ENGINEER'S DESIGN REPORT

Willows-Glenn County Airport

Aircraft Wash Rack & Containment/Evaporation Pond Construction Project

AIP No. 3-06-0279-04

Prepared for
County of Glenn

and
Federal Aviation Administration

Prepared by
Mead & Hunt

JULY 2012

I. PROJECT SCOPE

This report documents the design of an Aircraft Wash Rack and Containment/Evaporation Pond and associated improvements at Willows-Glenn County Airport. This work is being funded under Airport Improvement Program (AIP) No. 3-06-0279-04.

Specifically, the improvements included in this Project are:

- Construction of an aircraft wash rack
- Construction of a containment/evaporation pond

II. DESIGN STANDARDS

The methodologies used in developing designs for this Project are in conformance with applicable FAA standards. The following Advisory Circulars have been reviewed during the design of the Project:

AC 150/5300-13	*Airport Design*
AC 150/5320-5C	*Surface Drainage Design*
AC 150/5370-2F	*Operational Safety on Airports During Construction*
AC 150/5370-10E	*Standard for Specifying Construction of Airports*
AC 150/5320-15A	*Management of Airport Industrial Waste*
AC 150/5200-33B	*Hazardous Wildlife Attractants On or Near Airports*

III. TOPOGRAPHIC SURVEYS

Topographic surveys of the proposed construction site were performed by the County of Glenn. The results of these surveys were used to create a digital terrain model (DTM) of the Project area and generate the existing ground contours. A finished ground DTM was created and used to evaluate proposed ground elevations and paving transition slopes. Existing and finished ground DTMs were used to evaluate placement of the wash rack and evaporation pond, perform cut and fill calculations, and develop cross sections of the proposed site.

IV. GEOTECHNICAL INVESTIGATION

CGI Technical Services Inc. performed a geotechnical investigation that included evaluation of surface and subsurface conditions. This information is used to provide geotechnical engineering recommendations related to the design and construction of the Project, and to identify potential geologic hazards that could impact the Project. The subsurface characterization estimated the depth, profile, consistency, strength, and grain-size distribution of the soils that might be encountered during Project construction, along with the general depth to groundwater. The investigation included sampling subgrade soils.

Field geotechnical investigation was limited to reconnaissance-level geologic mapping of the Project site and subsurface exploration through excavation of three backhoe test pits. The test pits, designated TP-1 through TP-3, were excavated on January 26, 2012. Detailed descriptions of soils encountered are represented on the test pit logs included in *Appendix A*. The soils encountered within the excavations

were logged in general accordance with the Unified Soil Classification System (USCS). Surficial and subsurface soil samples were collected and tested.

California Bearing Ratio (CBR) tests were performed on representative samples of the subgrade, and a CBR of 6 is recommended for pavement design. The geotechnical investigation found that unstable soil and perched water tables may be encountered during construction. The Geotechnical Investigation Report is included as *Appendix A* of this report.

III. ANALYSIS AND DESIGN

A. PRELIMINARY DESIGN REPORT. A preliminary design report was submitted to the County on April 10, 2012. The preliminary report summarized the preliminary design criteria and design approach for this project. The County submitted their comments on the preliminary design report and these comments are incorporated within this engineering design report.

B. DESIGN AIRCRAFT AND LOADING. Willows-Glenn County Airport is rated as a B-I airport and currently serves both small general aviation aircraft and agricultural aircraft weighing up to 7,000 lbs. at maximum takeoff weight. Due to the possible use of the wash rack by fuel trucks or emergency vehicles, an equivalent aircraft design load of 30,000 lbs. was used for the pavement section design.

C. PAVEMENT DESIGN. The FAA program FAARFIELD was used to design the wash rack pavement section. The program minimum result was 6-inches of PCC over 5-inches of aggregate base. To be conservative, allow for inconsistent soft soil areas, and to allow for possible future heavier aircraft use, the chosen design was 6-inches of PCC over 6-inches of aggregate base. The PCC pad will contain rebar reinforcement. See *Appendix B* for design calculations.

D. PLANNING ANALYSIS.

i. **AIRCRAFT WASH RACK.** The Aircraft Wash Rack will be a 50-foot x 50-foot PCC pad, located adjacent to the southeasterly edge of the aircraft parking apron. Wash equipment shall include: control pedestal; hose bib, hose reel and hose; control switch with timer that activates a solenoid valve on the water supply line; and a 20-amp, GFI-protected, electrical outlet in a water proof enclosure. Wash system is controlled by a timer-activated solenoid valve that automatically shuts the water off in a selected time interval, thus preventing water from being wasted, and activates a sump pump located in the third chamber of a sand/oil separator.

When the wash rack is not in use, storm run-off will simply sheet flow from the PCC pad into the drain inlet, then via piping into the sand/oil separator where suspended solids, grease, and oil will be trapped. Petro-chemicals will be absorbed into floating pillows inside the sand/oil separator chambers. Storm water will then discharge into an open ditch via gravity-flow. Routine maintenance to replace saturated pillows and dispose of accumulated solids will be required. Based on usage, the County will need to determine when these routine maintenance actions should be performed.

When the wash rack is in use, wash water run-off will also be directed into the sand/oil separator, where the timer controlled relay will activate the sump-pump, which will discharge wash effluent into the containment/evaporation pond, where it will evaporate.

The containment/evaporation pond is sized to accommodate normal aircraft wash activities. Design incorporates a safety factor to ensure the containment structure will not overflow by providing a float-controlled switch that will shut-off the water supply to the wash rack and activate a warning light when the structure is full. Solar evaporation will be the primary means of wash water disposal.

ii. **POLLUTION CONTROL FACILITY (PCF).** The aircraft wash rack operates as described above. This facility will prevent polluted effluent from directly entering the storm drainage system or surface run-off. The PCF includes a sand/oil separator, control valves, piping and a covered shallow-depth containment/evaporation structure. Aircraft wash water will be captured in a drain inlet at the low point of the PCC pad and be routed into the sand/oil separator where solids and oils will be trapped. Upon exiting the separator, wash water will be pumped to the containment/evaporation structure where the water will evaporate. The containment/evaporation structure will be PCC, and approximately 10 feet x 80 feet, at a depth of 3 feet. The pond will be elevated to prevent surface run-off from entering and covered to prevent it from filling with rainwater. The elevated pond will be constructed with 6-inch thick walls, and sit on a 6-inch thick aggregate base rock pad. The PCC pad will be underlain by a PVC liner to prevent any contaminated water from leaching into the ground.

An off-the-shelf greenhouse structure will be used to cover the containment/evaporation structure. A greenhouse style cover will allow solar evaporation to take place while preventing rainwater from filling the pond. Additionally, a cover will satisfy the FAA requirements for mitigating bird attraction, and prevent people or animals from inadvertent exposure to hazards.

E. **DEMOLITION WORK.** Approximately 95 linear feet of chain-link fence shall be removed from the Project area. The fence shall be re-routed to include the proposed Project limits.

Approximately 3,090 square feet of the existing gravel service road will be demolished. The road shall be re-routed around the proposed Project limits.

One existing aircraft tie-down spot on the AC apron will be removed to provide aircraft access to the wash rack. The associated marking and metal anchors shall be removed.

F. **RE-ROUTE SERVICE ROAD DESIGN.** A portion of the existing gravel service road lies directly in the construction area for the PCC pad of the wash rack. Approximately 315 linear feet of the road will be re-routed prior to construction of the wash rack and pollution control facility. The re-routed section of the road is approximately 300 linear feet, and will be 8-inches of aggregate base. The majority of the aggregate base for the re-routed road will be recycled road base from the existing road. An intersecting Airport access road will likewise be slightly re-routed outside of this area.

G. **FENCE & GATE DESIGN.** The existing fence in the area adjacent to the proposed site for the aircraft wash rack and controls will be routed around the new construction. Proposed alignment

shall run between the well pump house and the PCC pad and along the backside of the wash rack PCC pad. A pedestrian access gate will be installed next to the pump house. A new 20 foot wide, double swing vehicle gate will be located on the newly re-routed service road.

H. **POWER SERVICE.** A 110/220v, 30 amp power service is required. A new meter and service will be installed from the existing service drop at the County Animal Control Building adjacent to the Project site. Underground conduits will be routed around the building and to the new wash rack location.

I. **WATER SERVICE.** Water service to the wash rack will be provided either from the adjacent water well or from the city water service CALWATER which provides water to businesses in the airport area. The water from the well is currently being tested to see if it meets drinking water standards so that a determination of the water service source can be made.

J. **DRAINAGE DESIGN.** As part of the re-routed service road work, an existing 18-inch culvert under the existing service road will be removed and a new 18-inch culvert will be placed under the new re-routed service road. The drainage from the wash rack is discussed above in Section C-i.

K. **EROSION CONTROL DESIGN.** The natural drainage ditches and storm drain inlets will be protected from silt runoff during construction with straw wattles. Immediately after construction completion, the disturbed ground will be hydroseeded to establish plant growth.

IV. AIRPORT SAFETY AND OPERATIONS DURING CONSTRUCTION

A. **Runway Closure.** Runway closure will not be required for this project. No work is anticipated within the Runway Safety Areas (RSA).

B. **Taxiway/Taxilane Closure.** A 240 foot length by 90 foot wide section of the southeasterly most parking apron taxilane will be closed and barricaded during construction.

C. **Apron Closure.** The five most southeasterly parking locations on the parking apron will be barricaded and closed during construction.

A Construction Safety and Phasing Plan (CSPP) has been prepared and submitted to the FAA as a separate document and a copy is included in Division IV of the specifications.

V. ENGINEER'S COST ESTIMATE

The construction Project will be funded by the FAA's Airport Improvement Program (AIP). The grant will be awarded based on the competitive bidding process. The estimated construction budget for this Project is approximately $176,000, not including County Administration costs or Construction Management Services.

A detailed breakdown of construction costs for the Project is presented in *Appendix C*.

VI. CONSTRUCTION PHASING AND TIME OF COMPLETION

This Project will be completed in two distinct elements: Mobilization and Construction. The overall time for completion of this Project is forty (40) working days.

A. MOBILIZATION. Notice to Proceed with Mobilization will be given immediately after the award of the Contract. All work included in the Mobilization phase shall be completed within fifteen (15) working days. During this phase of the Project, no work shall be conducted that in any way restricts Airport operations. Mobilization work shall include, but not be limited to, the following:

1. Processing of required submittals, including the Contractor's work schedule.
2. All prequalification testing, review, and approval.
3. Mix design preparation, review, and approval.
4. Airfield Safety Devices delivered to site (barricades).
5. All miscellaneous Mobilization efforts required to commence construction.
6. Materials and equipment delivered to site.

It is the County's intent that all preliminary work required to pursue construction to completion be finalized during the Mobilization phase to minimize delays during construction.

B. CONSTRUCTION. Notice to Proceed with the Construction phase shall be issued at the County's discretion after the completion of Mobilization. All work included in the Construction phase shall be completed within twenty five (25) calendar days.

There are mandatory requirements and associated liquidated damages, if the specified timeframes are not met.

C. LIQUIDATED DAMAGES. If the overall time limitation for any element of work not be met, liquidated damages of $1,000 per calendar day will be assessed.

VII. CONTRACT DOCUMENTS

A. BID DOCUMENTS AND GENERAL PROVISIONS. Bid Documents and General Provisions are based on FAA Specifications. Any changes to FAA Standard sections have been italicized. The FAA-required "Requirements for Bids for AIP Contracts" are included as Division II of the Project Specifications.

B. TECHNICAL SPECIFICATIONS. Technical Specifications for this Project are all adapted and modified from FAA or Caltrans Standard Specifications. Where references to a Standard Specification are made, the standards are referred to for information purposes only. All of the information the Contractor needs to complete the work is contained within the Project Plans and Specifications.

VIII. CONSTRUCTION INSPECTION AND TESTING

Construction inspection will be provided by Mead & Hunt, Inc. Quality Control and Quality Assurance testing will be provided by the Contractor. The Engineer shall review the test results for compliance with the Contract Documents.

IX. SPONSOR CERTIFICATION FOR PROJECT PLANS AND SPECIFICATIONS

A copy of the Sponsor Certification for Project Plans and Specifications is included as *Appendix D.*

Respectfully submitted by,

MEAD & HUNT, Inc.

Tad Thurston, P.E.
Project Engineer

Lee Moen, P.E.
Vice President
Manager of Engineering

Appendices:

Appendix A	*Geotechnical Investigation Report*
Appendix B	*Pavement Design Computations*
Appendix C	*Engineer's Cost Estimate*
Appendix D	*Sponsor Certification for Project Plans and Specifications*

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Appendix A

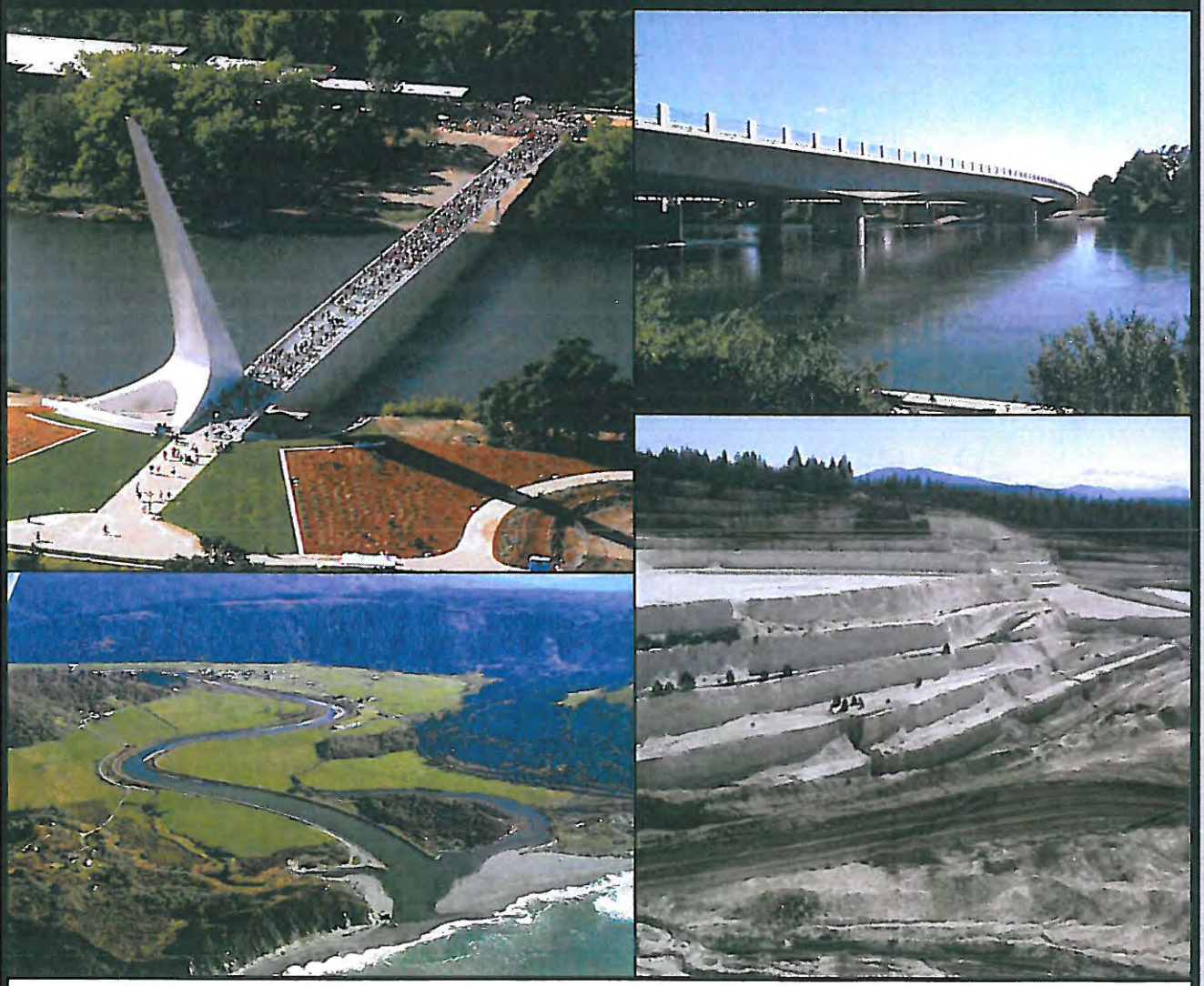
Geotechnical Investigation Report

GEOTECHNICAL STUDY

WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN COUNTY AIRPORT
WILLOWS, CALIFORNIA

Prepared For:

Mead & Hunt, Inc.



CGI TECHNICAL SERVICES INC.

Mead & Hunt

CGI TECHNICAL SERVICES INC.

March 26, 2012
CGI: 11-1144.58

Mr. Richard Lichau
MEAD & HUNT, INC.
133 Aviation Boulevard, Suite 100
Santa Rosa, California 95403

Subject: **Geotechnical Report**
Willows-Glenn Airport
Wash Rack & Related Improvements
Willows, Glenn County, California

Dear Mr. Lichau:

CGI Technical Services, Inc. (CGI), is pleased to submit this geotechnical report for the proposed design of the wash rack and related improvements at the Willows-Glenn Airport located in Willows, Glenn County, California. This report presents our findings, conclusions, and recommendations for design of the proposed development.

We appreciate the opportunity to perform this study and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact Jim Bianchin at (530) 244-6277 at your earliest convenience.

Regards,

CGI TECHNICAL SERVICES, INC.

