 inches thick. Steel reinforcement (rebar) was observed at the bottom of the footing. As noted above, exterior foundations should be embedded a minimum of 18 inches below the lowest adjacent exterior finish grade for frost protection and confinement. Since the footing appears to only 6 inches below the adjacent grade, it may be subject to frost heave and slight movement should be anticipated. To help reduce the adverse effects of frost heave, we recommend that the ground surface slope away from foundations and that ponding not be allowed adjacent to footings.

The footings appear to be founded on competent native soil (silty Sand). An allowable bearing capacity of 1,000 psf for dead plus live loads should be used for new structures to be founded on the existing foundation. Allowable bearing pressures may be increased by 33 percent for transient loading such as wind or seismic loads. We expect the metal building concrete floor was designed to support small vehicles. However, the floor slab is likely not designed to support point or line loads. New interior wall foundations should not exceed 500 pounds per lineal foot without further analysis.

6.3.2 Seismic Design Criteria

In accordance with the 2019 California Building Code (CBC), the seismic design criteria shown in the table below should be used for the project site. The values were obtained for the site using the online Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps tool found at https://seismicmaps.org. Input values included the site's approximate latitude and longitude obtained from Google Earth and the Site Class. Site Class selection was based on our literature review, our subsurface investigation, our experience in the area, and the Site Class definitions provided in Chapter 20 of ASCE 7-16.

Table 6.3.2.1 – 2019 CBC Seismic Design Parameters

Description	Value	Reference
Approximate Latitude/Longitude	39.8105°N/120.3852°W	Google Earth
Site Class	C	Table 20.3-1, ASCE 7-16
Mapped Short-Period Spectral Response Acceleration Parameter	S_S = 1.031 g	Figure 1613.2.1(1), 2019 CBC
Mapped 1-Second Period Spectral Response Acceleration Parameter	S_1 = 0.332 g	Figure 1613.2.1(2), 2019 CBC
Short Period Site Coefficient	F_A = 1.2	Table1613.2.3(1), 2010 CBC
1-Second Period Site Coefficient	F_V = 1.5	Table 1613.2.3(2), 2019 CBC
Site Adjusted Short-Period Spectral Response Acceleration Parameter	S_{MS} = 1.237 g	Equation 16-36, 2019 CBC
Site Adjusted 1-Second Period Spectral Response Acceleration Parameter	S_{M1} = 0.498 g	Equation 16-37, 2019 CBC
Design Short-Period Spectral Response Acceleration Parameter	S_{DS} = 0.825 g	Equation 16-38, 2019 CBC
Design 1-Second Period Spectral Response Acceleration Parameter	S_{D1} = 0.332 g	Equation 16-39, 2019 CBC
Peak Ground Acceleration	PGA = 0.437 g	Figure 22-9, ASCE 7-16
Risk Category	II	Table 1604.5, 2019 CBC
Seismic Design Category	D	Tables1613.2.5 (1) & (2) 2019 CBC

6.3.3 Slab-on-Grade Construction

Concrete slabs-on-grade may be used in conjunction with perimeter concrete footings. Slabs-on-grade should be a minimum of four inches thick. If floor loads higher than 250 psf, intermittent live loads, or vehicle loads are anticipated, the project structural engineer should provide slab thickness and steel reinforcing requirements.

Prior to constructing concrete slabs, the upper eight inches of slab subgrade should be scarified, uniformly moisture conditioned to within two percent of optimum moisture content and compacted to at least 90 percent of the maximum dry density. Scarification and compaction may not be required if floor slabs are placed directly on undisturbed compacted structural fill.

Slabs should be underlain by at least four inches of Class 2 aggregate base placed over the prepared subgrade. The aggregate base should be compacted to a minimum of 95 percent of the maximum dry density. If a subdrain is installed as described below, slabs may be constructed over the crushed gravel layer provided a moisture barrier will be placed over the gravel.

To reduce the potential for groundwater intrusion, the project architect and/or owner should consider constructing a drain beneath concrete slabs-on-grade in areas where groundwater and/or saturated soil may be present during wet periods. Subdrains should consist of a minimum of four inches of clean crushed gravel placed over native subgrade leveled or sloped at two percent towards a 4-inch diameter perforated drain pipe. The drain pipe should be placed with perforations faced down in a minimum 12-inch wide gravel-filled trench. The depth of the trench may vary depending on cover requirements for the drain pipe and the slope required to drain water from beneath the slab to a properly constructed infiltration facility. A minimum of one pipe should be installed in each area of the slab surrounded by continuous perimeter foundation elements.

In slab-on-grade areas where moisture sensitive floor coverings are proposed, a vapor barrier (e.g., 15 mil Stego® Wrap) should be placed over the base course or gravel subdrain to reduce the migration of moisture vapor through the concrete slab. The vapor barrier should be installed in accordance with the manufacturer's instructions. Concrete should be placed directly on the vapor barrier. All slab concrete should have a water-cement ratio of 0.45 or less. Alternatively, two inches of spray insulation may be placed between the gravel layer and slab-on-grade.

Regardless of the type of vapor barrier used, moisture can wick up through a concrete slab. Excessive moisture transmission through a slab can cause adhesion loss, warping, and peeling of resilient floor coverings, deterioration of adhesive, seam separation, formation of air pockets, mineral deposition beneath flooring, odor, and fungi growth. Slabs can be tested for water transmissivity in areas that are moisture sensitive. Commercial sealants, moisture retarding admixtures, fly ash, and a reduced water-to-cement ratio can be incorporated into the concrete to reduce slab permeability. To further reduce the chance of moisture transmission, a waterproofing consultant should be contacted.

Exterior slabs-on-grade such as sidewalks should be placed on a minimum 6-inch thick compacted aggregate base section to help reduce the potential for frost heave. Deleterious material should be removed from floor slab subgrades prior to concrete placement. For exterior slabs, the upper eight inches of native soil should be scarified, moisture conditioned, and compacted to at least 90 percent of the maximum dry density. We recommend a minimum concrete thickness of four inches. Where traffic loads are possible, we recommend a minimum concrete thickness of six inches. Concrete used for sidewalk construction should meet the durability requirements of Section 1904 of the 2016 CBC. The Exposure Class should be F2 unless the surface will be exposed to deicing chemicals, in which case the Exposure Class should be F3.

Concrete slabs impart a relatively small load on the subgrade (approximately 50 psf). Therefore, some vertical movement should be anticipated from possible expansion, freeze-thaw cycles, or differential loading.

6.3.4 Pavement Sections

Based on our understanding of the project, gravel surface roads and parking areas are planned and the existing aggregate base (AB) will be reused. Asphalt concrete pavement may be used for an apron off of A-23 and for a planned cart path. The following presents design for asphalt concrete pavement sections, gravel roads and parking areas, and paving stone sections.