James A. Bianchin, C.E.G.
Senior Engineering Geologist

Azeddine Bahloul, P.E.
Senior Engineer

Copies: Three (3) hardcopies and one (1) electronic file (PDF)

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1.0 GENERAL

This report presents the results of our geotechnical study for a new wash rack facility at the Willows-Glenn County Airport (Airport) located in the City of Willows, California. CGI Technical Services, Inc. (CGI), has prepared this report at the request of Mead & Hunt, Inc. (Mead & Hunt). The project location is shown on Plate 1 – Site Location Map. The following sections present our understanding of the project, the purpose of our study, and the findings, conclusions, and recommendations of this study. Our services were performed in general compliance with our proposal dated December 8, 2011.

1.1 PROJECT UNDERSTANDING

We understand that the project consists of the design of a number of improvements at the subject airport. Two improvements require geotechnical input for design: a proposed wash rack and a proposed evaporation pond. The project elements are shown on Plate 2 – Project Elements. The wash rack and evaporation pond are proposed for undeveloped sites located southeast of the existing animal control facility.

The wash rack is anticipated to have dimensions of about 65 feet long and 55 feet wide. It will be situated about 80 feet southeast of the animal control facility. The configuration of the wash rack on site is unknown at the time this report was prepared but it is anticipated that drainage collection systems could extend a few to many feet below the existing grade. It is also anticipated that grading will be required to elevate the existing grade and create a flat development pad.

Wash water collected from the wash rack will be collected and transferred to an evaporation pond located east of the project site. The evaporation pond is proposed to be about 80 feet long and 10 feet wide. The depth of the pond is unknown at this time but anticipated to be a few to many feet below the ground surface. It is anticipated that pond sidewalls will be constructed at inclinations no steeper than 2:1 and that the pond will be lined.

As part of the project, an existing gravel road will be destroyed and relocated south of its current location. Once constructed, new fencing and gates will be constructed to reduce access to the site.

1.2 STUDY PURPOSE

The purpose of our geotechnical study was to explore and evaluate selected site surface and subsurface conditions in order to provide geotechnical engineering recommendations related to the design and construction of the project, and to identify potential geologic hazards that could impact the project. The subsurface characterization was primarily intended to estimate the depth, profile, consistency, strength, and grain-size distribution of the soils that might be encountered during project construction, along with the general depth to groundwater.

1.3 PREVIOUS WORK PERFORMED

Our review and research of the site found no existing geotechnical work performed for the site; however, some environmental studies to estimate depth and extent of contaminates and groundwater have occurred adjacent and east of the site. We attempted to obtain those environmental studies from the California State Water Control Board's Geotracker database, which did not contain those data.

In addition, regional geotechnical and groundwater data are available locally around the project area. A geotechnical report for a fast-foot restaurant in Willows was obtained and reviewed as part of this study. Groundwater data were obtained from the California Department of Water Resources (DWR) Water Database and from the California State Water Control Board's Geotracker database. Those references along with regional geologic and other sources cited are present in the References Section of this report.

1.4 SCOPE OF SERVICES

Services performed for this study are in general conformance with the proposed scope of services presented in our December 8, 2011 proposal. Our scope of services included:

- Reconnaissance of the site surface conditions, topography, and existing drainage features;
- Attempted acquisition of existing, available geotechnical and groundwater data for the project site;
- Review of pertinent, selected regional geological data;
- Exploration of the subsurface conditions within the project site using test pits. Exploration locations are shown on Plate 3 – Geotechnical Map. Exploration procedures and exploration logs are presented in Appendix A – Subsurface Exploration;
- Performance of laboratory testing on selected samples obtained during our field investigation. Laboratory test procedures and results of those tests are presented in Appendix B – Laboratory Testing;
- Preparation of this report, which includes:
  - A description of the proposed project;
  - A summary of our field exploration and laboratory testing programs;
  - A description of site surface and subsurface conditions encountered during our field investigation;
  - A description of ground shaking conditions expected at the site, including CBC seismic design criteria;
  - Recommendations for:
    - Site preparation, engineered fill, site drainage, and subgrades;
    - Suitability of on-site materials for use as engineered fill;
    - 2010 CBC seismic design criteria;
    - Concrete slabs on-grade;
    - Temporary excavations, shoring, and trench backfill;
    - Allowable bearing capacities and class of soil type for foundation design and construction.
  - Appendices that present a summary of our field investigation procedures and laboratory testing programs.

2.0 FINDINGS

2.1 FIELD INVESTIGATION

CGI conducted a geotechnical field investigation to evaluate subsurface soil conditions, and to provide subsurface data for evaluation of the proposed development. Our field geotechnical investigation was limited to reconnaissance-level geologic mapping of the project site and subsurface exploration through excavation of three backhoe test pits. The test pits, designated TP-1 through TP-3, were excavated on January 26, 2012. Test pit locations are shown on Plate 3. Detailed descriptions of soils encountered are presented on the test pit logs included in Appendix A. The soils encountered within the excavations were logged in general accordance with the Unified Soil Classification System (USCS). Surficial and subsurface soil samples were collected and transported to our laboratory for testing. Laboratory test results are included with this report.

2.2 SITE CONDITIONS

2.2.1 Surface Conditions

The project is located on a relatively flat site east of and adjacent to the paved agricultural application tarmac at the Airport. The wash rack site is unpaved, contains scattered vegetation and debris, and is moderately hummocky from past ground disturbance. It is bordered to the west by a fence separating the site from airport tarmac, to the north by the existing Animal Control facility, to the east by fallow ground, and to the south by an unpaved access road.

The proposed evaporation pond site is generally flat and covered with gravel and small cobbles, and scattered vegetation consisting of low seasonal shrubs and tumble weeds. The site is bordered to the west by a fence separating the site from airport tarmac, to the north by an unpaved access road, to the east by fallow ground, and to the south by a debris-laden field and industrial park. The pond area is traversed by two drainage ditches: one to the southwest along the fence line separating the pond from the tarmac and one located along the northeast portion of the site. Both ditches are oriented in a northwesterly direction.

Project elevation is about 135 feet above mean sea level (MSL) according to the U.S. Geological Survey Willows Quadrangle 7.5-Minute topographic map. Drainage occurs as sheet flow towards the southeast. Drainage swales capture and convey sheetflow away from the project site.

2.2.2 Subsurface Conditions

Soils encountered beneath the ground surface consisted predominately of silty clay to clayey silt to the depths explored. These materials are considered Basin Deposits and can be locally interbedded with clayey sand, sandy clay, and sand. Sandy clay and clayey sand were encountered to a depth of 10 to 16.5 feet with sand below, at a site located about 2,000 feet northeast of the site. Similarly, interbedded silts and sands were encountered to depths of up to 55 feet in drill holes advanced at a service station site located about 1,800 feet northeast of the project site (Cambria, 2005).

In addition, disturbed soils and/or artificial fill were encountered at both the wash rack and evaporation basin sites. At the wash rack site, the upper 18 to 24 inches of soils were disturbed and some debris, consisting of brick, wood, and charred materials, was present within those soils. The site was reportedly a former incinerator site for Glenn County's Health Department and, as such, some former medical waste that was not fully incinerated was been observed at this site (Ken Dunn, personal communication with Jim

Bianchin on January 26, 2012). Artificial fill at the evaporation pond site was observed to consist of 8 to 12 inches of sand, gravel, and cobbles that had been placed on the ground surface at that site.

The logs in Appendix A present specific soil and rock descriptions encountered within each test pit advanced by CGI during this study.

2.3 GEOLOGIC CONDITIONS

2.3.1 Regional Geology

The project site is located in the northern Sacramento Valley within the Great Valley Physiographic province. The Great Valley province is bordered to the north by the Klamath and Cascade Physiographic provinces, to the east by the Cascade and Sierra Nevada Physiographic provinces, to the west by the Klamath and Coast Ranges Physiographic provinces, and to the south by the Transverse Ranges Physiographic province.

The Great Valley Physiographic province is about 50 miles wide and 400 miles long. The Sacramento Valley, which forms the northern portion of the province, is about 150 miles long and 40 miles wide (Hinds, 1952). According to Hackel (1966), "The Great Valley is a large elongate northwest-trending asymmetric structural trough that has been filled with a tremendously thick sequence of sediments ranging from Jurassic to recent." Sediment thicknesses of up to 10 miles are reported within the Sacramento Valley; however, in the project area, being at the northern margin of the valley, those thicknesses have been projected to be less than one mile (Hackel, 1966). Sediments within the Great Valley consist of both marine and continental deposits, with most of the sediments underlying the project area consisting of continental deposits.

2.3.2 Local Geologic Setting

The local materials consist of artificial fill materials and the Basin Deposits. Artificial fill materials were observed at both the wash rack and evaporation pond sites during this study. The artificial fill materials are discussed in greater detail in Section 2.2.2 above. Underlying the artificial fill materials are Basin Deposits (Helley & Harwood, 1985), consisting of relatively recent alluvial soils, as shown on Plate 4 – Geologic Map. Those materials consist predominately of fine-grained soils with lesser amounts of granular soils. In the project region, both fine-grained and granular soils have been observed within the upper 55 feet of the soil column, as discussed in Section 2.2.2.

2.3.3 Groundwater

Groundwater was encountered in test pit TP-3 at a depth of 4.5 feet. Groundwater was not encountered in test pits TP-2 and TP-3. Groundwater was not encountered at a fast-food restaurant site located northeast of the site but was encountered by Cambria (2006) at a depth of about 8 feet. Additionally, groundwater has been measured as shallow as 8 feet below the ground surface in regional groundwater wells monitored by DWR (2012).

The depth to groundwater can vary throughout the year and from year to year. Intense and long duration precipitation, modification of topography, and cultural land uses, such as irrigation, water well usage, on site waste disposal systems, and water diversions can contribute to fluctuations in groundwater levels. Localized saturated conditions or perched groundwater conditions near the ground surface should be anticipated during and following periods of heavy precipitation and snowmelt. If groundwater is

encountered during construction, it is the Contractor's responsibility to install mitigation measures for adverse impacts caused by groundwater encountered in excavations.

3.0 GEOLOGICAL HAZARDS

3.1 GEOLOGIC HAZARD ZONES

No mapped geologic hazards zones are known for the project region.

3.2 FAULTING & SEISMICITY

3.2.1 Seismic Setting

The State of California designates faults as active, potentially active, and inactive depending on the recency of movement that can be substantiated for a fault. Fault activity is rated as follows:

FAULT ACTIVITY RATINGS		
Fault Activity Rating	**Geologic Period of Last Rupture**	**Time Interval (Years)**
Active	Holocene	Within last 11,000 Years
Potentially Active	Quaternary	>11,000 to 1.6 Million Years
Inactive	Pre-Quaternary	Greater than 1.6 Million Years

The California Geologic Survey (CGS) evaluates the activity rating of a fault in fault evaluation reports (FER). FERs compile available geologic and seismologic data and evaluate if a fault should be zoned as active, potentially active, or inactive. If an FER evaluates a fault as active, then it is typically incorporated into a Special Studies Zone in accordance with the Alquist-Priolo Earthquake Hazards Act (AP). AP Special Studies Zones require site-specific evaluation of fault location and require a structure setback if the fault is found traversing a project site.

The site is not located within an Alquist-Priolo Earthquake Fault Zone and no active faults are known to pass through the project site (Jennings, 1994; Hart & Bryant, 1997). However, a number of regional and local faults traverse the project region. The most significant of these faults are the potentially active Corning fault and the inactive Willows fault, bot located about 6 miles northeast of the project site. The closest active fault, as zoned by the State, is the Bartlett Springs fault, located about 40 miles west of the site.

3.2.2 CBC Design Recommendations

At a minimum, structures should be designed in accordance with the 2010 California Building Code (CBC) seismic design criteria. CBC-based design requires the definition of the following seismic parameters: Site Class Designation; Site Coefficients (F_a and F_v); Mapped spectral accelerations for short periods (S_s); and Mapped spectral accelerations for a 1-second period (S_1).

CBC SEISMIC DESIGN PARAMETERS	
Parameter	**CBC Designation**
Mapped Spectral Acceleration, S_s	0.727g
Mapped Spectral Acceleration, S_1	0.286g
Site Class Designation	D
Site Coefficient, F_a	1.219
Site Coefficient, F_v	1.828

3.3 LIQUEFACTION AND LATERAL SPREADING

Liquefaction is described as the sudden loss of soil shear strength due to a rapid increase of soil pore water pressures caused by cyclic loading from a seismic event. In simple terms, it means that a liquefied soil acts more like a fluid than a solid when shaken during an earthquake. In order for liquefaction to occur, the following are needed:

- Granular soils (sand, silty sand, sandy silt, and some gravels);
- A high groundwater table; and
- A low density in the granular soils underlying the site.

If those criteria are present, then there is a potential that the soils could liquefy during a seismic event. It is our opinion that soils encountered during this study have a low potential to liquefy. This opinion is based on the fact that the in-situ soils are clay rich. Furthermore, granular sediments encountered by Cambria (2005) are generally medium dense to dense. Thus, conditions encountered during this study and reported by Cambria (2005) support our opinion that there is likely a low potential for liquefaction to occur in sediments beneath the site.

3.4 EXPANSIVE POTENTIAL

There is a direct relationship between plasticity of a soil and the potential for expansive behavior, with expansive soil generally having a high plasticity. Thus, granular soils typically have a low potential to be expansive, where as, clay-rich soils can have a low to high potential to be expansive. Atterberg limit testing performed on two selected samples recorded plasticity indices (PI) of approximately 18 and 21. Those PI values are associated with soils having a low to medium expansion potential (Day, 1999).

3.5 SOIL CHEMISTRY

A selected sample of the near-surface soil encountered at the site was submitted for limited soil chemistry testing for use in cement typing and corrosion evaluations. The results of those tests are pending and will be submitted in a separate letter once they become available.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our investigation, it is our opinion that the site is suitable for the proposed improvements provided recommendations presented, herein, are utilized during design and construction of the project. Specific comments and recommendations regarding the geotechnical aspects of project design and construction are presented in the following sections of this report.

Recommendations presented, herein, are based upon the proposed site development plan prepared by Mead & Hunt (2010), along with stated assumptions. Changes in the configuration from those studied during this investigation may require supplemental recommendations.

4.2 FAULTING

No known faults pass through the project site. Several faults have been mapped in the vicinity of the project area. The site does not lie within the boundaries of an Alquist-Priolo Earthquake Fault Zone; therefore, it is our opinion that surface rupture potential is low.

4.3 LIQUEFACTION POTENTIAL

Based on our observations and material exposed during the investigation, it our opinion that liquefaction has a relatively low risk of adversely affecting the proposed improvements.

4.4 EXPANSIVE POTENTIAL

Atterberg limit testing performed on select surficial samples recorded plasticity indices of approximately 18 and 21 for the materials that will be encountered on site This material correlates to material having a low to moderate expansion potential (Day, 1999).

4.5 LANDSLIDES & OTHER GEOHAZARD

No signs of landsliding, either former or incipient, were observed on or adjacent to the project property. It is our opinion that naturally occurring landslides pose a low risk to the project. See Sections 4.6.8 and 4.7 of this report regarding temporary and man-made slope stability issues.

4.6 SITE PREPARATION AND GRADING

4.6.1 Stripping

Prior to general site grading and/or construction of planned improvements, existing pavement, debris, and deleterious materials should be stripped and disposed of off-site or outside the construction limits. CGi should be allowed to observe stripped areas to confirm that adequate removal of debris, deleterious, and unsuitable materials have been properly stripped and removed from the site.

4.6.2 Existing Utilities, Wells, and/or Foundations

Below-grade utility lines, septic tanks, cesspools, wells, on-site waste disposal fields and tanks, irrigation ponds and/or foundations that are encountered during construction should be removed and disposed of off-site. Buried tanks, if present, should be removed in compliance with applicable regulatory agency requirements. Existing, below-grade utility pipelines (if any) that extend beyond the limits of the proposed construction and will be abandoned in-place should be plugged with lean concrete or grout to prevent

migration of soil and/or water. All excavations resulting from removal and demolition activities should be cleaned of loose or disturbed material prior to placing any fill or backfill.

4.6.3 Scarification and Compaction

Following site stripping and overexcavation, areas to receive engineered fill should be scarified to a minimum depth of 8 inches, uniformly moisture-conditioned to near optimum moisture content, and compacted to at least 90 percent of the maximum dry density as determined using standard test method ASTM D1557[1].

4.6.4 Keying and Benching

The proposed development area is located on relatively flat ground. Therefore, keying and benching are not anticipated to be required for this project.

4.6.5 Wet/Unstable Soil Conditions

If site preparation or grading is performed in the winter, spring, or early summer seasons, or shortly after significant precipitation, near-surface on-site soils may be significantly over optimum moisture content. This condition could hinder equipment access as well as efforts to compact site soils to a specified level of compaction. In addition, perched water can be present in subsurface layers throughout the year and contribute to wet soil conditions. If over optimum soil moisture content conditions are encountered during construction, disking to aerate, replacement with imported material, chemical treatment, stabilization with a geotextile fabric or grid, and/or other methods will likely be required to facilitate earthwork operations. The applicable method of stabilization is the contractor's responsibility and will depend on the contractor's capabilities and experience, as well as other project-related factors beyond the scope of this investigation. Therefore, if over-optimum moisture within the soil is encountered during construction, CGI should review these conditions (as well as the contractor's capabilities) and, if requested, provide recommendations for their treatment.

4.6.6 Site Drainage

Finished grading should be performed in such a manner that provides a minimum of 10 horizontal feet of positive surface gradient away from all structures. The ponding of water should not be allowed adjacent to structures, retaining walls, or the top of fill sections. Interceptor drains should be constructed above all cut and fill slopes to prevent water from flowing over those slopes. Surface runoff should be directed toward engineered collection systems or suitable discharge areas and not allowed to flow onto or over slopes. Discharge from roof downspouts should also be collected, conveyed in solid (unperforated) pipelines, and discharged away from all structures and into engineered systems, such as storm drains. Landscape plantings around structures should be avoided or be dry climate tolerant and require minimal irrigation. Care should be taken to avoid overwatering all landscaping.