An R-Value of 57 was obtained for pavement design. Based on our experience in the Sierra Valley area, environmental factors, such as freeze-thaw cycles and thermal cracking will usually govern the life of asphalt concrete (AC) pavements. Thermal cracking of asphalt pavement allows more water to enter the pavement section, which promotes deterioration and increases maintenance costs. In addition, snow removal activities on site may result in heavy traffic loads.

A Traffic Index (TI) of 8 was used for proposed asphalt concrete pavement section along the apron off of A-23. Due to anticipated heavy traffic loads, we recommend a minimum of 4 inches AC on 8 inches of aggregate base (AB).

For the proposed cart path, we anticipate that heavy snow removal equipment will not be used and the path will have minimal traffic loads. Due to anticipated minimal traffic loads along the cart path, we used environmental factors to evaluate pavement thicknesses. For the proposed cart path, we recommend a minimum pavement thickness of three inches AC on 6 inches of AB.

A Traffic Index (TI) of 4 was used to design AB thickness required for the project. For a TI of 4 and an obtained R-value of 57, we recommend a minimum AB thickness of 7 inches for proposed access roads and parking areas. The existing AB may be reused. However, the existing AB may contain soil and should be used in the bottom of the new AB section, where possible. New AB should be placed on the top.

We recommend that paving stones in non-traffic areas be supported by a minimum of four inches of Caltrans Class 2 AB. For light traffic areas, the AB section should be increased to at least six inches. An underlying concrete slab is not necessary for light traffic and non-traffic areas. Prior to placing aggregate base, the subgrade should be prepared in accordance with the recommendations provided below.

Due to seasonal saturation of the underlying AB and freeze-thaw cycles, some vertical movement of paving stones over time should be anticipated. This movement can likely be reduced by constructing a drainage layer beneath paving stone pavements. The drainage layer should consist of at least 4 inches of compacted clean angular gravel under the AB layer. The drainage layer should contain a minimum 4-inch diameter perforated pipe, sloped to drain water from beneath the pavement towards an infiltration facility. All open-graded gravel should be consolidated using vibratory compaction equipment. A minimum 4-ounce non-woven filter fabric such as Mirafi 140N or approved equivalent should be placed between the compacted gravel subdrain and aggregate base course.

The upper six inches of native soil should be compacted to at least of 95 percent of the maximum dry density prior to placing AB. AB should also be compacted to a minimum of 95 percent of the maximum dry density. Subgrade and AB dry densities should be evaluated by NV5. In addition to field density tests, the subgrade should be proof rolled under NV5's observation prior to AB placement. If temporary pavement is used during construction, we recommend preparation of the subgrade and AB as outlined above prior to construction of the temporary pavement.

To improve pavement performance and lifespan, we recommend promoting drainage of the pavement subgrade. Drainage can be accomplished through roadway layout and design, subdrains, and/or roadside ditches. An NV5 representative should evaluate pavement subgrade at the time of construction and provide location-specific recommendations for subdrains. Typical subdrains consist of a shallow trench with a minimum 4-inch diameter perforated pipe encased in open-graded gravel wrapped in filter fabric. Pavement subgrade should be graded and prepared such that water drains from beneath the pavement or gravel section to a properly designed infiltration facility. Subdrains may be used in conjunction with roadside ditches located on one or both sides of the cart path. Roadside ditches should be constructed to a depth greater than the proposed pavement and subdrain section. Ditches should be rock-lined or vegetated to help reduce erosion and convey water to a properly designed infiltration facility.

6.4 PLAN REVIEW AND CONSTRUCTION MONITORING

Construction monitoring includes review of plans and specifications and observation of onsite activities during construction as described below. We should review final grading and foundation plans prior to construction to evaluate whether our recommendations have been implemented and to provide additional and/or modified recommendations, if necessary. We also recommend that our firm be retained to provide construction monitoring and testing services during site grading, foundation, retaining wall, underground utility, and road construction to observe subsurface conditions with respect to our engineering recommendations.

7 LIMITATIONS

Our professional services were performed consistent with generally accepted geotechnical engineering principles and practices employed in the site area at the time the report was prepared. No warranty, express or implied, is intended.

Our services were performed consistent with our agreement with our client. We are not responsible for the impacts of changes in environmental standards, practices, or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others or the use of segregated portions of this report. This report is solely for the use of our client. Reliance on this report by a third party is at the risk of that party.

If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in the report should be reviewed by NV5 to assess the relevancy of our conclusions and recommendations. Additional field work and laboratory tests may be required to revise our recommendations. Costs to review project changes and perform additional field work and laboratory testing necessary to modify our recommendations are beyond the scope of services provided for this report. Additional work will be performed only after receipt of an approved scope of services, budget, and written authorization to proceed.

Analyses, conclusions, and recommendations presented in this report are based on site conditions as they existed at the time we performed our subsurface exploration. We assumed that subsurface soil conditions encountered at the locations of our subsurface explorations are generally representative of subsurface conditions across the project site. Actual subsurface conditions at locations between and beyond our explorations may differ. If subsurface conditions encountered during construction are different than those described in this report, we should be notified so that we can review and modify our recommendations as needed. Our scope of services did not include evaluating the project site for the presence of hazardous materials or petroleum products.

The elevation or depth to groundwater and soil moisture conditions underlying the project site may differ with time and location. The project site map shows approximate exploration locations as determined by pacing distances from identifiable site features. Therefore, exploration locations should not be relied upon as being exact.

The findings of this report are valid as of the present date. Changes in the conditions of the property can occur with the passage of time. These changes may be due to natural processes or human activity, at the project site or adjacent properties. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or a broadening of knowledge. Therefore, the recommendations presented in this report should not be relied upon after a period of two years from the issue date without our review.

8 REFERENCES

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California Building Standards Commission. (2016). *2016 California Building Code.* Print.

California Department of Transportation. (2012). *Highway Design Manual.* Print.

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California Geological Survey. (2010). *Fault Activity Map of California.* Geologic Data Map No. 6, By Charles W. Jennings and William A. Bryant. *<http://maps.conservation.ca.gov/cgs/fam/>*

Das, Braja M. *Principles of Foundation Engineering, 6th Edition.* 2007. Thomson. Print.

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Kramer, Steven L. *Geotechnical Earthquake Engineering*. 2008. Pearson Education. Print.

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Plumas County. (2016). *Sewage Disposal System Installation and Procedure Manual*. April 2016.

United States Geological Survey. (2018). *Portola, California Quadrangle*. Print.