4.6.7 Excavation Characteristics

Explorations for this project were advanced using a John Deere 310SJ backhoe using a 2-foot wide bucket. In general, earth materials encountered in the upper 10 feet of the soil profile were penetrated with

[1] This test procedure applies wherever relative compaction, maximum dry density, or optimum moisture content is referenced within this report.

relatively minimal difficulty using this equipment. It is our opinion that soils present at the site should be excavatable using conventional heavy grading equipment operated by experienced personnel.

4.6.8 Permanent & Temporary Slopes

This section explicitly excludes trench slopes for buried utilities. Temporary trench excavations are discussed in Section 4.7.1 of this report.

It is our understanding that no permanent slopes are part of this project; however, if changes to the design are made to include permanent slopes, those permanent slopes should be constructed at inclinations of 2:1 or flatter. In isolated areas where a cut slope is less than 8 feet tall, is adequately protected from erosion, and is not intended to support structures or surcharges, then the cut slope can be constructed at inclinations of 1.5:1 or flatter, per Section J106 of the 2010 CBC. Temporary construction slopes should be constructed no steeper than 1:1.

4.6.9 Overexcavation

Artificial fill materials loose disturbed soils beneath the wash rack site and loose sand, gravel, and cobbles at the evaporation pond site were encountered during exploration at the site. It is recommended that the disturbed soils beneath the wash rack site be removed down to firm and unyielding, undisturbed natural soils. It is anticipated that the depth of overexcavation will range from 12 to 24 inches. The overexcavation should extend a minimum of 5 horizontal feet outside of the building perimeter. A CGi engineer or geologist should observe and approve the overexcavated areas to confirm that those materials have been fully removed prior to placement of engineered fill materials. Overexcavated materials containing organics, debris, or deleterious materials should be removed from the project site and disposed of at an approved location.

Artificial fill within the evaporation site may be left in place provided paved access road, structure pads, and areas where other physical improvements will derive support from those materials are overexcavated. The overexcavation is anticipated to range from 6 to 18 inches and should expose firm and unyielding in-place natural soils. A CGi engineer or geologist should observe and approve the overexcavated areas to confirm that those materials have been fully removed prior to placement of engineered fill materials. Overexcavated materials containing organics, debris, or deleterious materials should be removed from the project site and disposed of at an approved location.

Areas that are overexcavated should be backfilled with engineered fill materials, in accordance with recommendations presented in Section 4.6.13 of this report.

4.6.10 On-Site Soil Materials

It is our opinion that most of the near-surface soils encountered at the site can be used for general engineered fill provided it is free of organics, debris, oversized particles (>3") and deleterious materials. When highly plastic clayey materials (materials having a plasticity index exceeding 30 and a liquid limit in excess of 50) are encountered during grading, those materials should be segregated and excluded from engineered fill, where possible, or thoroughly mixed with granular materials to reduce the plasticity of the soil. The existing artificial fill materials encountered during exploration can also be re-used as engineered fill provided those materials are screened of organics, woody debris, refuse, deleterious materials, and oversize particles (>3"). If potentially unsuitable soil is considered for use as engineered fill, CGI should

observe, test, and provide recommendations as to the suitability of the material prior to placement as engineered fill.

4.6.11 Imported Fill Materials - General

If imported fill materials are used for this project, they should consist of soil and/or soil-aggregate mixtures generally less than 3 inches in maximum dimension, nearly free of organic or other deleterious debris, and essentially non-plastic. Typically, well-graded mixtures of gravel, sand, non-plastic silt, and small quantities of clay are acceptable for use as imported engineered fill within foundation areas. Imported fill materials should be sampled and tested prior to importation to the project site to verify that those materials meet recommended material criteria noted below. Specific requirements for imported fill materials, as well as applicable test procedures to verify material suitability are as follows:

IMPORTED FILL RECOMMENDATIONS				
GRADATION				
Sieve Size	**General Fill**	**Granular Fill**	**Test Procedures**	
	Percent Passing		**ASTM**	**AASHTO**
3-inch	100	100	D422	T88
¾-inch	70 – 100	70 – 100	D422	T88
No. 200	0 - 30	<5	D422	T88
PLASTICITY				
Liquid Limit	<30	NA	D4318	T89
Plastic Index	<12	Nonplastic	D4318	T90
ORGANIC CONTENT	<3%	<3%	D2974	NA

4.6.12 Materials - Granular

All granular fill should consist of imported soil mixtures generally less than 3 inches in maximum dimension, nearly free of organic or other deleterious debris, and essentially non-plastic. Specific requirements for granular fill, as well as applicable test procedures to verify material suitability are presented in Section 4.6.11 of this report.

4.6.13 Placement & Compaction

Soil and/or soil-aggregate mixtures used for fill should be uniformly moisture-conditioned to within 3 percent of optimum moisture content, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction[2]. Testing should be performed to verify that the relative compactions are being obtained as recommended herein. Compaction testing, at a minimum, should consist of one test per every 500 cubic yards of soil being placed or at every 1.5-foot vertical fill interval, whichever comes first. We recommend that CGI be retained to perform compaction testing to verify compliance with our recommendations.

In general, a "sheep's foot" or "wedge foot" compactor should be used to compact fine-grained fill materials. A vibrating smooth drum roller could be used to compact granular fill materials and final fill surfaces.

[2] This test procedure applies wherever relative compaction, maximum dry density, or optimum moisture content is referenced within this report.

4.7 UTILITY TRENCHS AND TRENCH BACKFILL

4.7.1 Trenches and Dewatering

Utility trenches greater than 5 feet deep should be braced or shored in accordance with good construction practices and all applicable safety ordinances. In general, soils having a tendency to run or flow were not observed during our study; however, there is a potential that shallow un-shored trenches excavated with sidewalls steeper than 1:1 could locally cave. The actual construction of the trench walls and worker safety is the sole responsibility of the contractor.

Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within a 1:1 (horizontal to vertical) projection from the toe of the trench excavation to the ground surface. Where the stability of adjoining buildings, walls, buried utilities within the trench sidewalls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation.

4.7.2 Materials

Pipe zone backfill (i.e., material placed from the trench bottom to a minimum of 6 inches over the pipeline crown) should consist of imported soil having a Sand Equivalent (SE) of no less than 30 and having a particle size no greater than ½-inch in maximum dimension. On site soils will likely not meet this recommendation. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of on-site soil that meets the material requirements previously provided for engineered fill with 100% passing the ¾-inch sieve.

If imported material is used for pipe or trench zone backfill, we recommend it consist of fine-grained sand. In general, use of coarse-grained sand, crushed rock, and/or gravel is not recommended due to the potential for soil migration into and water seepage along trenches backfilled with this type of material.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local codes and/or bedding requirements for specific types of pipe. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

4.7.3 Placement and Compaction

Trench backfill should be placed and compacted in accordance with recommendations previously provided for engineered fill. Mechanical compaction is strongly recommended; *ponding, flooding, and jetting should not be allowed during construction.* It should be noted that if in rare instances, ponding, flooding, or jetting are allowed, the pipe zone backfill materials should have an SE of 50 or greater and should be less than ½-inch in maximum dimension. In addition, a number of additional conditions for collection and removal of excess ponded, flooded, or jetted water will be required if those methods are utilized during construction. Special care should be given to ensuring that adequate compaction is made beneath the haunches of the pipeline (that area from the pipe springline to the pipe invert) and that no voids remain in this space.

4.7.4 Trench Subgrade Stabilization

Soft and yielding trench subgrade could be encountered along the bottom of trench excavations. It is recommended that the bottom of trenches be stabilized prior to placement of the pipeline bedding so that, in the judgment of the geotechnical engineer, the trench subgrade is firm and unyielding. The Contractor should have the sole responsibility for design and implementation of trench subgrade stabilization techniques. Some methods that we have observed used to stabilize trench subgrades include the following:

- Use of ¾–inch to 1½-inch floatrock worked into the trench bottom and covered with a geotextile fabric such as Mirafi 500X;
- Placement of a geotextile fabric, such as Mirafi 500X, on the trench bottom and covered with at least one foot of compacted processed miscellaneous base (PMB) conforming to the requirements of Section 200-2.5 of the Greenbook, latest edition;
- Overexcavation of trench subgrade and placement of two-sack sand-cement slurry; and
- In extreme conditions, injection grouting along the trench alignment.

If floatrock is used, typically sand with an SE of 50 or more should be used to fill the voids in the rock prior to placement of pipe bedding materials.

4.7.5 Erosion Protection

The on-site soil materials are relatively erodable. Maintained, drought-resistant vegetation, riprap, or similar protective material should cover all permanent cut and fill slopes. All drainage channels should be paved or lined with rip-rap.

4.8 FOUNDATIONS

4.8.1 Minimum Footing Embedment and Dimensions

Minimum embedment depths, widths, and thicknesses should conform to Table 1809.7 of the CBC, but should be determined by the Structural Engineer. Transition lot construction, where structures span across both native cut materials and engineered fills, can lead to differential settlement issues. **Foundations should not span both cuts and fills**.

Frost penetration depths typically do not affect soil within the area of the proposed project. Therefore, foundations should not require specific design recommendations to reduce the potential adverse affects of frost on structure foundations.

4.8.2 Allowable Bearing Capacity

It is assumed that all structure foundations for the proposed buildings will rest entirely on cut or entirely on engineered fill. The foundations must not be constructed partially on fill and partially on cut. Isolated and continuous footing elements should be proportioned for dead loads plus probable maximum live load, and a maximum allowable bearing pressure of the following:

ALLOWABLE BEARING CAPACITIES			
Material	**Allowable Bearing Capacity (psf)**	**Increase per Foot of Embedment (psf)**	**Maximum Allowable Bearing Capacity (psf)**
Alluvium/Basin Deposits	1,500	250	2,500

The allowable bearing pressures provided are net values. Therefore, the weight of the foundation (which extends below finished subgrade) may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads and includes a calculated factor of safety of at least 3. An increase of allowable bearing pressure by one-third for short-term loading due to wind or seismic forces should NOT be incorporated unless an alternative load combination, as described in Section 1605.3.2 of the 2010 CBC, is applied. The allowable bearing value is for vertical loads only; eccentric loads may require adjustment to the values recommended above.

To minimize differential settlement between the proposed addition and the existing structure, it is our recommendation that the new footing to be anchored to the existing foundation. The anchoring system should be designed by the project structural engineer.

4.8.3 Lateral Earth Pressures

Subsurface structures should be designed to resist the earth pressure exerted by the retained, compacted backfill plus any additional lateral force that will be applied due to surface loads placed at or near the wall or below-grade structure. Recommended design criteria for subsurface structures are presented below:

The recommended equivalent fluid weights presented below are for static (non-earthquake) conditions with the ground level behind the shoring system.

LATERAL EARTH PRESSURES UNDER STATIC CONDITIONS			
Lateral Earth Pressure Condition	**Slope Inclination Above Structure**	**Equivalent Fluid Weight (pcf)**	
		Dry/Moist (Drained Conditions)	**Saturated (Undrained Conditions)**
At-Rest	Flat	75	100
	2:1	95	120
Active	Flat	55	80
	2:1	75	95

The resultant force of the static lateral force prism should be applied at a distance of 30 percent of the wall height above the soil elevation on the toe side of the wall. The tabulated values are based on a soil unit weight of 125 pounds per cubic foot (pcf), and do not provide for surcharge conditions resulting from construction materials, equipment, or vehicle traffic. Loads not considered as surcharges should bear behind a 1:1 (horizontal to vertical) line projected upward from the base of the shoring. If surcharges are expected, CGI should be advised so that we can provide additional recommendations as needed.

4.8.4 Minimum Footing Reinforcement

Footing reinforcement should be designed by a Structural Engineer and should conform to pertinent structural code requirements. Minimum footing reinforcement should not be less than that required for shrinkage, temperature control, and structural integrity.

4.8.5 Estimated Settlements

The proposed structures should not rest partially on fill and partially on cut. All foundations are anticipated to rest on native soils or engineering fill. Anticipated total settlement for the proposed structure foundations, if construction occurs as recommended within this report, should be less than one inch. Differential settlement for the structure foundations is anticipated to be less than ½ -inch in 20 feet.

4.8.6 Construction Considerations

Prior to placing steel or concrete, foundation excavations should be cleaned of all debris, loose or disturbed soil, and any water. A representative of CGI should observe all foundation excavations prior to concrete placement.

4.9 SLIDING AND PASSIVE RESISTANCE

4.9.1 Sliding Resistance

Ultimate sliding resistance generated through a compacted soil/concrete interface can be computed by:

- Multiplying the soil/concrete adhesion (150 psf) by the footing contact area for cohesive soils. In no case shall the lateral sliding resistance exceed one-half the dead load; or
- Multiplying the total dead weight structural loads by the friction coefficient of 0.30 for imported granular engineered fill.

4.9.2 Passive Resistance

Passive resistance developed from lateral bearing of shallow foundation elements bearing against compacted soil surfaces for that portion of the foundation element extending below a depth of 1 foot below the lowest adjacent grade can be estimated using an equivalent fluid weight of 150 pcf. Passive resistance of the upper one foot of the soil column should be neglected.

4.9.3 Safety Factors

Sliding resistance and passive pressure may be used together without reduction in conjunction with recommended safety factors outlined below. A minimum factor of safety of 2 is recommended for foundation sliding, where sliding resistance and passive pressure are used together. The safety factor for sliding can be reduced to 1.5 if passive pressure is neglected.

4.10 CONCRETE SLABS SUPPORTED ON-GRADE

4.10.1 General

All ground-supported slabs should be designed by a Civil Engineer to support the anticipated loading conditions but, as a minimum, should be at least 4 inches thick. Reinforcement for floor slabs should be designed by a Civil Engineer to maintain structural integrity, and should not be less than that required to meet pertinent code, shrinkage, and temperature requirements. Reinforcement should be placed at mid-thickness in the slab with provisions to ensure it stays in that position during construction and concrete placement.

The mat slab can be designed using a flat slab on an elastic half-space analog. A modulus of subgrade reaction (k_{s1}) of 50 kcf is recommended for design of mat-type foundations. That modulus of subgrade reaction value represents a presumptive value based on soil classification. No plate-load tests were performed as part of this study. The modulus value is for a 1-foot-square plate and must be corrected for mat size and shape, assuming a cohesive subgrade.

4.10.2 Subgrade Preparation

Subgrade soils supporting interior concrete floor slabs should be scarified to a minimum depth of 8 inches, uniformly moisture-conditioned to near the optimum moisture content, and compacted to at least 90 percent relative compaction.

4.10.3 Rock Capillary Break/Vapor Barrier

Interior concrete floor slabs supported-on-grade should be underlain by a capillary break consisting of a blanket of compacted, free-draining, durable rock at least 4 inches thick, graded such that 100 percent passes the 1-inch sieve and less than 5 percent passes the No. 4 sieve.[3] Vapor barriers are not anticipated to be needed for this project. If a vapor barrier is desired, CGI can provide recommendations for design and construction of a vapor barrier beneath proposed slabs. A capillary break and/or vapor barrier may not be required for some types of construction (such as equipment buildings, warehouses, garages, and other uninhabited structures insensitive to water intrusion and/or vapor transmission through the slab). For these types of structures, the gravel capillary break and/or vapor barrier may be omitted and the slab placed directly on the prepared subgrade or other approved surface. In the event a capillary break and/or vapor barrier is not to be used, CGI should review the planned structure in order to assess the applicability of the approach and provide (if necessary) additional recommendations regarding subgrade preparation and/or support.

5.0 REVIEW OF PLANS AND SPECIFICATIONS

We recommend CGI conduct a general review of final plans and specifications to evaluate that recommendations contained herein have been properly interpreted and implemented during design. In the event that CGI is not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations.

6.0 LIMITATIONS

This report has been prepared in substantial accordance with the generally accepted geotechnical engineering practice, as it existed in the site area at the time our services were rendered. No other warranty, either express or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by CGI during the construction phase in order to evaluate compliance with our recommendations.

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[3] In general, Caltrans Class 2 aggregate base (or similar material) does not meet the requirements provided above for a capillary break. Therefore, we recommend this material not be used for a capillary break beneath interior concrete slabs supported-on-grade.

Conclusions and recommendations contained in this report were based on the conditions encountered during our field investigation and are applicable only to those project features described herein (see Section 1.1 – Project Understanding). Soil and rock deposits can vary in type, strength, and other geotechnical properties between points of observation and exploration. Additionally, groundwater and soil moisture conditions can also vary seasonally and for other reasons. Therefore, we do not and cannot have a complete knowledge of the subsurface conditions underlying the project site. The conclusions and recommendations presented in this report are based upon the findings at the point of exploration, and interpolation and extrapolation of information between and beyond the points of observation, and are subject to confirmation based on the conditions revealed by construction. If conditions encountered during construction differ from those described in this report, or if the scope or nature of the proposed construction changes, we should be notified immediately in order to review and, if deemed necessary, conduct additional studies and/or provide supplemental recommendations.

The scope of services provided by CGI for this project did not include the investigation and/or evaluation of toxic substances, or soil or groundwater contamination of any type. If such conditions are encountered during site development, additional studies may be required. Further, services provided by CGI for this project did not include the evaluation of the presence of critical environmental habitats or culturally sensitive areas.

This report may be used only by our client and their agents and only for the purposes stated herein, within a reasonable time from its issuance. Land use, site conditions, and other factors may change over time that may require additional studies. In the event significant time elapses between the issuance date of this report and construction, CGI shall be notified of such occurrence in order to review current conditions. Depending on that review, CGI may require that additional studies be conducted and that an updated or revised report is issued.

Any party other than our client who wishes to use all or any portion of this report shall notify CGI of such intended use. Based on the intended use as well as other site-related factors, CGI may require that additional studies be conducted and that an updated or revised report be issued. Failure to comply with any of the requirements outlined above by the client or any other party shall release CGI from any liability arising from the unauthorized use of this report.

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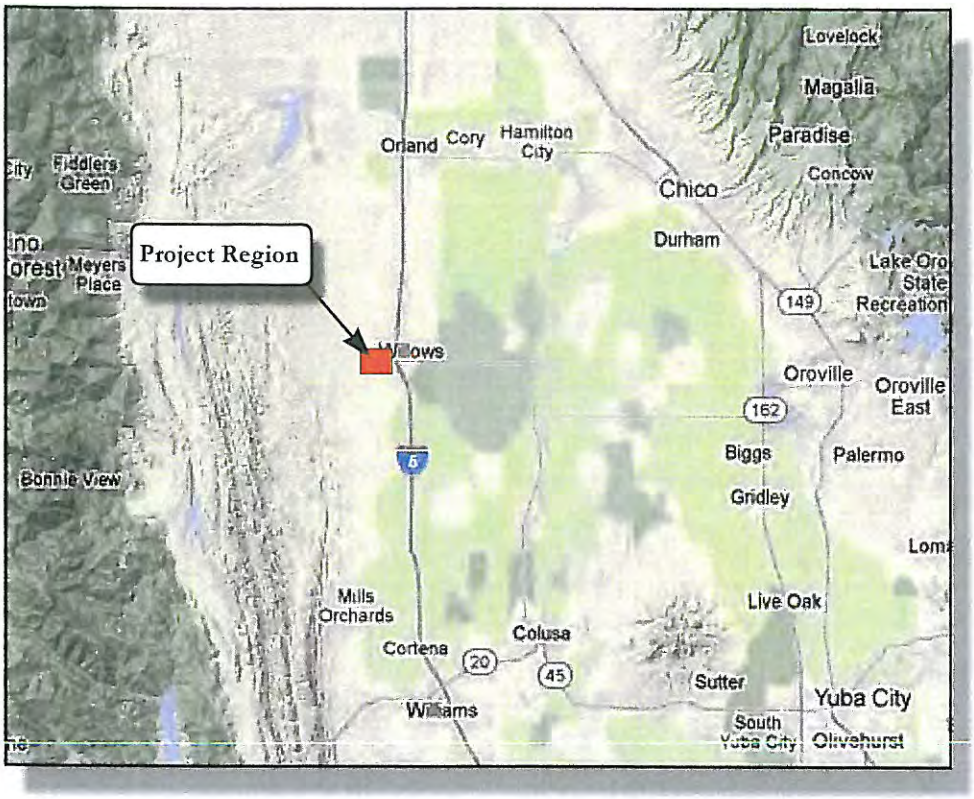
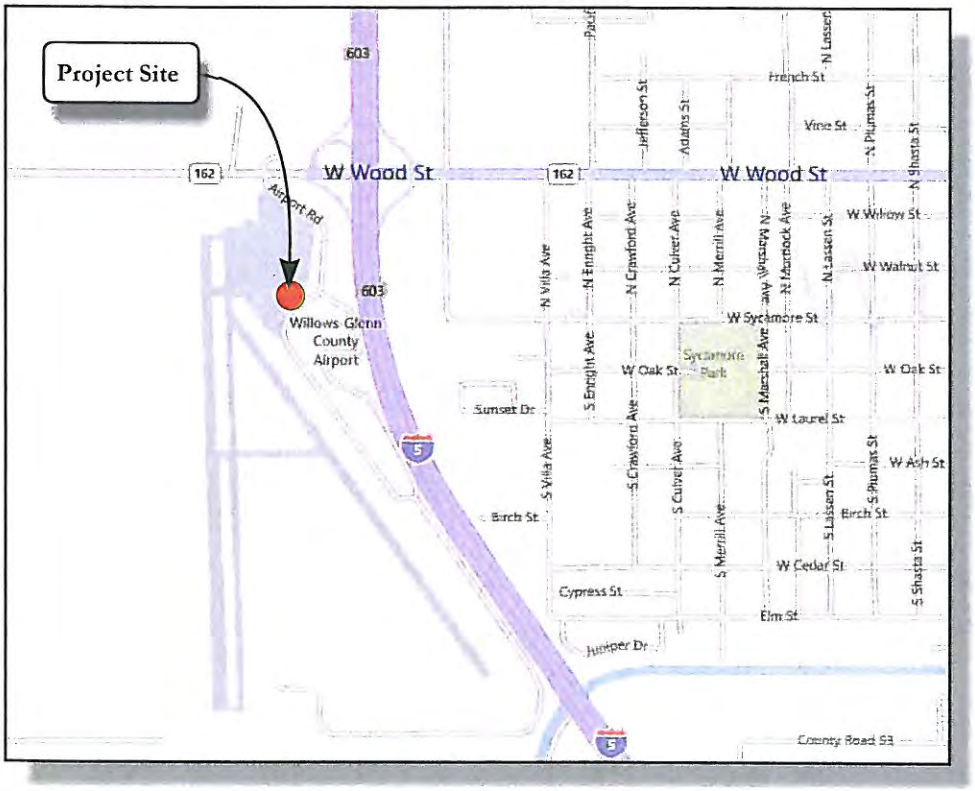




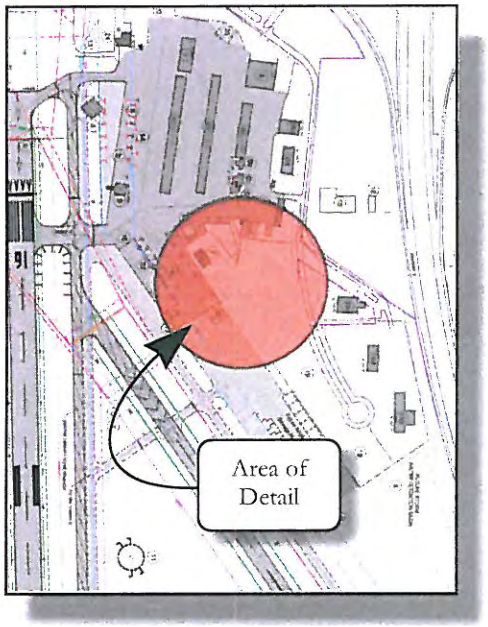
CGI Technical Services Inc.

Project No.: 12-1144.58

SITE LOCATION MAP
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate

1



Based on Mead & Hunt (2011) Plan Sheet C-101, sheet 1 of 1

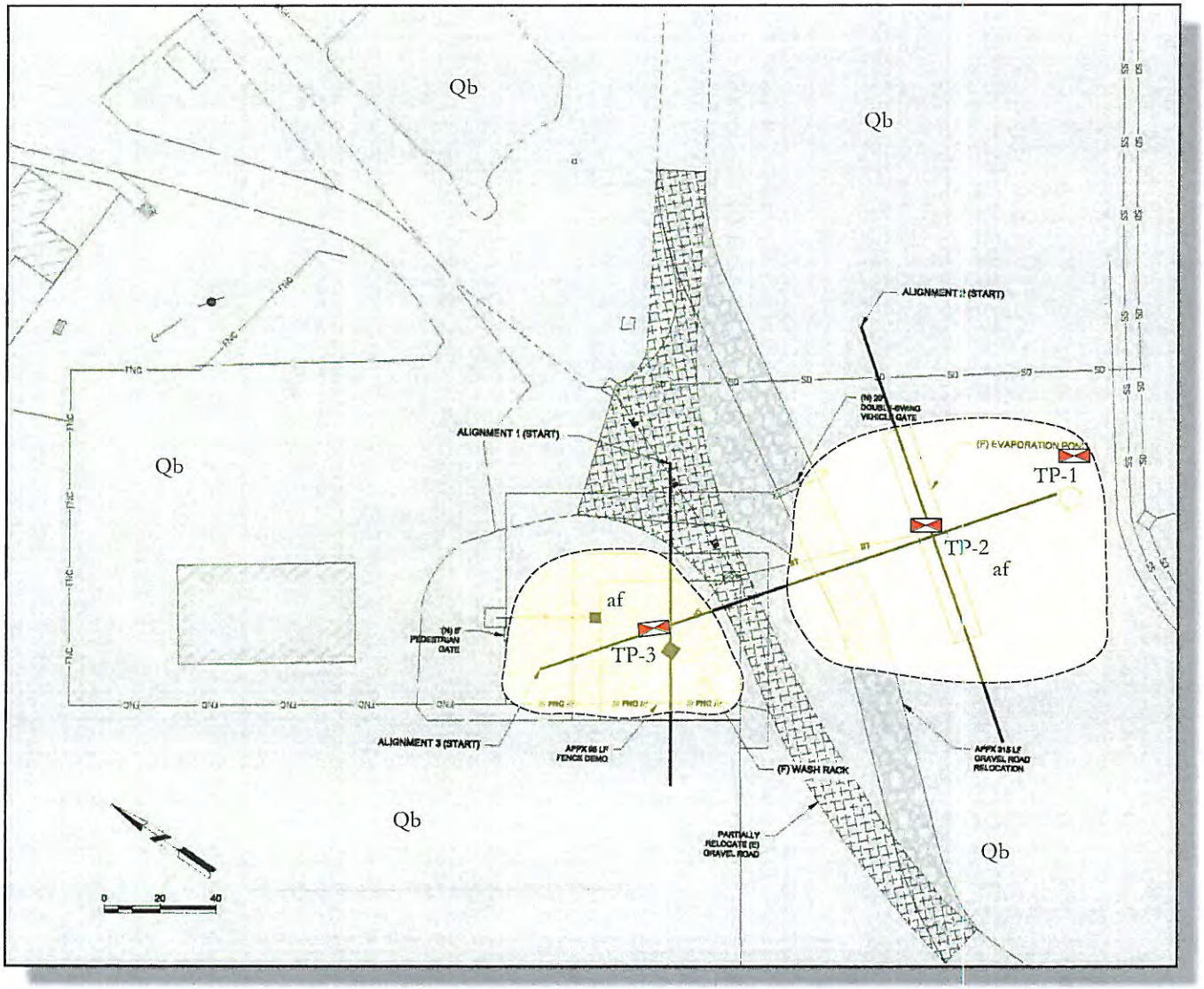
CGI Technical Services Inc.

Project No.: 12-1144.58

PROJECT ELEMENTS
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate

2



af Artificial Fill

Qb Basin Deposits

Test Pit Locations
TP-3

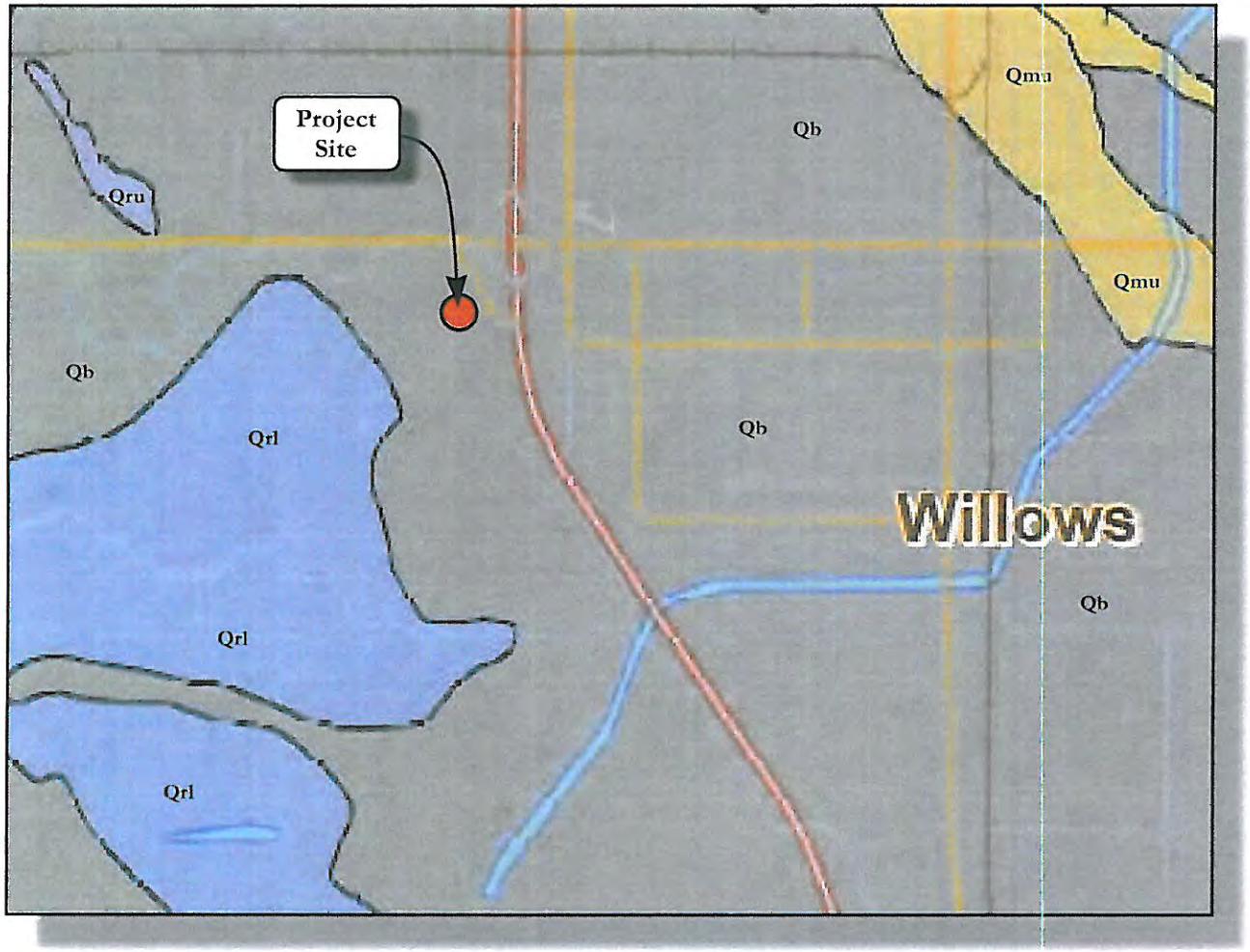
Base map from Mead & Hunt (2011), Plan Sheet C-101, Sheet 1 of 1

CGI Technical Services Inc.

Project No.: 12-1144.58

GEOTECHNICAL MAP
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate
3



Qb — Basin Deposits

Qmu — Modesto Formation

Qru — Riverbank Formation Upper Member

Qrl — Riverbank Formation Lower Member

Geologic Contact: dashed where approximate, dotted where covered, queried where uncertain

Fault: showing dip of fault and and trend of striae on fault surface (arrow); bar and ball on downthrown side; dashed where approximate, dotted where concealed; queried where uncertain

Base map: Helley & Harwood (1985)

CGI Technical Services Inc.

Project No.: 12-1144.58

GEOLOGIC MAP
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate 4

APPENDIX A
SUBSURFACE EXPLORATION

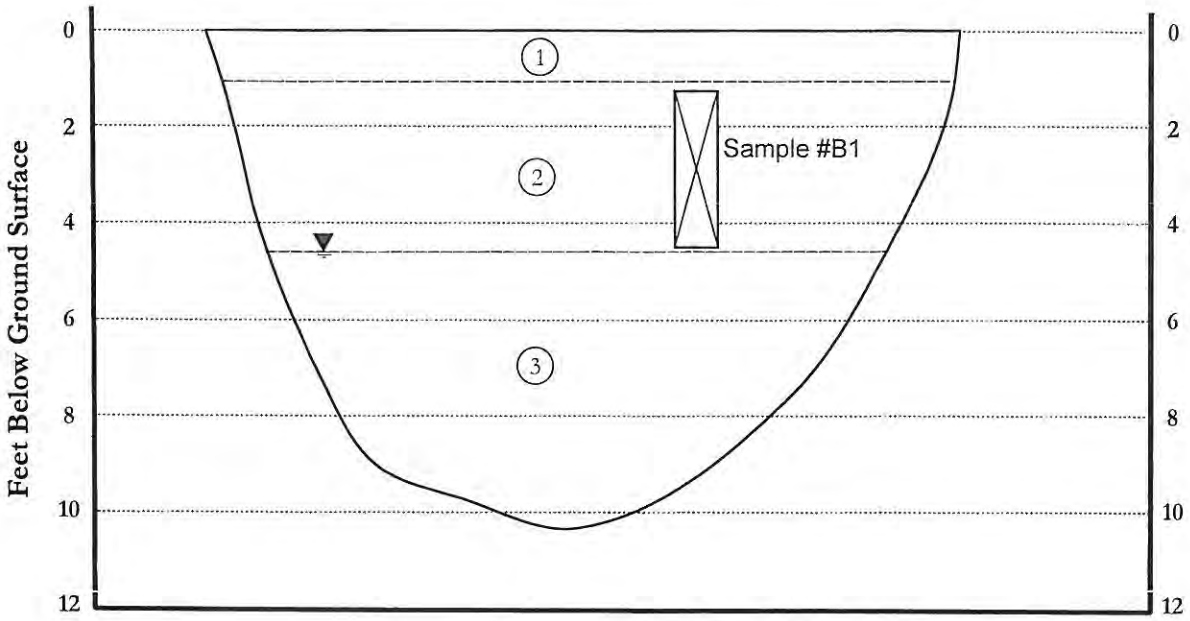
The subsurface exploration program for the proposed project consisted of excavating and logging of three exploratory test pits. Test pit locations are shown on Plate 3.