Plumas County Environmental Health

270 County Hospital Road, Ste. 127, Quincy CA 95971
Phone: (530) 283-6355 ~ Fax: (530) 283-6241

DATE: September 24, 2020

TO: Rebecca Herrin, Assistant Planning Director
Plumas County Planning & Building Services

RE: Feather River Land Trust
Sierra Valley Preserve
Special Use Permit U 2-19/20-04
APNs: 025-220-024-000, 025-060-021-000, 025-060-022-000, 025-080-045-000, 025-080-044-000, 025-080-043-000, 010-030-004-000, 140-070-024-000, 140-070-025-000, 025-022-025-000, 025-220-006-000

This is to notify you that this Department:

☐ APPROVES

☒ APPROVES SUBJECT TO:

☐ CANNOT APPROVE DUE TO THE FOLLOWING:

☐ FINDS THE APPLICATION INCOMPLETE DUE TO:

1) Drinking Water:

The CA Water Board, Division of Drinking Water in Redding, approved the creation of a new Public Water System for this project based upon the Preliminary Technical Report submitted in behalf of the project proponent (see the attached Water Board letter dated September 4, 2020). Environmental Health concurs with the Water Board on this approval and will take the lead on the construction and operational permitting for this new water system from this point forward.

The water system must be designed by a CA Registered Professional Engineer and submitted to Environmental Health. The water system plans must show the layout and materials proposed, along with shop drawings of any bulk water storage tank(s). The plans must be reviewed and approved by Environmental Health prior to any installation or construction. Plans must address the applicable portions of CA Code of Regulations, Title 22, Division 4 "Environmental Health", Chapter 16 "Waterworks Standards" and the Plumas County Code, Title 6, Chapter 9 "Water Supply Systems".

EXHIBIT 9

All known existing water wells within the project area lack documentation of a commercial 50 ft sanitary seal. As such, these existing wells are categorically excluded from supplying the drinking water system. Pursuant to the CA Waterworks Standards and Plumas County Code, Title 6, Chapter 8 "Water Wells", the new Public Water System will require the installation of a new commercial drinking water well with a minimum 50 ft deep sanitary seal. The well must be installed under permit issued by Environmental Health, and with the approval of the Sierra Valley Groundwater Management District. The well sanitary seal must extend for a minimum of 50 ft in depth, or to the first confining layer, whichever is greater.

Once the well is installed, the water from the well must be sampled and shown to meet drinking water standards as defined in the CA Code of Regulations, Title 22 for a Transient-NonCommunity water system. Should the water quality not meet drinking water standards, the installation of water treatment will be required to bring the water quality within the regulatory standards.

If fire suppression is proposed or required for this project, Environmental Health recommends installing a fire system that is separate from the drinking water system to reduce the potential for water stagnation issues. However, if combined, the drinking water system will require appropriate backflow protection.

2) Sewage Disposal:

Referring to "The Preliminary Design – Onsite Wastewater Treatment System" Section III, Subsection A - "Proposed OWTS – Residential"

The existing 1,200-gallon septic tank, if it remains in the current location and is demonstrated to be in good condition, will be sufficient for up to a total of four (4) residence bedrooms, either for a single-family home, or for a duplex unit created from a single-family home, or for two (2) smaller homes.

If not already present, water-tight and vapor-tight tank access risers with lids that terminate above grade must be installed at each septic tank access location. Please retain the existing septic tank lids in place to provide a second level of tank safety.

If the proposed duplex unit is created, or if separate homes are installed to replace the existing home damaged by a recent fire, each residence unit should be fitted with separate soil pipes that connect directly to the septic tank with their respective "sanitary tee's" in the tank to avoid potential line blockage issues with the adjoining unit.

Section III, Subsection B "Proposed OWTS – Commercial"

The commercial septic system must be installed under permit issued by Environmental Health as an engineered design. The designing engineer must submit detailed septic system construction plans to Environmental Health for review and approval prior to construction. The designing engineer, or their designee, will be required to witness and document construction of the septic system with field notes and photographs.

Septic system final approval will be subject to submission of an engineering field note summary with photo documentation, a letter of conformance signed by the designing engineer, and an as-built diagram of the system. Environmental Health is required to conduct on-site inspections during construction, and witness a demonstration of pump and alarm function at final inspection.

3) Hazardous Materials:

Within 30-days of hazardous materials above reportable quantities being present at the facility, the facility shall submit a Hazardous Materials Business Plan and declare all additional applicable business activities through CERS. Prior to issuing a Hazardous Materials Registration for the facility a CERS submittal must be received by Plumas County Environmental Health, at which time a site inspection will be scheduled to verify submittal actuary and the facility will be invoiced the applicable permit fees. Upon receipt of payment a Registration will be issued to the facility.

Sincerely,

Rob Robinette
Environmental Health Specialist II

Attachment: Waterboard Letter of Approval dated September 4, 2020.

CALIFORNIA
Water Boards

GAVIN NEWSOM
GOVERNOR

JARED BLUMENFELD
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

Division of Drinking Water

September 4, 2020

Plumas County Environmental Health Department
270 County Hospital Road, Suite 127
Quincy, CA 95971

Attention: Jerry Sipe, Director of Environmental Health

Subject: Sierra Valley Preserve, Preliminary Technical Report Approval

In compliance with Section 116527(b) of the California Health and Safety Code, the State Water Resources Control Board, Division of Drinking Water (Division), received and reviewed a preliminary technical report, dated July 6, 2020, for a proposed transient non-community water system to serve the Sierra Valley Preserve, located near Beckwourth in Plumas County. The Division approves this report and agrees that the provisions required in SB1263 are met as there are no existing community water systems within three miles of the proposed public water system and that the proposed public water system does not lie within the sphere of influence boundary for any city or municipal water service.

Since consolidation with an existing public water system is not feasible, the owner of the facility may proceed to apply for a public drinking water supply permit following submission of a more detailed technical report. The preliminary report establishes the requisite managerial and financial capacity of the proposed water system as the land is wholly owned by the Feather River Trust, and the proposed budget plan by the Trust is satisfactory. However, a more detailed technical report should be submitted to the Plumas County Environmental Health Department including plans and specs for the well, storage tanks, distribution system, and any other infrastructure to be included as part of the public water system. It is recommended that the technical plan is submitted prior to construction so that any changes required to meet Waterworks Standards are noted before procurement.

If you have any questions, please contact Nick McGann at (530) 224-3269 or me at (530) 224-4828.

Stephen Watson

Stephen W. Watson, P.E.
Lassen District Engineer
Drinking Water Field Operations Branch

cc: Rob Robinette, Plumas County Environmental Health Department
PR Design & Engineering
Feather River Land Trust

File: Plumas LPA
SVP SB1263 Eval. Ltr/njm

P•R DESIGN & ENGINEERING INC.
8889 North Lake Blvd, P.O. Box 1847
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Tel 530-546-4500 www.prdei.com

July 22, 2020

Rob Robinette
Plumas County Environmental Health
270 County Hospital Road #127
Quincy, CA 95971

RE: Feather River Land Trust
Sierra Valley Preserve
Special Use Permit U 2-19/20-04

Mr. Robinette:

Thank you for your review of the special use permit application referenced above. Please see responses to your comments below in italics.

1) Drinking Water: The drinking water element of the application is incomplete. Approval is subject to compliance with:
   - Plumas County Code (PCC), Title 6, Chapters 8 & 9;
   - CA Health and Safety Code (H&S);
   - CA Code of Regulations, Title 22; and
   - Concurrence with Environmental Health.