The test pits were excavated on January 26, 2012, using a John Deere 310SJ rubber-tired backhoe equipped with a two-foot wide bucket. The backhoe was provided by Pacheco Backhoe Services of Willows, California. The test pits were advanced to depths ranging from about 6 to 10 feet below the existing ground surface. Bulk samples of selected materials encountered were recovered from the test pits for laboratory classification and testing. The results of the testing procedures are attached within Appendix B.

The exploration logs describe the earth materials encountered. The logs also show the location, exploration number, date of exploration, and the names of the logger and equipment used. A CGI geologist, using ASTM 2488 for visual soil classification, logged the explorations. The boundaries between soil types shown on the log are approximate because the transition between different soil layers may be gradual and may change with time. Test pits were backfilled using excavated soils and wheel rolled.

Test pit logs are presented as Plates A-1.1 and A-1.3. A legend to the test pit logs is presented as Plate A-2.

LOG OF TEST PIT



Soil Descriptions	
1	ARTIFICIAL FILL (af) GRAVEL (GW) with Sand, gray, moist with abundant fine to coarse sand and, subrounded to rounded fine to coarse gravel with few cobbles.
2	BASIN DEPOSITS (Qb) Silty CLAY to CLAY (CL/CH), moderate yellowish brown, damp, very stiff to hard, slightly plastic
3	BASIN DEPOSITS (Qb) Clayey SILT to Silty CLAY (ML/CL), moderate yellowish brown, damp, dense/stiff, slightly plastic

Date Logged:	January 26, 2012	Excavated With:	John Deere 310SJ
Logged by:	Jim Bianchin	Backfilled With:	Excavated Cuttings
Excavator:	Pacheco Excavating	Depth to Water (ft):	4.5 Feet

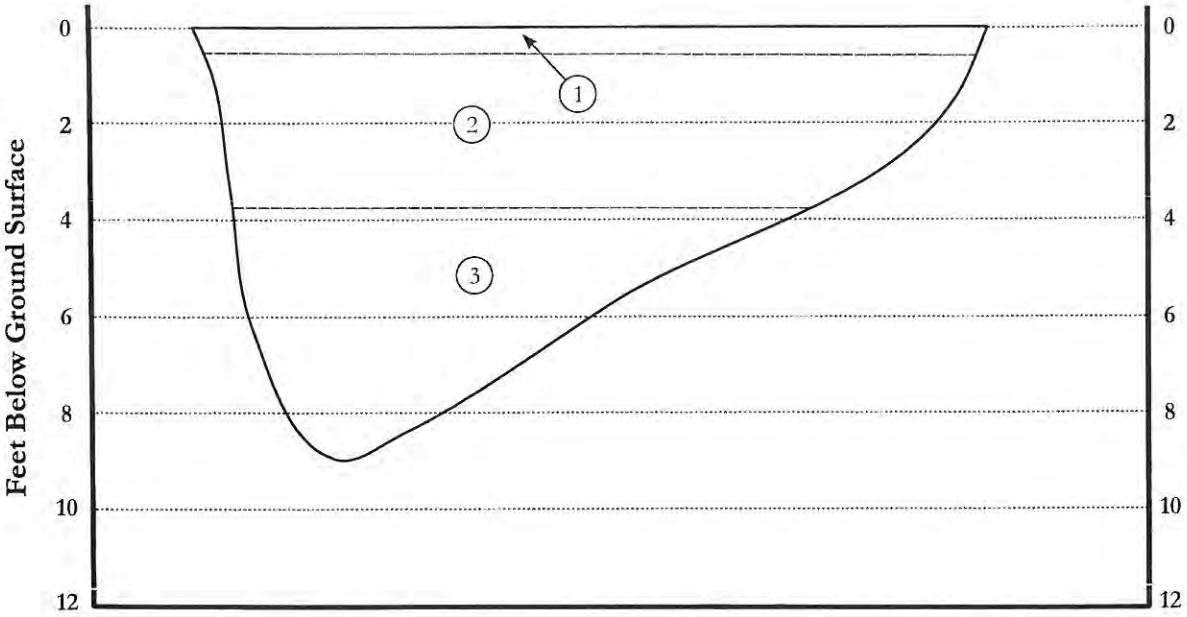
CGI Technical Services Inc.

Project No.: 12-1144.58

TEST PIT TP-1
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate No.
A-1.1

LOG OF TEST PIT



Soil Descriptions	
1	ARTIFICIAL FILL (af) GRAVEL (GW) with Sand, gray, moist with abundant fine to coarse sand and, subrounded to rounded fine to coarse gravel with few cobbles.
2	BASIN DEPOSITS (Qb) Silty CLAY to CLAY (CL/CH), moderate yellowish brown, damp, very stiff to hard, slightly plastic
3	BASIN DEPOSITS (Qb) Clayey SILT to Silty CLAY (ML/CL), moderate yellowish brown, damp, dense/stiff, slightly plastic

Date Logged:	January 26, 2012	Excavated With:	John Deere 310SJ
Logged by:	Jim Bianchin	Backfilled With:	Excavated Cuttings
Excavator:	Pacheco Excavating	Depth to Water (ft):	Not Encountered

CGI Technical Services Inc.

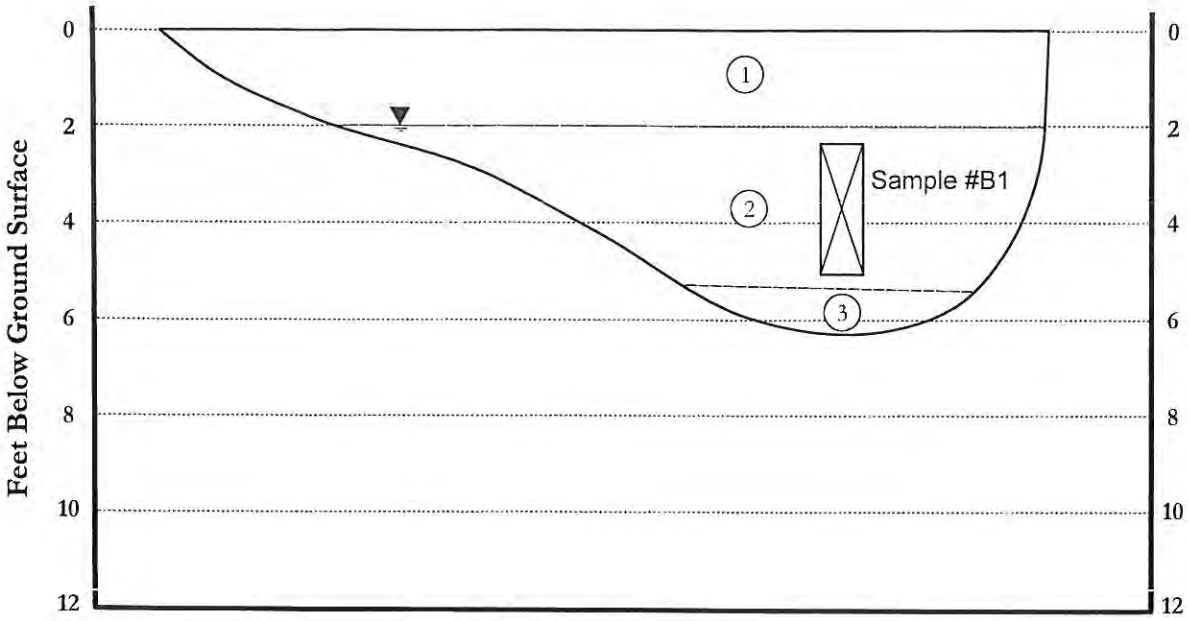
Project No.: 12-1144.58

TEST PIT TP-2
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate No.

A-1.2

LOG OF TEST PIT



Soil Descriptions	
1	ARTIFICIAL FILL (af) Silty CLAY to CLAY (CL/CH), dark brown to brown, wet with perched water at 2 feet, soft, with fine roots in upper 12 inches, few fine to coarse subrounded gravel, and little debris consisting of wood, brick, and plastic
2	BASIN DEPOSITS (Qb) Silty CLAY to CLAY (CL/CH), moderate yellowish brown, damp, very stiff to hard, slightly plastic
3	BASIN DEPOSITS (Qb) Clayey SILT to Silty CLAY (ML/CL), moderate yellowish brown, damp, dense/stiff, slightly plastic

Date Logged:	January 26, 2012	Excavated With:	John Deere 310SJ
Logged by:	Jim Bianchin	Backfilled With:	Excavated Cuttings
Excavator:	Pacheco Excavating	Depth to Water (ft):	2 Feet

CGI Technical Services Inc.

Project No.: 12-1144.58

TEST PIT TP-3
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate No.
A-1.3

Major Divisions			USCS Symbol	Description
COARSE-GRAINED SOILS More than 50% of sample or material is larger than the No. 200 Sieve (0.0029 inches)	GRAVELS More than 50% of the coarse fraction is retained on No. 4 sieve (0.187 inches)	GRAVELS Clean Gravels, few fines	GW	Well graded gravels and sand mixtures with little to no fines
			GP	Poorly graded gravels & gravel/sand mixtures with little to no fines
		GRAVELS With appreciable fines	GM	Silty gravels and poorly graded gravel/sand/silt mixtures
			GC	Clayey gravels and poorly graded gravel/sand/clay mixtures
	SANDS More than 50% of the coarse fraction passes the No. 4 sieve (0.187 inches)	SANDS Clean Sands, few fines	SW	Well graded sands and gravelly sands with little to no fines
			SP	Poorly graded sands and gravelly sands with little to no fines
		SANDS With appreciable fines	SM	Silty sands and poorly graded sand/gravel/silt mixtures
			SC	Clayey sands and poorly graded sand/gravel/clay mixtures
FINE-GRAINED SOILS More than 50% of sample or material is smaller than the No. 200 Sieve (0.0029 inches)	SILTS & CLAYS Liquid limit less than 50		ML	Inorganic silts with very fine sands, silty and/or clayey fine sands, clayey silts with slight plasticity
			CL	Inorganic clays with low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and clays with low plasticity
	SILTS & CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts
			CH	Inorganic clays with high plasticity, fat clays
			OH	Orgainic silts and clays with high plasticity
HIGHLY ORGANIC SOIL			PT	Peat, humus, swamp soil with high organic content

Samples

- Bulk or disturbed sample
- Relatively undisturbed sample

Symbols

- Groundwater
- Caving
- Contact Between Soil/Rock Layers

GENERAL NOTES

Dual symbols (such as ML/CL or SM/SC) are used to indicate borderline classifications.
In general, USCS designations shown on the logs were evaluated using visual methods. Actual designations (based on laboratory tests) may vary.
Logs represent general soil conditions observed on the date and locations indicated. No warranty is provided regarding soil continuity between locations.
Lines separating soil strata on logs are approximate. Actual transitions may be gradual and vary with depth.

CGI Technical Services Inc.

Project No.: 12-1144.58

LEGEND TO TEST PIT LOGS
WASH RACK & RELATED IMPROVEMENTS
WILLOWS-GLENN AIRPORT
WILLOWS, GLENN COUNTY, CALIFORNIA

Plate No.

A-2

APPENDIX B
LABORATORY TESTING

Laboratory Analyses

Laboratory tests were performed on selected bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Testing was performed under procedures described in one of the following references:

- ASTM Standards for Soil Testing, latest revision;
- Lambe, T. William, Soil Testing for Engineers, Wiley, New York, 1951;
- Laboratory Soils Testing, U.S. Army, Office of the Chief of Engineers, Engineering Manual No. 1110-2-1906, November 30, 1970.

Plasticity Index Tests

Atterberg Limits (plastic limit, liquid limit, and plasticity index) tests were performed on two selected samples in accordance with standard test method ASTM D4318. Results of the Atterberg Limits tests are presented in the report text and on the attached plate labeled Atterberg Limits Tests.

Grain Size Distribution

Grain size distribution was determined for two selected soil samples in accordance with standard test method ASTM D422. The grain size distribution data are shown on the attached plates labeled *Laboratory Sieve Analysis.*

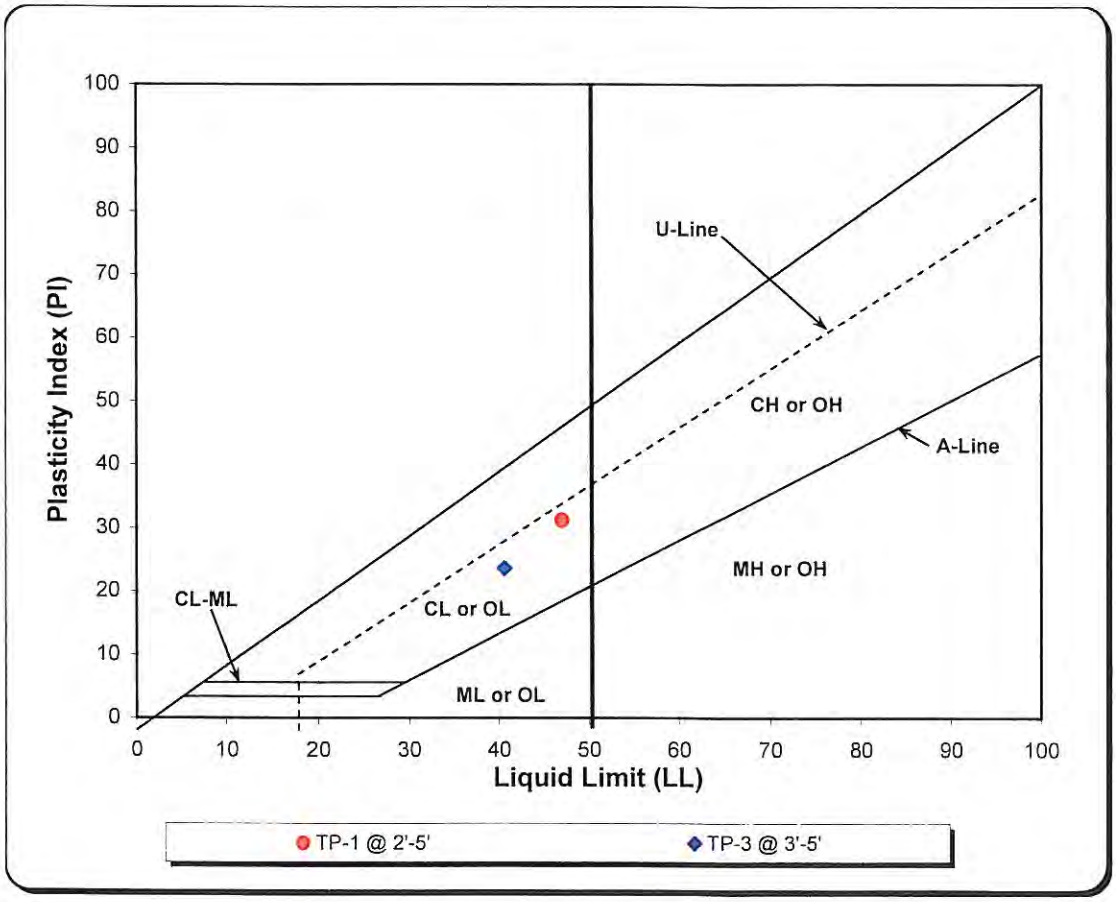
Corrosion Testing

Soil chemistry tests were performed to evaluate the pH, resistivity, chloride, and sulfate concentrations within one sample of on-site soils tested. The results of the test are attached to this appendix.

CGI Technical Services Inc.

ATTERBERG LIMITS TESTS

Client:	Mead & Hunt, Inc.	**Job No.:**	12-1144.58
Project:	Willows-Glenn Airport Wash Rack	**Lab No.:**	5480
Location:	Willows, California		
Sampled By:	JAB	**Date Sampled:**	26-Jan-12
Received By:	TK	**Date Received:**	26-Jan-12
Tested By:	JS	**Date Tested:**	6-Feb-12
Reviewed By:	JAB	**Date Reviewed:**	6-Feb-12



LEGEND			CLASSIFICATION	ATTERBERG LIMITS TEST RESULTS		
Location	Depth, ft	Sample No.		Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
TP-1	2' - 5'	B1	Silty Clay	47.1	15.9	31
TP-3	3' - 5'	B1	Silty Clay	40.7	17.0	24

ASTM D4318 & D2487

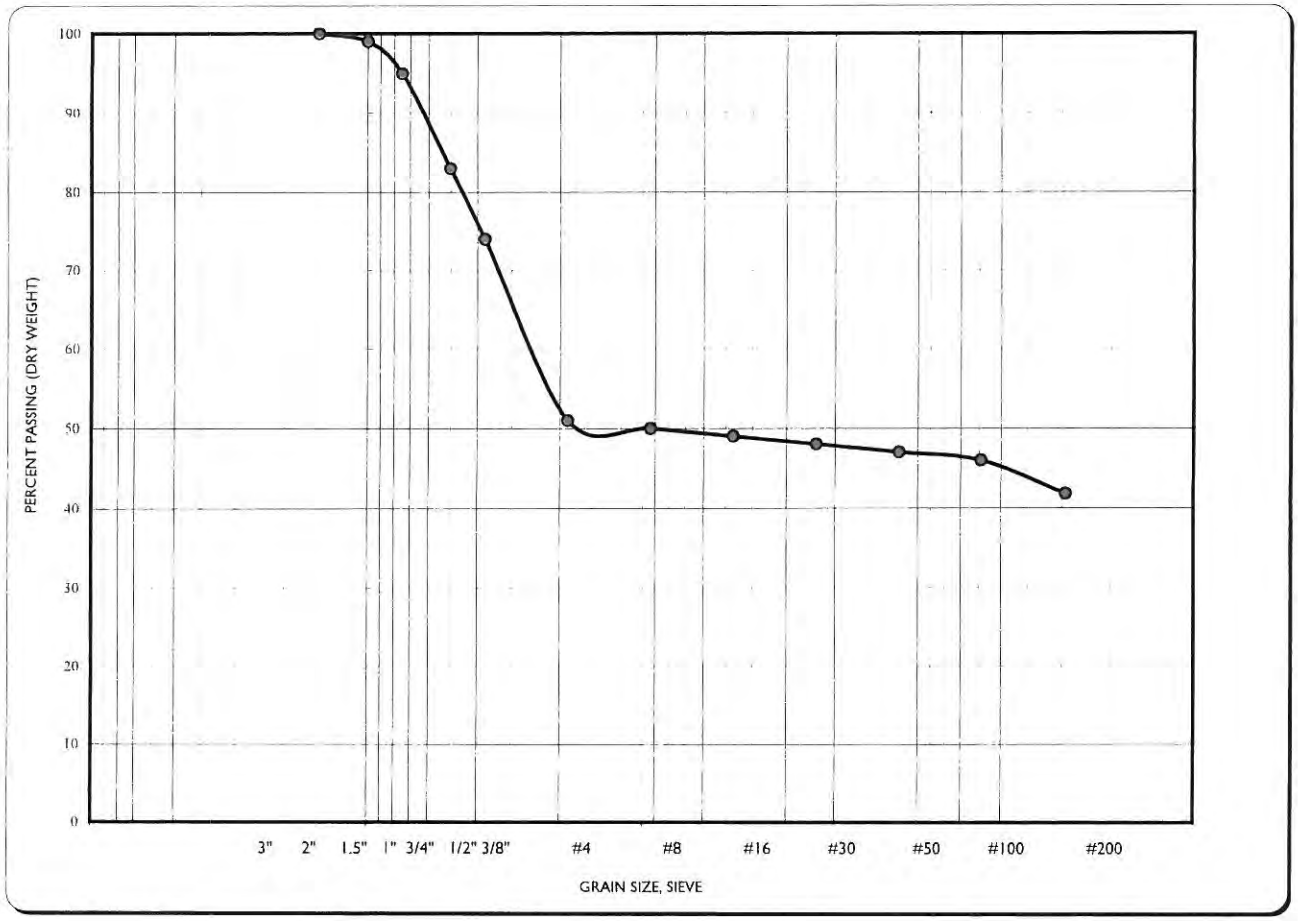
CGi Technical Services, Inc.

LABORATORY TEST RESULTS

Client: Mead & Hunt, Inc.
Project: Willows-Glenn Airport Wash Rack
Material Type: Clayey Sand
USCS: SC

Sample Location: TP-1, 1'-3'
Sampled By: JAB
Tested By: TK

Job No.: 12-1144.58
Lab No.: 5424
Date Received: 26-Jan-12
Date Tested: 3-Feb-12
Date Reviewed: 3-Feb-12



SIEVE ANALYSIS		
Sieve Size Standard	Grain Size (mm)	Percent Passing
3	76.20	
2	50.80	
1.5	37.50	100
1"	25.00	99
3/4"	19.00	95
1/2"	12.50	83
3/8"	9.50	74
#4	4.75	51
#8	2.36	50
#16	1.18	49
#30	600um	48
#50	300um	47
#100	150um	46
#200	75um	41.8

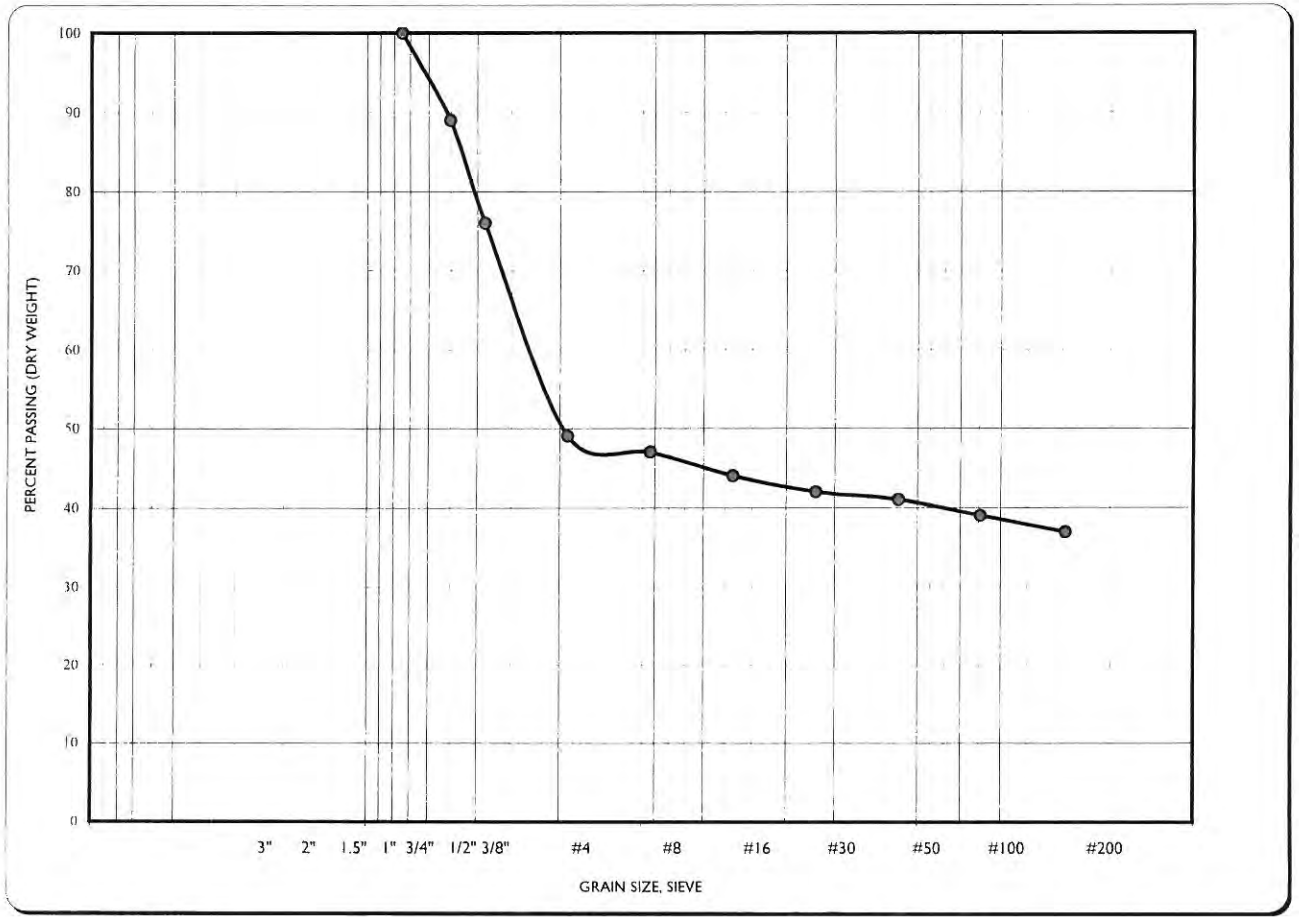
CGi Technical Services, Inc.

LABORATORY TEST RESULTS

Client: Mead & Hunt, Inc.
Project: Willows-Glenn Airport Wash Rack
Material Type: Clayey Sand
USCS: SC

Sample Location: TP-3, 3'-5'
Sampled By: JAB
Tested By: TK

Job No.: 12-1144.58
Lab No.: 5424
Date Received: 26-Jan-12
Date Tested: 3-Feb-12
Date Reviewed: 3-Feb-12



SIEVE ANALYSIS		
Sieve Size Standard	Grain Size (mm)	Percent Passing
3	76.20	
2	50.80	
1.5	37.50	
1"	25.00	
3/4"	19.00	100
1/2"	12.50	89
3/8"	9.50	76
#4	4.75	49
#8	2.36	47
#16	1.18	44
#30	600um	42
#50	300um	41
#100	150um	39
#200	75um	36.9

Table 1 - Laboratory Tests on Soil Samples

CGI Technical Services, Inc.
Willows Glenn Airport
Your #12-1144.58, HDR\|Schiff #12-0098LAB
8-Feb-12

Sample ID			TP3 B-1 @ 2'-5' Native
Resistivity		**Units**	
as-received		ohm-cm	4,400,000
saturated		ohm-cm	196
pH			8.1
Electrical Conductivity		mS/cm	2.04
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	173
magnesium	Mg^{2+}	mg/kg	71
sodium	Na^{1+}	mg/kg	2,323
potassium	K^{1+}	mg/kg	11
Anions			
carbonate	CO_3^{2-}	mg/kg	33
bicarbonate	HCO_3^{1-}	mg/kg	355
fluoride	F^{1-}	mg/kg	16
chloride	Cl^{1-}	mg/kg	110
sulfate	SO_4^{2-}	mg/kg	4,384
phosphate	PO_4^{3-}	mg/kg	ND
Other Tests			
ammonium	NH_4^{1+}	mg/kg	ND
nitrate	NO_3^{1-}	mg/kg	ND
sulfide	S^{2-}	qual	na
Redox		mV	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

Appendix B
Pavement Design Computations

FAARFIELD - Airport Pavement Design (V 1.305, 9/28/10 64-bit)

Section NewRigid01 in Job Willows.
Working directory is C:\Program Files (x86)\FAA\FAARFIELD\

The aircraft list contains only one aircraft. Please see the introduction to the Help File for a discussion on using FAArfield to make single aircraft comparisons.
The structure is New Rigid.
Design Life = 20 years.
A design has not been completed for this section.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	PCC Surface	6.00	4,000,000	0.15	700
2	P-208 Cr Ag	5.00	37,310	0.35	0
3	Subgrade	0.00	17,582	0.40	0

Total thickness to the top of the subgrade = 11.00 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	Sngl Whl-30	30,000	750	1.00

Additional Airplane Information

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Sngl Whl-30	0.26	0.26	3.12

Appendix C

Engineer's Cost Estimate

Willows-Glenn County Airport

AIP NO. 3-06-0279-04

Wash Rack & Containment/Evapoation Pond

BASE BID

		ENGINEER'S ESTIMATE			
Item No.	Description	Unit	Estimated Quantity	Unit Cost	**Extension**
1	Mobilization	LS	1	$ 8,000.00	$ 8,000.00
2	Airfield Safety and Traffic Control	LS	1	$ 5,000.00	$ 5,000.00
3	Earthwork & Site Preparation	LS	1	$ 16,000.00	$ 16,000.00
4	Temporary Erosion & Pollution Control	LS	1	$ 2,000.00	$ 2,000.00
5	Aggregate Base (CalTrans)	TN	190	$ 52.00	$ 9,880.00
6	Asphalt Concrete (CalTrans)	TN	25	$ 100.00	$ 2,500.00
7	Containment/Evaporation Pond/Green House	LS	1	$ 51,000.00	$ 51,000.00
8	Wash Rack & Pollution Control Facility	LS	1	$ 55,000.00	$ 55,000.00
9	18-inch HDPE Storm Drain	LF	30	$ 40.00	$ 1,200.00
10	2-inch PVC Conduit w/ Cabling	LF	370	$ 15.00	$ 5,550.00
11	Pull Boxes	EA	7	$ 700.00	$ 4,900.00
12	Chain Link Fence	LF	385	$ 25.00	$ 9,625.00
13	Pedestrian Gate	LS	1	$ 1,000.00	$ 1,000.00
14	20' Double-Swing Vehicle Gate	LS	1	$ 3,000.00	$ 3,000.00
15	Hydroseeding	ACRE	0.5	$ 1,750.00	$ 875.00
				TOTAL =	**$ 175,530.00**

Appendix D

Sponsor Certification for Project Plans and Specifications

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIRPORT IMPROVEMENT PROGRAM
SPONSOR CERTIFICATION

PROJECT PLANS AND SPECIFICATIONS

Glenn County	Willows-Glenn	3-06-0279-04
(Sponsor)	*(Airport)*	*(Project Number)*

Description of Work:
Construction of a self contained aircraft wash rack and pollution control facility at the Willows-Glenn Airport.

Title 49, United States Code, section 47105(d), authorizes the Secretary to require certification from the sponsor that it will comply with the statutory and administrative requirements in carrying out a project under the Airport Improvement Program (AIP). AIP standards are generally described in FAA Advisory Circular (AC) 150/5100-6, Labor Requirements for the Airport Improvement Program, AC 150/5100-15, Civil Rights Requirements for the Airport Improvement Program, and AC 150/5100-16, Airport Improvement Program Grant Assurance One--General Federal Requirements. A list of current advisory circulars with specific standards for design or construction of airports as well as procurement/installation of equipment and facilities is referenced in standard airport sponsor Grant Assurance 34 contained in the grant agreement.

Except for the certified items below marked not applicable (N/A), the list includes major requirements for this aspect of project implementation, although it is not comprehensive, nor does it relieve the sponsor from fully complying with all applicable statutory and administrative standards.

	Yes	No	N/A
1. The plans and specifications were or will be prepared in accordance with applicable Federal standards and requirements, so no deviation or modification to standards set forth in the advisory circulars, or State standard, is necessary other than those previously approved by the FAA.	☒	☐	☐
2. Specifications for the procurement of equipment are not or will not be proprietary or written so as to restrict competition. At least two manufacturers can meet the specification.	☒	☐	☐
3. The development included or to be included in the plans is depicted on the airport layout plan approved by the FAA.	☒	☐	☐
4. Development that is ineligible for AIP funding has been or will be omitted from the plans and specifications.	☒	☐	☐
5. The process control and acceptance tests required for the project by standards contained in Advisory Circular 150/5370-10 are or will be included in the project specifications.	☒	☐	☐
6. If a value-engineering clause is incorporated into the contract, concurrence was or will be obtained from the FAA.	☒	☐	☐
7. The plans and specifications incorporate or will incorporate applicable requirements and recommendations set forth in the Federally approved environmental finding.	☒	☐	☐

	Yes	No	N/A
8. For construction activities within or near aircraft operational areas, the requirements contained in Advisory Circular 150/5370-2 have been or will be discussed with the FAA as well as incorporated into the specifications, and a safety/phasing plan has FAA's concurrence, if required.	☒	☐	☐
9. The project was or will be physically completed without Federal participation in costs due to errors and omissions in the plans and specifications that were foreseeable at the time of project design.	☐	☒	☐

I certify, for the project identified herein, responses to the forgoing items are accurate as marked and have prepared documentation attached hereto for any item marked "no" that is correct and complete.

Glenn County

(Name of Sponsor)

(Signature of Sponsor's Designated Official Representative)

John Linhart

(Typed Name of Sponsor's Designated Official Representative)

Director

(Typed Title of Sponsor's Designated Official Representative)

7/26/2012

(Date)

WILLOWS - GLENN COUNTY AIRPORT
CONSTRUCTION PLANS

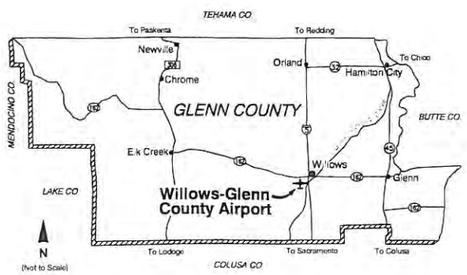
WASH RACK AND CONTAINMENT/EVAPORATION POND

JULY 2012

AIP NO. 3-06-0279-04

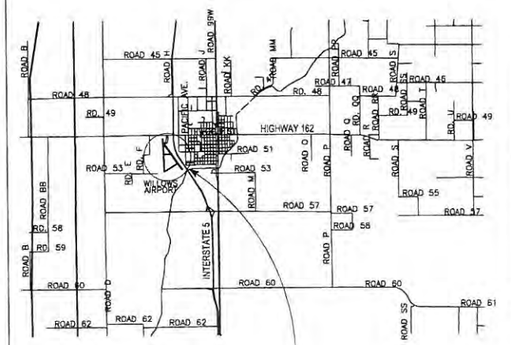
CALIFORNIA MAP

LOCATION MAP



COUNTY OF GLENN
STATE OF CALIFORNIA

VICINITY MAP



Willows Glenn
County Airport

Mead & Hunt

Mead & Hunt, Inc.
133 Aviation Boulevard,
Suite 100
Santa Rosa, CA 95403
phone: 707-526-5010
meadhunt.com

REGISTERED PROFESSIONAL ENGINEER
LEE B. MOEN
No. 50686
Exp. 3-31-14
CIVIL
STATE OF CALIFORNIA

7-27-12

WILLOWS-GLENN COUNTY AIRPORT
WASH RACK & CONTAINMENT/EVAPORATION POND
WILLOWS, CALIFORNIA

REVISION

AIP NO	3-06-0279-04
WASH NO	07187-00-115019 01
DATE	6-26-2012
DESIGNED BY	TET/MRR
DRAWN BY	TET
CHECKED BY	LBM

SHEET CONTENTS
COVER SHEET

G-001

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7/27/2012 11:16:11 AM

SHEET LIST TABLE

DRAWING NUMBER	SHEET NUMBER	SHEET TITLE
1	G-001	COVER SHEET
2	G-002	LEGEND & ABBREVIATIONS
3	G-021	PROJECT LAYOUT PLAN & SURVEY CONTROL
4	G-081	CONSTRUCTION SAFETY & PHASING PLAN
5	C-021	DEMOLITION & EROSION CONTROL PLAN
6	C-022	RELOCATED SERVICE ROAD PLAN AND PROFILE
7	C-101	WASH RACK AND EVAPORATION POND GRADING PLAN
8	C-201	WASH RACK DETAILS-1
9	C-202	WASH RACK DETAILS-2
10	C-601	FENCING PLAN AND DETAILS