   Preliminary Technical Report: The proponents have not submitted a "preliminary technical report" as required by CA H&S, Section 116527 "Water-Related Improvements for review by Environmental Health and the CA Regional Water Quality Control Board for the creation of a new public water system. The final approval or denial to create a new public water system will be made by the CA Regional Water Quality Control Board, Division of Drinking Water.

   The proponent should anticipate additional requests for information based upon the responses provided.

   Please see the attached Preliminary Technical Report prepared according to the guidance provided by the CA Regional Water Quality Control Board, Division of Drinking water.

2) Sewage Disposal: The sewage disposal element of the application is incomplete. Approval is subject to compliance with:
   - Plumas County Code (PCC), Title 6, Chapter 6; and
   - Concurrence with Environmental Health.

   Leach Field Site Suitability: The groundwater monitoring for leach field placement is not yet complete. The piezometer monitoring wells were installed on January 15, 2020 which is later than the November 1st start date set by PCC, Title 6, Chapter 6. In addition, at the time of this

EXHIBIT 10

writing, the current year winter monitoring period is not yet complete, ending on May 31st, 2020.

The winter of 2020 was mostly dry for the months of January and February which is not typical for mid-winter precipitation in the Sierra Valley. There was some precipitation in late March and early April which might provide some data to evaluate the seasonal groundwater elevation. However, this limited data may prove insufficient to determine the depth to elevated seasonal groundwater for a commercial sewage system. Due to the limited groundwater monitoring data in a region known for elevated seasonal groundwater, additional monitoring may be required that could extend through the spring of calendar year 2021.

The proponent should anticipate additional requests for information based upon the responses provided.

A preliminary design report for the design of the on-site wastewater treatment system (OWTS) is included with this submittal. A comprehensive soil evaluation prepared by NV5 is included in the appendix of the OWTS design report.

3) Hazardous Materials – The hazardous materials element of the application is incomplete.

The use and/or disposal of hazardous materials are subject to compliance with:

- California Health and Safety Code, Division 20, Chapter 6.95, Section 25500-25519;
- California Code of Regulation, Title 19, Division 2, Chapter 4;
- Code of Federal Regulations, Title 40, parts 350-372; and
- Concurrence with Environmental Health.

The application does not provide sufficient details, including and not limited to vegetation management chemicals, machinery, equipment and/or vehicle fuels, oils, chemicals, volumes, storage, and waste volumes, storage, and disposal.

The proponent should anticipate additional requests for information based upon the response provided.

The proposed project includes storage of approximately 500 gallons of petroleum fuel to be used for maintenance vehicles & equipment stored on-site. The project will also store herbicides for use in removal of invasive species and general vegetation management. All hazardous materials, including petroleum and herbicides, in excess of reportable quantities will be included and addressed in the Hazardous Materials Business Plan and will be reported in the California Electronic Reporting System (CERS). The Feather River Land Trust anticipates that it will perform minor vehicle maintenance on-site, including changing oil in their private fleet. The generation of hazardous materials require that the FRLT enroll in the Hazardous Waste Generator Program.

The applicant is aware of and understands the state and local requirements for the storage of hazardous materials and the generation of hazardous waste. The applicant anticipates completion of the HMBP and enrollment in the Waste Generator Program during the building/grading permit phase of the project.

Thank you again for your review of the project. I look forward to working with you on the Sierra Valley Preserve Headquarters project.

Sincerely,

Jason Lynn

Drainage Narrative

Sierra Valley Preserve
181 Austin Road
APN: 052-220-025
Plumas County, California

Existing Conditions

The project is located east of County Route A-23 approximately 0.8 miles south of Highway 70 near the town of Beckwourth, CA. The parcel encompasses approximately 32 acres. Proposed improvements are limited to a roughly 4.5-acre project area.

Existing development within the project area includes Austin Road which has been formally abandoned by Plumas County; a 2,600 sf residence; a 3,200 sf barn; a 4,000 sf workshop; a 250 sf silo; a 500 sf accessory structure and approximately 82,000 square feet of heavily compacted soil. Existing disturbance within the project area is approximately 92,550 square feet.

Much of the property is within the mapped special flood hazard area subject to inundation by the 1% annual chance flood event of the Middle Fork of the Feather River. The special flood hazard area is mapped as Zone A (FIRM number 06063C1325E), meaning that no base flood elevations have been determined. Two small areas of the property are shown to be within the mapped Zone X, indicating that they may be subject to inundation by the 0.2% annual chance flood event. Most of the existing and proposed development is located within the mapped Zone X area.

Storm Water Runoff & Conveyance

Existing development within the project area is primarily in upland areas that minimizes the impacts of inundation during large flood events and provides good drainage away from buildings, roads and other improvements within the project area. In general, runoff from existing impervious surfaces flows to the east where it meanders through the riparian floodplain of the Middle Fork of the Feather River. There are no existing water quality treatment measures in place within the project area.

Design Storm Flow Rates

Peak runoff from impervious surfaces for the 10- and 100-year design storm was estimated using the rational formula. The time of concentration was estimated using Manning's kinematic equation. Rainfall depth and intensity was determined based NOAA Atlas 14 precipitation data.

Time of Concentration:

$$t_{sheet} = \frac{0.007(nL_o)^{0.8}}{\sqrt{P_2}(S)^{0.4}}$$

Where:

T_{sheet}=time of concentration, hr
n = Manning's Roughness coefficient
L_o = overland flow distance, ft

EXHIBIT 11

P_2 = 2yr, 24hr rainfall depth, in
S = slope of hydraulic grade line, ft/ft

$$t_{sheet} = \frac{0.007(0.11\ x\ 300)^{0.8}}{\sqrt{2.18}(.029)^{0.4}} = .05hr = 3min.$$

Peak Discharge:

$$Q = CIA_d$$

Where:

Q = Peak discharge, cfs
C = Runoff coefficient
I = Rainfall intensity, in/hr
A = Area, acres

$$Q_{10} = 0.75\ x\ 2.8\ x\ 2.1 = 4.4\ cfs$$

$$Q_{100} = 0.75\ x\ 4.87\ x\ 2.1 = 7.7\ cfs$$

Proposed Conditions

The proposed project includes demolition of the existing workshop and barn and construction of a 4,000 sf workshop; 2,000 sf exhibit shed; 2,000 sf storage building; and a new 3,000 sf visitor center, open to the public for the recreational enjoyment of the Sierra Valley Preserve. Additional improvements will include a new entrance to the property via County Route A23, approximately 70 parking spaces, an outdoor learning area and pedestrian plaza. Disturbed soil area within the project area will be restored and re-vegetated with native plants and materials. Proposed development will encompass approximately 68,550 square feet; a 25 percent reduction in disturbance.