DRAWING LEGEND

	EXISTING	PROPOSED		EXISTING	PROPOSED
AC PAVEMENT			ELECTRIC		E
AC OVERLAY	N/A	N/A	PULL BOX		
PCC PAVEMENT			SIGN		N/A
PAVEMENT OR ROAD REMOVAL	N/A		RUNWAY EDGE LIGHT		N/A
NEW GRAVEL ROAD	N/A		THRESHOLD LIGHT		N/A
HYDROSEED	N/A		TAXIWAY REFLECTIVE MARKER		N/A
GRAVEL SHOULDER	N/A	+ + + + + +	WATER		W
RIP RAP	N/A		WATER VALVE		
ELEVATION		100.00	FIRE HYDRANT		N/A
BENCHMARK			SANITARY SEWER		N/A
TOPOGRAPHIC CONTOUR	N/A	000	CLEAN OUT		CO
APPROXIMATE DAYLIGHT	N/A		STORM DRAIN	SD	SD
PROPERTY		N/A	CATCH BASIN		
FENCE	FNC	FNC	MANHOLE		N/A
GATE			FLOW LINE		
BARRICADES	N/A	XXXXXXXXXXXXXXXX	SILT TRAP OR STRAW WATTLES	N/A	
			TELEPHONE		N/A

ABBREVIATIONS

AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
ASB	AGGREGATE SUB-BASE
AWG	AMERICAN WIRE GAUGE
BC	BEGINNING OF CURVE
BLDG	BUILDING
BM	BENCHMARK
BVC	BEGIN VERTICAL CURVE
CIR	COLD IN-PLACE RECYCLE
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
DB	DIRECT BURIAL
DIA or Ø	DIAMETER
(E)	EXISTING
E	ELECTRICAL LINE
EC	END OF CURVE
EG	EXISTING GRADE (OR GROUND)
EL	ELEVATION
EP	EDGE OF PAVEMENT
EVC	END VERTICAL CURVE
FAA	FEDERAL AVIATION ADMINISTRATION
FBO	FIXED BASE OPERATOR
FES	FLARED END SECTION
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
G	GAS LINE
GALV	GALVANIZED
GB	GRADE BREAK
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GS	GROUND SHOT
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HIGH POINT
IE	INVERT ELEVATION
L	LENGTH
LF	LINEAL FEET
MAX	MAXIMUM
MID	MID POINT
MIN	MINIMUM
MIRL	MEDIUM INTENSITY RUNWAY LIGHTING
MITL	MEDIUM INTENSITY TAXIWAY LIGHTING
(N)	NEW
OC	ON CENTER
OFA	RUNWAY OBJECT FREE AREA
OFZ	RUNWAY OBJECT FREE ZONE
PB	PULLBOX
PC	POINT OF CURVATURE
PCC	PORTLAND CEMENT CONCRETE
PI	POINT OF INTERSECTION
PT	POINT OF TANGENCY
PVC	POLY-VINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
R	RADIUS
R&R	REMOVE & REPLACE
RC	RELATIVE COMPACTION
RCP	REINFORCED CONCRETE PIPE
REQ	REQUIRED
RWY	RUNWAY
RSA	RUNWAY SAFETY AREA
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SG	STRAIGHT GRADE
SH	SHOULDER
SS	SANITARY SEWER
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
T/L	TAXILANE
TOFA	TAXIWAY OBJECT FREE AREA
T	TELEPHONE LINE
TC	TOP OF CURB
TG	TOP OF GRATE
TOE	TOE OF BANK
TOP	TOP OF BANK
TWY	TAXIWAY
TSA	TAXIWAY SAFETY AREA
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
USA	UNDERGROUND SERVICE ALERT
VERT	VERTICAL
VG	VALLEY GUTTER
W	WATER LINE
W/	WITH
W/O	WITHOUT
WV	WATER VALVE
WWM	WELDED WIRE MESH

Mead & Hunt

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WILLOWS-GLENN COUNTY AIRPORT
WASH RACK & CONTAINMENT/EVAPORATION POND
WILLOWS, CALIFORNIA

REVISION

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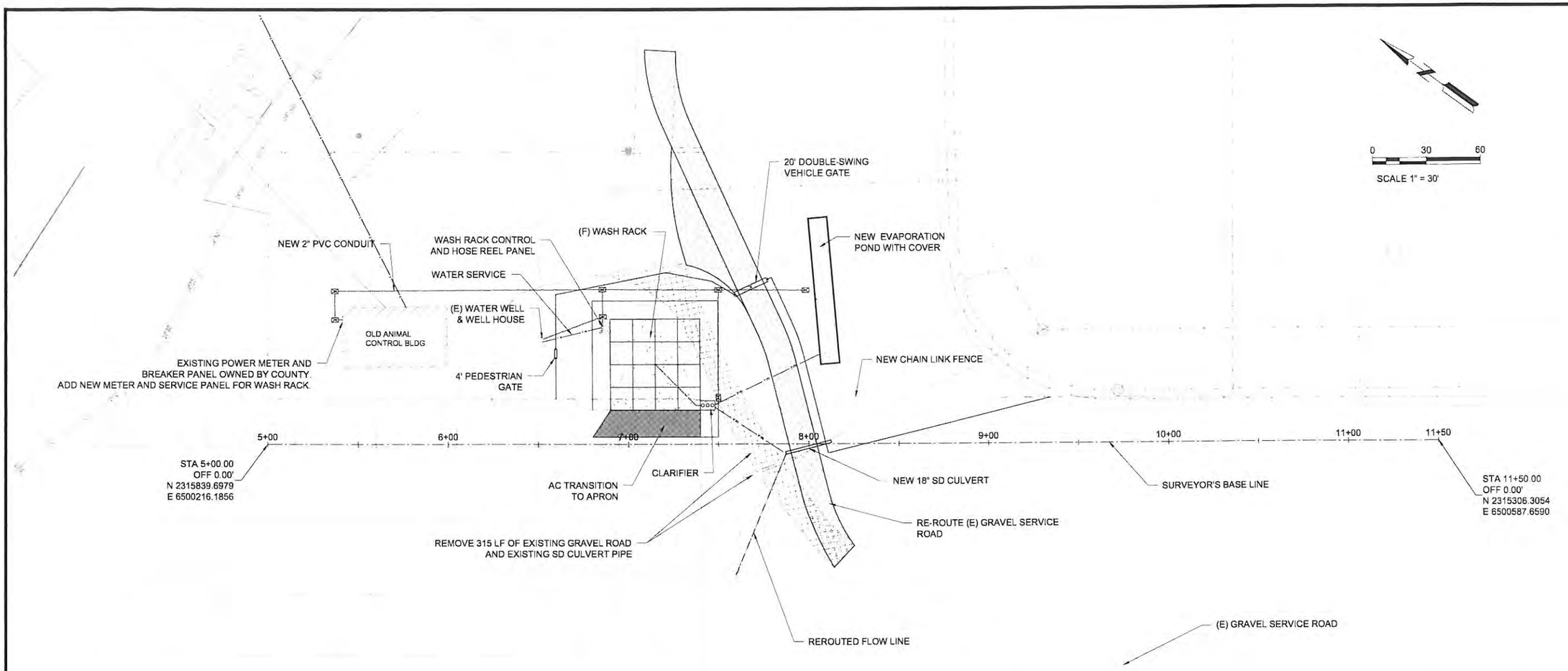
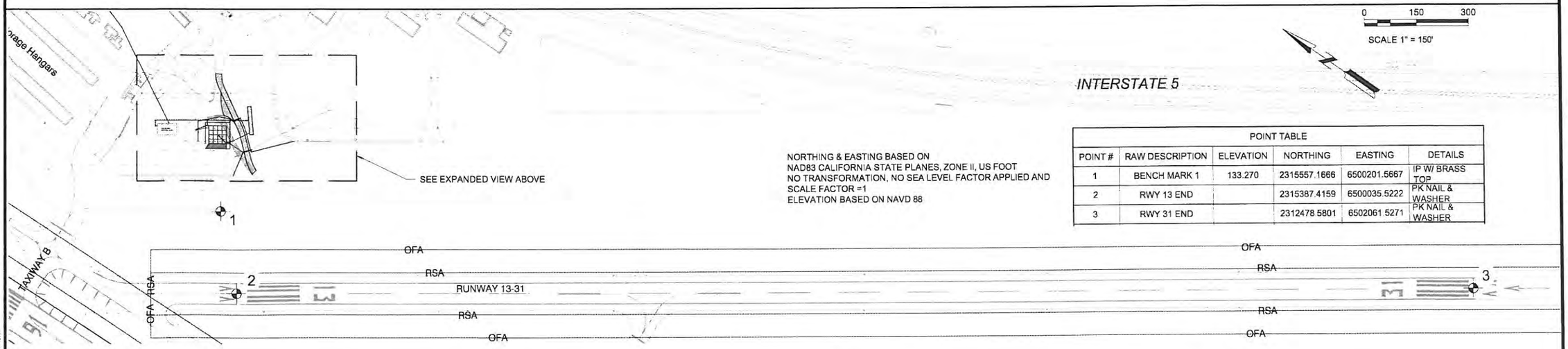
CHECKED BY	LBM

SHEET CONTENTS
LEGEND & ABBREVIATIONS





NORTHING & EASTING BASED ON
NAD83 CALIFORNIA STATE PLANES, ZONE II, US FOOT
NO TRANSFORMATION, NO SEA LEVEL FACTOR APPLIED AND
SCALE FACTOR =1
ELEVATION BASED ON NAVD 88

POINT TABLE					
POINT #	RAW DESCRIPTION	ELEVATION	NORTHING	EASTING	DETAILS
1	BENCH MARK 1	133.270	2315557.1666	6500201.5667	IP W/ BRASS TOP
2	RWY 13 END		2315387.4159	6500035.5222	PK NAIL & WASHER
3	RWY 31 END		2312478.5801	6502061.5271	PK NAIL & WASHER

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SHEET CONTENTS
PROJECT LAYOUT PLAN & SURVEY CONTROL

3 of 10

G-021

K:\07187-00\115019.01\PE\CAD\CAD\G-021 PROJECT LAYOUT & SURVEY CONTROL.DWG
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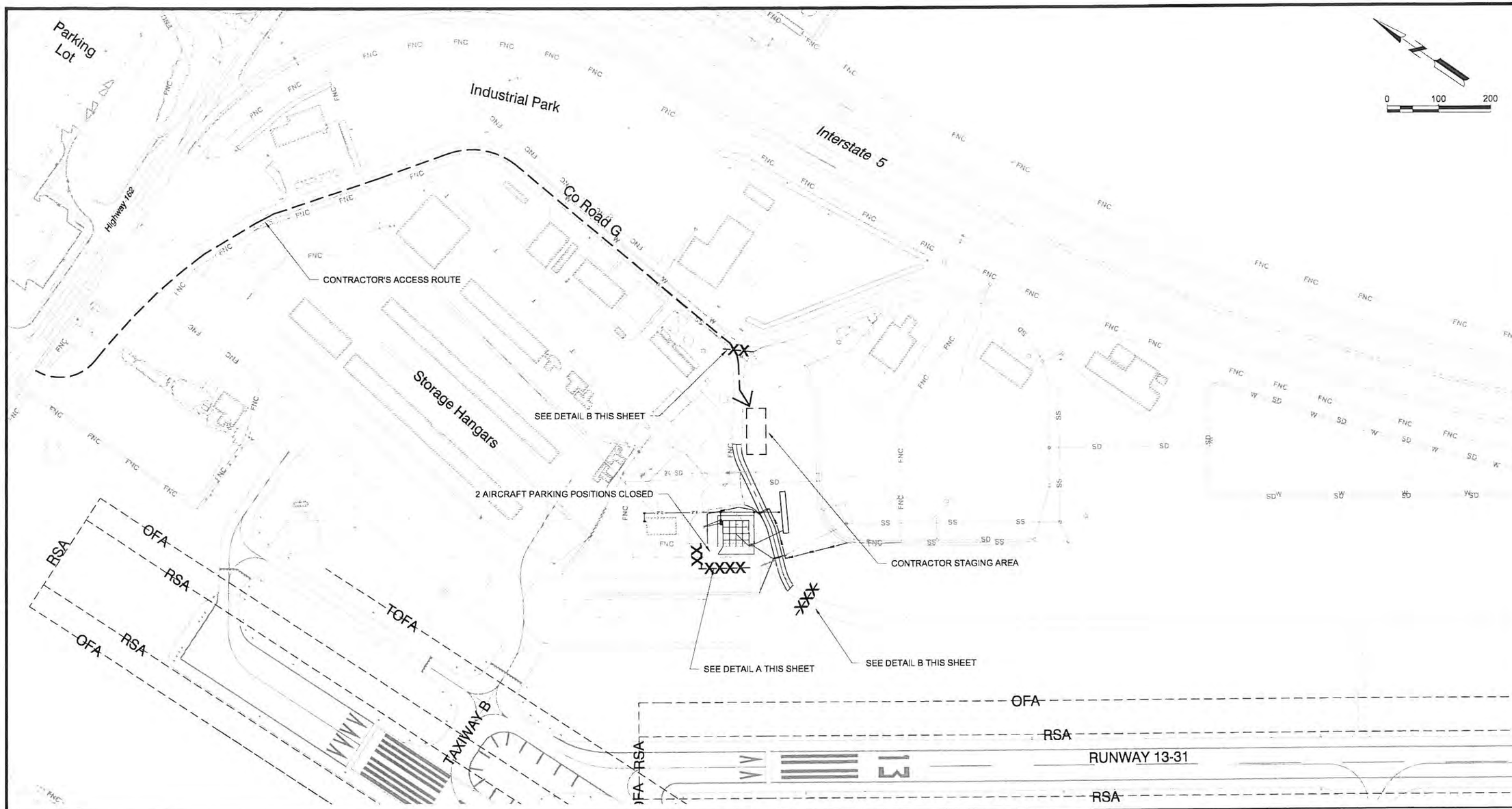
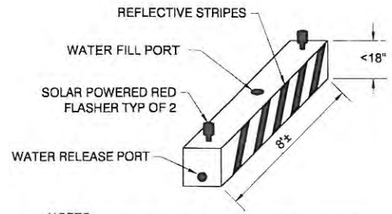
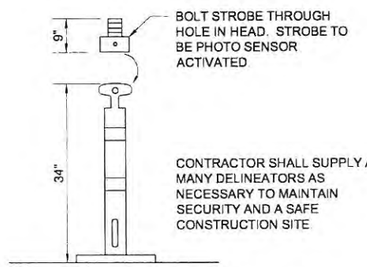




NOTES:
1 CONTRACTOR TO SUPPLY 10 BARRICADES WITH SOLAR POWERED MATCHING RED FLASHERS. BARRICADES TO BE RETAINED BY AIRPORT AT PROJECT COMPLETION