Storm Water Runoff & Conveyance

Proposed improvements are concentrated in areas that were previously impacted or developed and generally preserve the overall drainage patterns that exist on the site. By reducing the total project footprint and restoring and re-vegetating disturbed soil areas, the project will reduce design storm runoff.

To further improve water quality within the project area, the project will provide stormwater treatment of runoff from the 25-year, 1-hour storm event. Based on NOAA Atlas 14 precipitation data, the 25-year, 1-hour storm depth is about 1 inch and corresponds to the 85th percentile, 24-hour storm event. Anticipated water quality treatments include rock armor at all building driplines and along driveway and parking edges and will include designated stormwater retention and infiltration facilities.

Design Storm Flow Rates

Again, peak runoff from impervious surfaces for the 10- and 100-year design storm was estimated using the rational formula. The time of concentration was estimated using Manning kinematic equation. Rainfall depth and intensity was determined based NOAA Atlas 14 precipitation data.

Time of Concentration:

$$t_{sheet} = \frac{0.007(nL_o)^{0.8}}{\sqrt{P_2}(S)^{0.4}}$$

Where:

T_{sheet}=time of concentration, hr
n = Manning's Roughness coefficient
L_o = overland flow distance, ft
P_2 = 2yr, 24hr rainfall depth, in
S = slope of hydraulic grade line, ft/ft

$$t_{sheet} = \frac{0.007(0.11\ x\ 300)^{0.8}}{\sqrt{2.18}(.029)^{0.4}} = .05hr = 3min.$$

Peak Discharge:

$$Q = CIA_d$$

Where:

Q = Peak discharge, cfs
C = Runoff coefficient
I = Rainfall intensity, in/hr
A = Area, acres

$$Q_{10} = 0.75\ x\ 2.8\ x\ 1.6 = 3.4\ cfs$$

$$Q_{100} = 0.75\ x\ 4.87\ x\ 1.6 = 5.8\ cfs$$

Conclusion

The proposed project will reduce impervious surfacing and restore disturbed soil areas within the project area resulting in a roughly 25 percent reduction in runoff from impervious surfaces. Furthermore, the installation of permanent water quality improvements tactics and low impact development strategies will retain and infiltration runoff from the first-flush storm events offering a significant improvement to water quality. While not specifically addressed in this narrative, project proponents anticipate the use of permeable materials in portions of the vehicular and pedestrian areas, which will further reduce runoff and improve water quality. Such improvements where included, will be expanded on in later iterations of the project and will be discussed in detail in a preliminary and/or final drainage report to be prepared concurrent with construction documents.

PLUMAS COUNTY DEPARTMENT OF PUBLIC WORKS

1834 East Main Street, Quincy, CA 95971 – Telephone (530) 283-6268 Facsimile (530) 283-6323
Robert A. Perreault Jr., P.E., Director John Mannle, P.E., Asst. Director Joe Blackwell, Deputy Director

Memorandum

Date: May 4, 2020

To: Rebecca Herrin, Assistant Planning Director

From: Bob Perreault, Director of Public Works

Re: Response to Development Permit Application (Special Use Permit), submitted by Feather River Land Trust for the Sierra Valley Preserve U 2-19/20-04

The Department of Public Works has reviewed the above reference proposal and is submitting the following comments.

A preliminary 3-page ''Drainage Narrative'' was included in support of the Development Permit Application. Concerns regarding the Drainage Narrative include:

1. A drainage narrative is not a project wide ''Drainage Plan and Calculations.''
2. The submitted drainage documentation was not signed by a licensed civil engineer eligible to prepare drainage design work in the State of California.
3. A project "Drainage Area Map'' was not submitted.
4. The drainage plan did not identify or include construction details for proposed, necessary drainage improvement features.

The Department of Public Works requests submittal of a complete Drainage Plan and Calculations that incorporates the requirements referenced above. Once submitted, Public Works staff will conduct an appropriate review and comment. The Department of Public Works does not object to conditionally approving the submittal and approval of a complete Drainage Plan and Calculations provided that the review and approval by the Department of Public Works is completed prior to initiation of grading activities or the issuance of a building permit for new construction.

The Department of Public Works requires a more in-depth discussion of traffic impacts associated with the proposed project that specifically discusses safety aspects of the project's proposed encroachments onto County roadways. The "Trip Generation Narrative'' and a "Parking Demand Narrative", included in support of the Development Permit Application, should be included in a formal project Traffic Analysis. The following considerations should be included in the Traffic Analysis.

1. Even though the project's anticipated daily traffic volumes are low, the volumes need to be discussed in terms of peak hour trips. See thresholds used by Caltrans attached.

EXHIBIT 12

2. The anticipated peak hour traffic at the existing intersections. (For this facility, the maximum peak hour might be the hour that patrons are arriving for a special event or leaving after a special event.)

3. The traffic analysis should discuss peak hour trips entering/exiting for each access point, as well as discussing how existing traffic currently moves through the intersection. Typically, these turning movements are labeled on a map at each access point, showing left/thru/right turns on each intersection approach.

4. The turning movements in and out of the property even for low volume projects are reviewed per A.3.b. (in the attachment) to determine if improvements are necessary to meet AASHTO or Caltrans' design standards.

5. Show how traffic ingress/egress trips to the property will change if the proposed new intersection is constructed.

In addition, all encroachments onto County roadways shall be reviewed and approved for the proposed use. Review of existing encroachments will include the ability of the encroachment to safely accommodate the traffic associated with the new use. New encroachment permits, where necessary, shall be obtained from the Department of Public Works prior to commencement of the proposed use.

The Department of Public Works is amenable to discussing the content of this letter with the project applicant or their agent(s).

Bob Perreault

Bob Perreault, Director
Department of Public Works

CC: Tracy Ferguson, Planning Director
John Mannle, Assistant Director of Public Works
Joe Blackwell, Deputy Director of Public Works

A. Trip Generation Thresholds

The following criterion is a starting point in determining when a TIS is needed. When a project:

1. Generates over 100 peak hour trips assigned to a State highway facility
2. Generates 50 to 100 peak hour trips assigned to a State highway facility – and, affected State highway facilities are experiencing noticeable delay; approaching unstable traffic flow conditions (LOS "C" or "D").
3. Generates 1 to 49 peak hour trips assigned to a State highway facility – the following are examples that may require a full TIS or some lesser analysis[4]:
    a. Affected State highway facilities experiencing significant delay; unstable or forced traffic flow conditions (LOS "E" or "F").
    b. The potential risk for a traffic incident is significantly increased (i.e., congestion related collisions, non-standard sight distance considerations, increase in traffic conflict points, etc.).
    c. Change in local circulation networks that impact a State highway facility (i.e., direct access to State highway facility, a non-standard highway geometric design, etc.).

Note: A traffic study may be as simple as providing a traffic count to as complex as a microscopic simulation. The appropriate level of study is determined by the particulars of a project, the prevailing highway conditions, and the forecasted traffic.

B. Exceptions

Exceptions require consultation between the lead agency, Caltrans, and those preparing the TIS. When a project's traffic impact to a State highway facility can clearly be anticipated without a study and all the parties involved (lead agency, developer, and the Caltrans district office) are able to negotiate appropriate mitigation, a TIS may not be necessary.

C. Updating An Existing Traffic Impact Study

A TIS requires updating when the amount or character of traffic is significantly different from an earlier study. Generally a TIS requires updating every two years. A TIS may require updating sooner in rapidly developing areas and not as often in slower developing areas. In these cases, consultation with Caltrans is strongly recommended.

III. SCOPE OF TRAFFIC IMPACT STUDY

Consultation between the lead agency, Caltrans, and those preparing the TIS is recommended before commencing work on the study to establish the appropriate scope. At a minimum, the TIS should include the following:

A. Boundaries of the Traffic Impact Study

All State highway facilities impacted in accordance with the criteria in Section II should be studied. Traffic impacts to local streets and roads can impact intersections with State highway facilities. In these cases, the TIS should include an analysis of adjacent local facilities, upstream and downstream, of the intersection (i.e., driveways, intersections, and interchanges) with the State highway.

[4] A "lesser analysis" may include obtaining traffic counts, preparing signal warrants, or a focused TIS, etc.

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August 31, 2020

Bob Perreault
Plumas County DPW
270 County Hospital Road #127
Quincy, CA 95971

RE: Feather River Land Trust
Sierra Valley Preserve
Special Use Permit U 2-19/20-04

Mr. Perreault:

Thank you for your review of the special use permit application referenced above. Please see responses to your comments below in italics.

A preliminary 3-page "Drainage Narrative" was included in support of the Development Permit Application. Concerns regarding the drainage Narrative include:

1. A drainage narrative is not a project wide "Drainage Plan and Calculations".
2. The submitted drainage documentation was not signed by a licensed civil engineer eligible to prepare drainage design work in the State of California.
3. A project "Drainage Area map" was not submitted.
4. The drainage plan did not identify or include construction details for proposed, necessary drainage improvement features.

The Department of Public Works requests submittal of a complete Drainage Plan and Calculations that incorporates the requirements referenced above. Once submitted, Public Works staff will conduct an appropriate review and comment. The Department of Public Works does not object to conditionally approving the submittal and approval of a complete Drainage Plan and Calculations provided that the review and approval by the Department of Public Works is completed prior to initiation of grading activities or the issuance of a building permit for new construction.

The applicant will submit the Drainage Plan and Calculations at the time of building/grading permit review. Please condition the Special Use Permit accordingly.

The Department of Public Works requires a more in-depth discussion of traffic impacts associated with the proposed project that specifically discusses safety aspects of the projects proposed encroachments onto County roadways. The "Trip Generation Narrative" and a "Parking Demand Narrative", included in support of the Development Permit Application, should be included in a formal project Traffic Analysis. The following considerations should be included in the Traffic Analysis.

1. Even though the project's anticipated daily traffic volumes are low, the volumes need to be discussed in terms of peak hour trips. See thresholds used by Caltrans attached.

EXHIBIT 13

2. The anticipated peak hour traffic at the existing intersections. (For this facility the maximum peak hour might be at the hour that patrons are arriving for a special event or leaving after a special event.)
3. The traffic analysis should discuss peak hour trips entering/exiting for each access point as well as discussing how existing traffic currently moves through the intersection. Typically, these turning movements are labeled on a map at eah access point showing left/thru/right turns on each intersection approach.
4. The turning movements in and out of the property even for low volume projects are reviewed per A.3.b (in the attachment) to determine if improvements are necessary to meet AASHTO or Caltrans design standards.
5. Show how traffic ingress/egress trips to the property will change if the proposed new intersection is constructed.

In addition, all encroachments onto County roadways shall be reviewed and approved for the proposed use. Review of existing encroachments will include the ability of the encroachment to safely accommodate the traffic associated with the new use. New encroachment permits, where necessary, shall be obtained from the department of Public Works prior to commencement of the proposed use.

Please see the attached Traffic Analysis and Recommendations.

We greatly appreciate the assistance offered by Plumas DPW in responding to these comments.

Sincerely,

Andrew T. Ryan, PE

Trip Generation Narrative

Sierra Valley Preserve
181 Austin Road
APN: 052-220-025
Plumas County, California

Purpose & Scope

The purpose of this memo is to quantify the expected trip generation at the Sierra Valley Preserve (SVP): Visitor Center as part of the Special Use Permit process. This analysis will address trip generation and discuss a method for management of potential traffic impacts.

Plumas County is comprised of approximately 2,618 square miles of land. Approximately 24 percent of the land is in private ownership (400,000 acres), while the remaining 76 percent is national forest land (1,245,000 acres). The southern range of the Cascades, the northern range of the Sierra Nevada, the Feather River Canyon and Lake Almanor comprise the predominant geographical features of the County.[1] Portola is the only incorporated City located in the Sierra Valley and has a population of approximately 2,200 and is 5.5 miles from the SVP. The predominant industries in the area are Agriculture/Ranching and outside recreation/tourism.

Discussion

The SVP: Visitor Center is in a rural area and the property is currently zoned AP-Agricultural Preserve and R-10 Rural Residential. Nearby uses include agriculture, agriculture with retail sales, quarry/mining, outdoor recreation, and residential. The SVP will generate new trips as daily visitors and as participants in educational, experiential, and other special events. There is not an anticipated arrival or departure peak-hour for Daily Visitors. For all other events, there will be anticipated arrival and departure times based upon the programming of the event.

The Seasonal Peak (August) Daily Traffic Two-Way Volume for A-23 was provide by Plumas County Department of Public Works.

Traffic Counts

Beckwourth Calpine Road (A23)

Year	Highway 70	County Line
2011	921	677
2018	982	806

[1] *Plumas County Regional Transportation Plan Final - 2010*

EXHIBIT H

The proposed project has outlined existing and projected daily activity as follows:

Existing Daily Usage

Peak Daily Individual Visitor: 30-40 people/day

Average Daily Individual Visitor: 5-15 people/day

Existing Special Events

Typical Event: 30-60 people/day (4 events/year)

School Groups: 30-60 people/day (1-2 buses)

Large Events: 60-100 people/day (3 events/year)

Projected Daily Usage

Peak Daily Individual Visitor: 60-80 people/day

Average Daily Individual Visitor: 15-30 people/day

Projected Special Events

Typical Event: 30-60 people/day (4 events/year)

School Groups: 60-90 people/day (1-3 buses)

Large Events: 100-150 people/day (5 events/year)

Trips Per Day

Existing Event Peak: 64 trips/day

Projected Event Peak: 100 trips/day

Given the rural and somewhat distal location of the preserve from population centers of Auburn, Truckee, Reno/Sparks, and Susanville it would be unlikely to expect significant day trip visitors from those areas other than individuals and groups attending events or specific seasonal recreation opportunities like bird watching during spring migration (May). The Sierra Valley is generally busier in the summer months when school is out, and outdoor recreation is optimal. It is also reasonable to assume that as SVP becomes more well known that an increase in pass-by trips will occur as people driving by elect to stop at SVP.

The Caltrans threshold for determining the need for a Traffic Study would be based upon generating a 100 new peak-hour trips. The proposed project is anticipated to generate 100 trips/day during Large Events at a frequency of 5 Large Events/year. Given the current A-23 traffic volume, no existing Level of Service issues, and infrequent Large Events it does not appear that a formal Traffic Study would be warranted.

Forecasting future traffic patterns, of a unique use, in a fairly remote location is inherently difficult. The project applicant recognizes that some form of traffic planning may be required in the future and is open to developing a monitoring plan with the Plumas County Dept. of Public Works as an adaptive management measure. The intent of the monitoring plan would be the formal assessment of usage patterns over time to determine if further analysis is required. The monitoring and/or analysis requirements could either be threshold based (e.g. increase in traffic volumes) or time based (e.g. every 10 years).

Regarding the egress and ingress to SVP from A-23, the project is proposing commercial access design consistent with Caltrans standards. Design includes sight distance based upon traveling speed and geometry for anticipated large vehicles (bus, EMS, etc.).

Conclusion

Given the modest amount of expected usage within an undeveloped rural area it is not expected that Trip Generation from the project poses a significant and unavoidable impact.

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Sierra Valley Preserve
Project Traffic Analysis
And Recommendations

August 31,2020

181 Austin Road
APN: 052-220-025
Plumas County, California

PR Design and Engineering, Inc.
P.O. Box 1847
Kings Beach, CA 96143
530.546.4500 tel

EXHIBIT 15

Purpose & Scope

The purpose of this memo is to quantify the expected trip generation at the Sierra Valley Preserve (SVP): Visitor Center as part of the Special Use Permit process. This analysis will address trip generation and discuss methods for management of potential traffic impacts.

Plumas County is comprised of approximately 2,618 square miles of land. Approximately 24 percent of the land is in private ownership (400,000 acres), while the remaining 76 percent is national forest land (1,245,000 acres). The southern range of the Cascades, the northern range of the Sierra Nevada, the Feather River Canyon and Lake Almanor comprise the predominant geographical features of the County.[1] Portola is the only incorporated City located in the Sierra Valley and has a population of approximately 2,200 and is 5.5 miles from the SVP. The predominant industries in the area are Agriculture/Ranching and outside recreation/tourism.

The Plumas County Department of Public Works has provided comments from an initial review of the project and follow-up conversations. This document will address the following:

1. Review project generated trips and their affect on peak hour trips consistent with Caltrans Trip Generation Thresholds.
2. Discuss project generated trips at existing intersections.
3. Discuss peak hour trips for each access point including description of existing traffic.
4. Review the turning movements for each access point.
5. Discuss proposed ingress/egress location and any recommended improvements.

The choice of day and time period for analysis was selected from review of the traffic characteristics of the adjacent street system, A-23 Beckwourth Calpine Rd, and input from Plumas DPW. The project location's peak hour is PM on a typical Friday in August. In typical scenarios, project review of a proposed land use would focus the analysis on new traffic volume generated during the traditional commuting peak hours. The expected usage (birding, outdoor recreation, education, and nature interpretation) at the SVP is not expected to peak at the same time as the adjacent streets.

Overview

The SVP Visitor Center is in a rural area and the property is currently zoned AP-Agricultural Preserve and R-10 Rural Residential. Nearby uses include agriculture, agriculture with retail sales, quarry/mining, outdoor recreation, and residential. The SVP will generate new trips with daily visitors and participants in educational, experiential, and other special events. There is not an anticipated arrival or departure peak-hour for Daily Visitors as different user groups arrive at different times of day. Birding and wildlife viewing are expected at dusk and dawn hours. Educational groups are expected to arrive after morning commute hours and depart before the

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[1] *Plumas County Regional Transportation Plan Final - 2010*

evening commute. Outdoor recreation users will be dispersed over the daylight hours. Interpretive participants are expected late morning to early afternoon.

SVP events have the potential to generate trips during a 3-4-hour period, the anticipated arrival and departure time will be based upon the programming of the event. For example, a Birding Event would commence pre-dawn and end late morning whereas a Fundraising Event may begin late afternoon and end early evening.

Existing Conditions

The SVP is located between Plumas County Rte A-23 and Rte A-24 in the northern extent of the Sierra Valley. The northern portion of the preserve is bounded by the Union Pacific Railroad. See Exhibit 1.

A-23 is a two-lane roadway with a speed limit of 65 mph, it connects to State Route 70 (SR70) to the North and to State Route 89 (SR89) and State Route 49 (SR49) to the South. It is also described as the Beckwourth Calpine Rd.

A-24 is a two-lane roadway with a speed limit of 55 mph it connects to State Route 70 (SR70) to the North and to State Route 49 (SR49) to the South. It is also described as the Beckwourth Loyalton Rd.

There are two existing entrances to the preserve the West Entrance (A-23) and the East Entrance (A-24).

A preliminary site distance analysis was performed at the West Entrance (A-23). The posted speed limit is 65 mph and a design speed of 65mph was used. The design speed was selected based upon a sight visit and driving the approach to the entrance from the north and south. There is a modest amount of vertical curvature of the road that is rolling near the entrance but, does not impede the ability to spot oncoming vehicles. The Caltrans Highway Design Manual requires a site distance of 660 ft, see Exhibit 4. The required site distance is achievable at the West Entrance per Exhibit 3.

A preliminary site distance analysis was not performed for the East Entrance (A-24) because there is little to no expected change in traffic patterns at this location.

Traffic Volumes

As part of the project diligence we reviewed the following data provided by Plumas County Dept. of Public Works.

PM Peak HR Counts

Beckwourth Calpine Road (A23)

Year	North Bound	South Bound
2018	92	64
2020	80	73

PM Peak HR Counts

Beckwourth Loyalton Road (A24)

Year	North Bound	South Bound
2018	-	-
2020	11	9

Trip Generation

The proposed project and existing rural setting are unique, and they do not have correlating ITE Trip Generation rates for Land Use. Currently the preserve is not open to the public and we cannot perform data collection to estimate the trip generation for the project. The number of trips are estimated from the review of current traffic patterns and the experience the Feather River Land Trust has at other locations. It is estimated is that summer weekend and holidays will have the greatest activity and that summer weekdays would be 50-70% less than weekend and holidays. It is also relevant to consider that peak birding happens from late April to Early June pending the amount of snowpack runoff. Trip Generation from October to April is expected to be 10% of average daily summer use.

The proposed project has estimated existing (from limited public operations) and proposed daily activity (at 5yrs) as follows:

Existing Daily Usage - Summer

Weekend Peak Daily Individual Visitor: 20-30 people/day

Average Daily Individual Visitor: 5-15 people/day

Existing Special Events

Typical Event: 30-60 people/day (4 events/year)

School Groups: 30-60 people/day (1-2 buses)

Large Events: 60-100 people/day (3 events/year)

Projected Daily Usage -Summer

Weekend Peak Daily Individual Visitor: 60-80 people/day

Average Daily Individual Visitor: 15-30 people/day

Projected Special Events

Typical Event: 30-60 people/day (4 events/year)

School Groups: 60-90 people/day (1-3 buses)

Large Events: 100-150 people/day (5 events/year)

Trips Per Day

Existing Event Peak: 64 trips

Proposed Summer Weekend: 50 trips/day with 50% (25) being pass-by

Proposed Summer Weekday: 28 trips/day with 40% (11) being pass-by

Projected Event Peak: 100 trips/day

Given the rural and somewhat distal location of the preserve from population centers of Auburn, Truckee, Reno/Sparks, and Susanville it would be unlikely to expect significant day trip visitors from those areas other than individuals and groups attending events or specific seasonal recreation opportunities like bird watching during spring migration (May). The Sierra Valley is generally busier in the summer months when school is out, and outdoor recreation is optimal. It is also reasonable to assume that as SVP becomes more well known that an increase in pass-by trips will occur as people traveling by elect to stop at SVP.

The Caltrans threshold for determining the need for a Traffic Study would be based upon generating a 100 new peak-hour trips. The proposed project is anticipated to generate 100 trips/day during Large Events at a frequency of 5 Large Events/year. For the PM peak hour on a Friday, the project is estimated to contribute 10 peak hour trips. Given the current A-23 traffic volume, no existing Level of Service issues, expected peak hour trips and infrequent Large Events it does not appear that a formal Traffic Study would be warranted.

Trip Distribution and Assignment

It is expected that 50% of the trips will come from the North via SR 70 (Quincy-Reno via I-395) and 50% of the trips from the South SR 89 and SR 49 (Truckee/Tahoe and Nevada City). The closest intersection of A-23 and SR 70 is approximately 1.1 mi from the project site. The estimated vehicle peak hour trips and turning movements for each SVP entrance intersection can be seen on Exhibit 1.

Proposed Conditions

The proposed project would create a new project access to the SVP headquarters location and parking area.

Project Access

Regarding the egress and ingress to SVP from A-23, the project is proposing commercial access design consistent with Caltrans standards. Design includes sight distance based upon traveling speed and geometry for anticipated large vehicles (bus, EMS, etc.). See Headquarters Sight Distance Exhibit 2 for required site distances at design speed of 65 mph.

Recommendations

Forecasting future traffic patterns, of a unique use, in a rural location is inherently difficult. The project applicant recognizes that some form of traffic planning may be required in the future and is open to developing a monitoring plan with the Plumas County Dept. of Public Works as an adaptive management measure. The intent of the monitoring plan would be the formal assessment of usage patterns over time to determine if further analysis is required. The monitoring and/or analysis requirements could either be threshold based (e.g. increase in traffic volumes) or time based (e.g. every 10 years).

The following recommendations were developed with Plumas Dept. of Public Works:

- SVP will provide a scheduled event calendar to Public Works on an annual basis
- SVP will procure all Special Events for the calendar year under one permit
- SVP will avoid scheduling of a Large Event on a Summer Friday
- SVP will have a no fee permit with DPW for SVP staff to place "Special Event Ahead" signs as required by DPW
- SVP will notify California Highway Patrol and Sheriff's Department prior to Events
- SVP will collect intersection data no later than 5 years after project completion or per request of DPW
- SVP will prepare a formal traffic analysis when data collection shows more than 60 trip increase in PM peak hour for a summer Friday.
- SVP Site Improvements will include Caltrans standards for the egress and site distance requirements

Conclusion

For the purposes of project entitlement and CEQA clearance, the Trip Generation from the proposed project does not pose a significant and unavoidable impact to the environment or public safety. Implementation of the above recommendations will allow for appropriate management as the project becomes more well known over time. Creation of construction documents, after project entitlement, will allow for additional technical input from Plumas DPW, project team, and area stakeholders prior to construction.

Parking Demand Narrative

Sierra Valley Preserve
181 Austin Road
APN: 052-220-025
Plumas County, California

Purpose & Scope

The purpose of this memo is to quantify the expected parking demand at the Sierra Valley Preserve: Visitor Center as part of the Special Use Permit process. This analysis will address the daily parking demand with event and special event parking demand.

Discussion

Typical parking demand calculation would be based upon land use multipliers for the proposed land use. These are typically provided by the Agency issuing permits or are published factors from the Institute of Traffic Engineers (ITE). In this rural location in Plumas County there are not established factors for a visitor center and nature preserve. Additionally, there are not published factors from ITE that are representative of the visitor center or a nature preserve offering nature viewing, interpretive exhibits, and human powered recreation. The nearest published factor is Public Park but, use of this demand generator was eliminated because the study sites were located in urban/suburban locations near population centers. Without a code directed approach, published factors, or a nearby (regional) similar facility we have forecasted parking demand from Land Trust prior events, similar conservation/recreation use patterns, and the intended future events.

The following tables represent parking demand maximums and it is expected that average daily parking requirements will be significantly lower in non-peak months. We have modeled the average daily demands from expected midweek and weekend usage.

DAILY PARKING DEMAND TABLE:

DESCRIPTION	USE MULTIPLIER	PROGRAM AREA / 1000 SF	SPOTS REQUIRED	
Barn (Visitor's Center)	Custom	3,000	32	Based upon Typical Event 30-60 People plus 10 Volunteers/Vendors
Shed (Exhibit Space)	Custom	2,000	5	Based upon Interpretive Vieweing during Event
Shop (Workshop)	1.5 per 1000SF	2,000	3	Informed by typical work groups
			40	Located at New Parking Area, does not include 2 School Bus spots
		Average Daily Midweek	**8**	1 Employee; up to 7 Visitor cars at one time
		Average Daily Weekend	**18**	2 Employee; up to 16 Visitor cars at one time

SPECIAL EVENT PARKING DEMAND TABLE:

DESCRIPTION	USE MULTIPLIER	PROGRAM AREA / 1000 SF	SPOTS REQUIRED	
Event Employees/Volunteers	Custom	-	15	Either Event Staff, Volunteers and/or Vendors
Attendees	Custom	-	50	Assumes 2-3 per vehicle
SVP Staff	Custom	-	5	Informed by typical staffing at similar events
			70	Includes New Parking and Overflow Parking along entrance

EXHIBIT 16

Conclusion

This analysis is forward looking for a period of 5 years. It is reasonable to anticipate that the Preserve will become more well-known and as a result there would be an increase in daily visitors during peak months. Increased daily visitation is not expected to exceed capacity as there is additional capacity because the typical event parking exceeds the average daily parking demand.