A TYPICAL BARRICADE DETAIL
NO SCALE



B CONSTRUCTION DELINEATOR DETAIL
NO SCALE

LEGEND
CONTRACTOR ACCESS ROUTE
XXX LIGHTED BARRICADE

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CHECKED BY LBM

SHEET CONTENTS
CONSTRUCTION SAFETY & PHASING PLAN

4 of 10

G-081

X:\07187-00\115019\SITE\CAD\CAD-G-081 CONST SAFETY & PHASING.DWG
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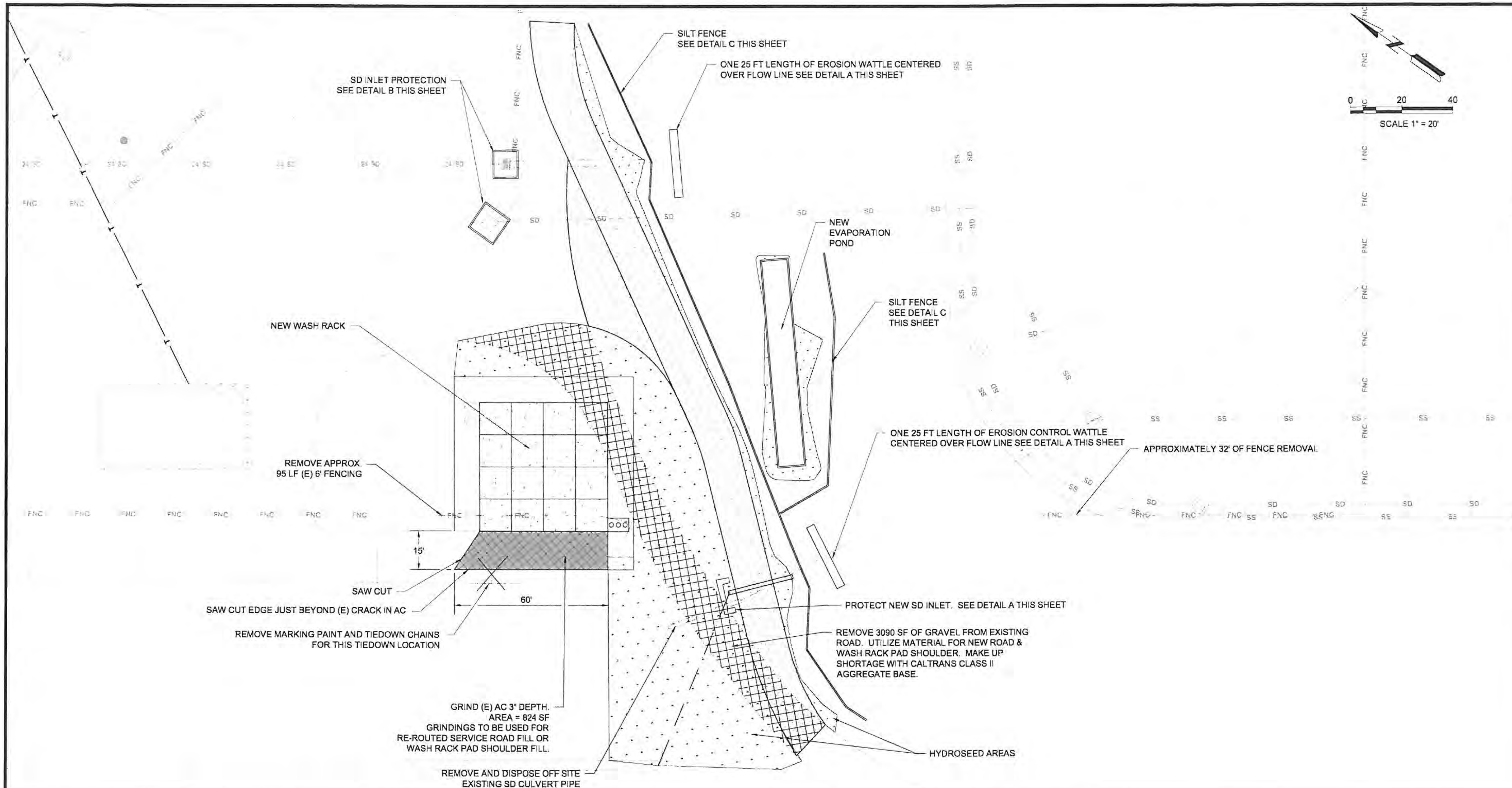
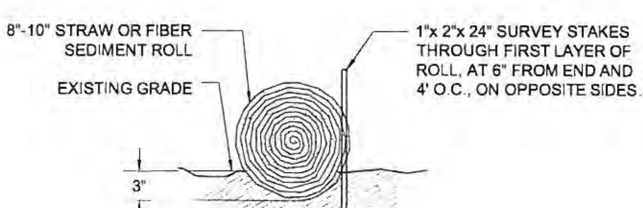
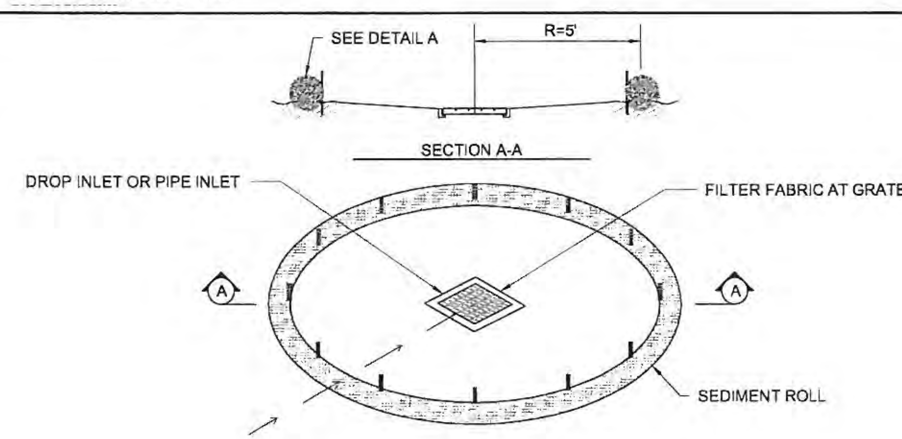


SILT FENCE
SEE DETAIL C THIS SHEET
ONE 25 FT LENGTH OF EROSION WATTLE CENTERED OVER FLOW LINE SEE DETAIL A THIS SHEET
SD INLET PROTECTION
SEE DETAIL B THIS SHEET
0 20 40
SCALE 1" = 20'
NEW EVAPORATION POND
SILT FENCE
SEE DETAIL C
THIS SHEET
NEW WASH RACK
ONE 25 FT LENGTH OF EROSION CONTROL WATTLE CENTERED OVER FLOW LINE SEE DETAIL A THIS SHEET
APPROXIMATELY 32' OF FENCE REMOVAL
REMOVE APPROX.
95 LF (E) 6' FENCING
15'
60'
SAW CUT
SAW CUT EDGE JUST BEYOND (E) CRACK IN AC
REMOVE MARKING PAINT AND TIEDOWN CHAINS FOR THIS TIEDOWN LOCATION
PROTECT NEW SD INLET. SEE DETAIL A THIS SHEET
REMOVE 3090 SF OF GRAVEL FROM EXISTING ROAD. UTILIZE MATERIAL FOR NEW ROAD & WASH RACK PAD SHOULDER. MAKE UP SHORTAGE WITH CALTRANS CLASS II AGGREGATE BASE.
GRIND (E) AC 3" DEPTH.
AREA = 824 SF
GRINDINGS TO BE USED FOR RE-ROUTED SERVICE ROAD FILL OR WASH RACK PAD SHOULDER FILL.
HYDROSEED AREAS
REMOVE AND DISPOSE OFF SITE EXISTING SD CULVERT PIPE



A EROSION CONTROL WATTLE DETAIL
NO SCALE



B SD INLET SEDIMENT PROTECTION
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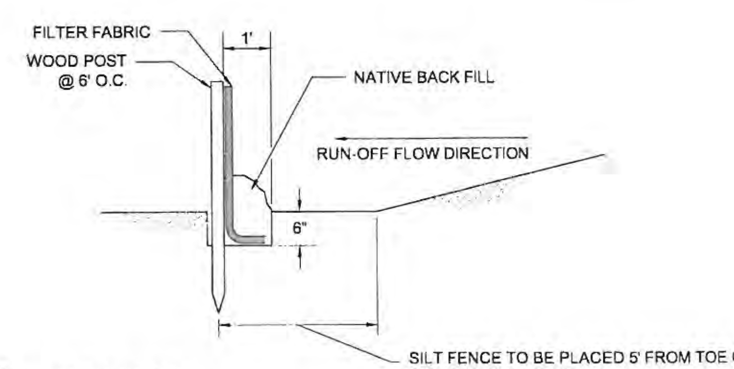

C SILT FENCE
NO SCALE

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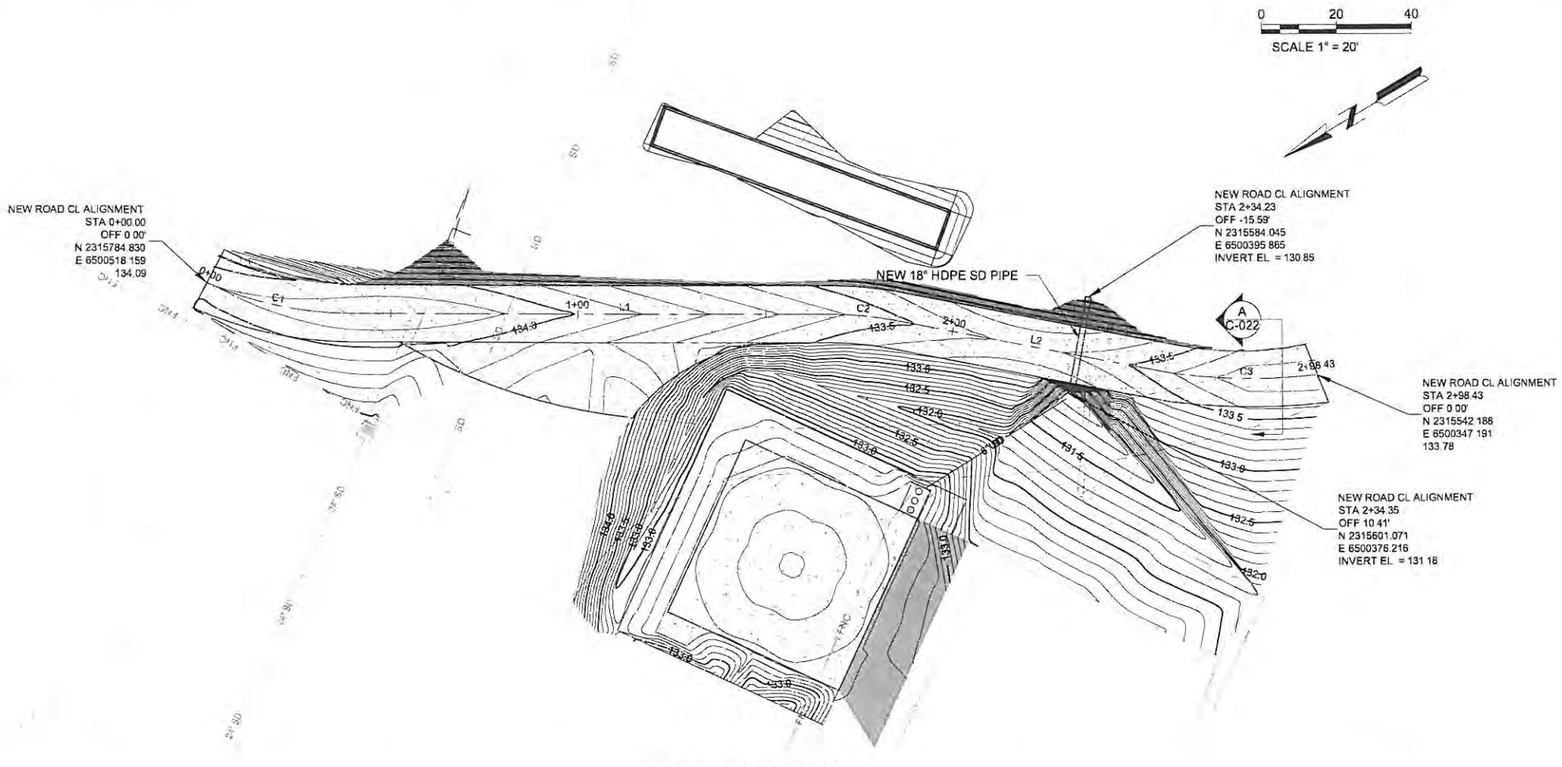
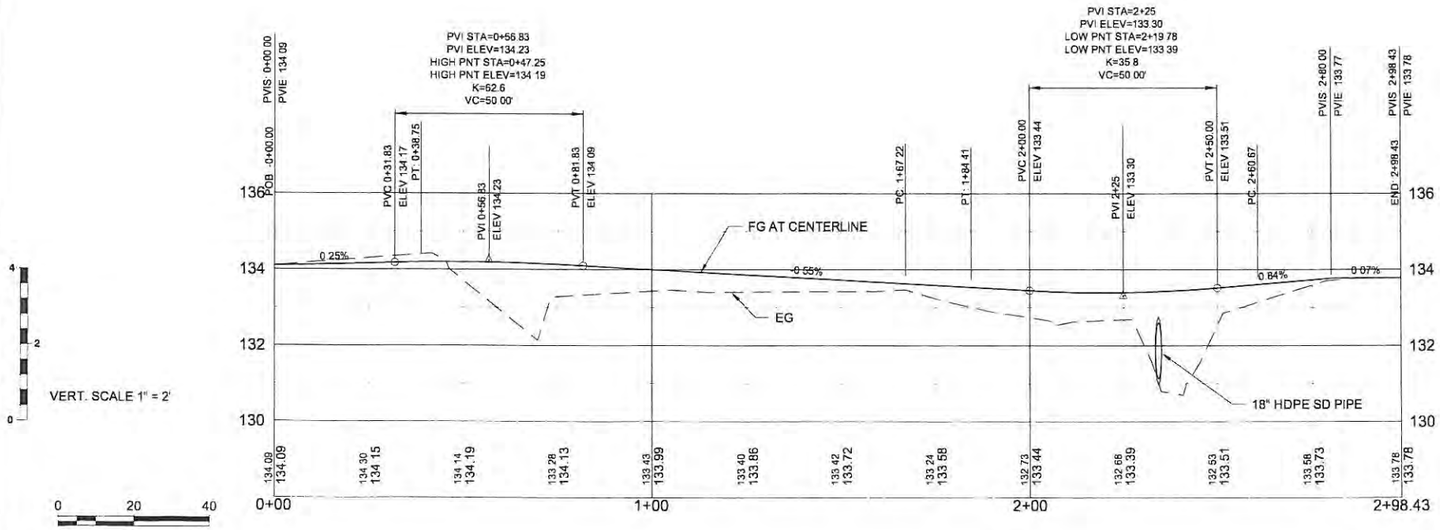
SHEET CONTENTS
DEMOLITION & EROSION CONTROL PLAN

C-021

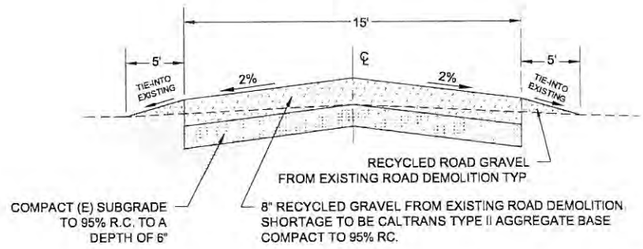


RELOCATED SERVICE ROAD PLAN

NEW ROAD CL ALIGNMENT			
NUMBER	LENGTH	RADIUS	LINE / CHORD DIRECTION
C1	38.749	95.520	SOUTH42° 21' 09.53"WEST
C2	17.196	92.500	SOUTH35° 51' 01.40"WEST
C3	37.768	161.536	SOUTH31° 13' 10.90"WEST
L1	128.470		S30° 31' 28.51"W
L2	76.252		S41° 10' 34.29"W



RELOCATED SERVICE ROAD CL PROFILE



A **RELOCATED SERVICE ROAD TYPICAL SECTION**
NO SCALE

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DO NOT SCALE DRAWINGS

SHEET CONTENTS
RELOCATED SERVICE ROAD PLAN AND PROFILE

SHEET NO 6 of 10

C-022

X:\2187\00115019.21\TECH\CADD\DWG\C-022 RELOCATED SERVICE ROAD PLAN AND PROFILE.DWG
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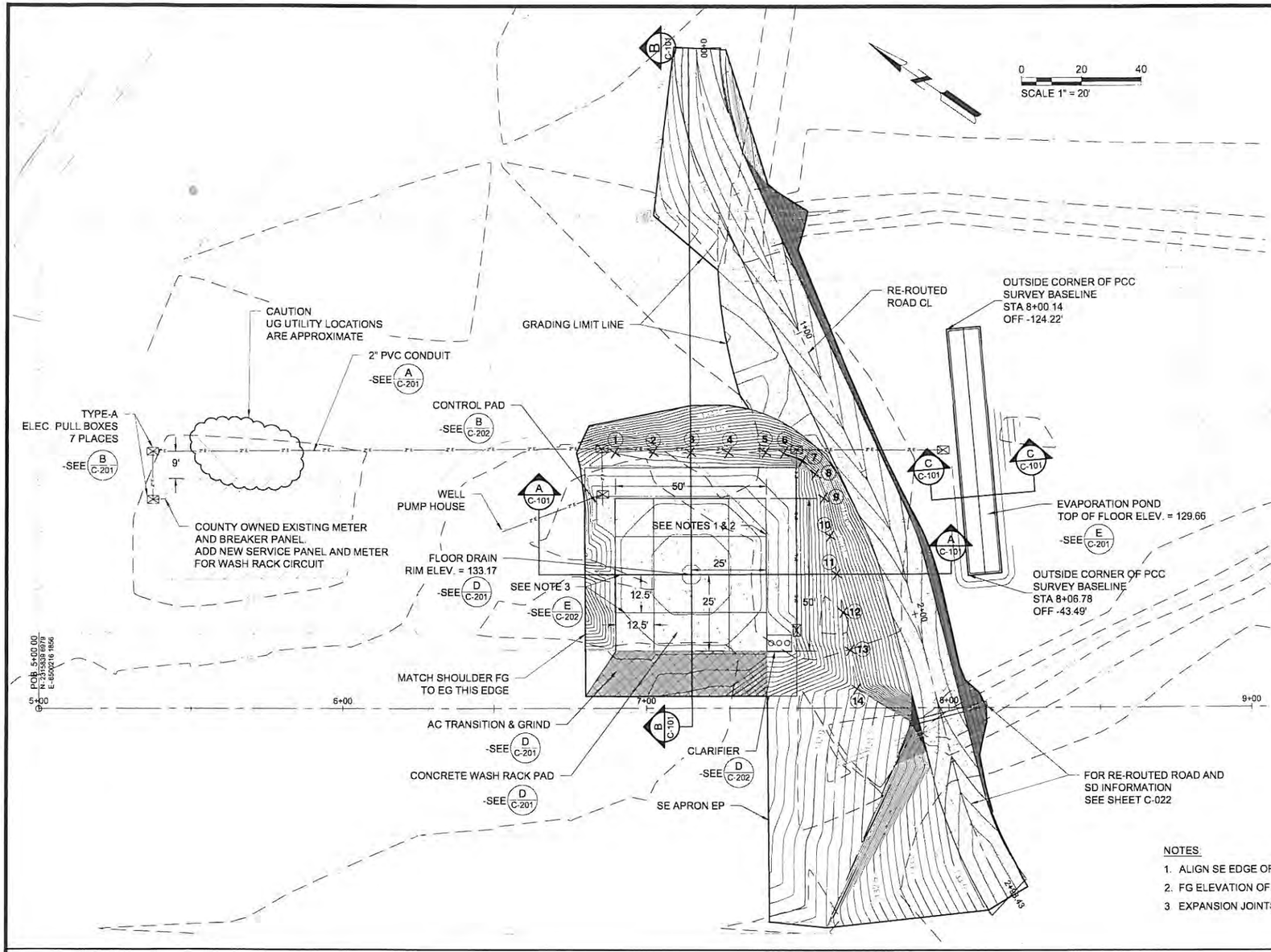
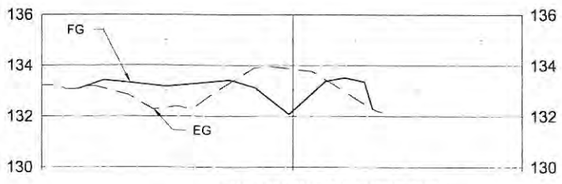
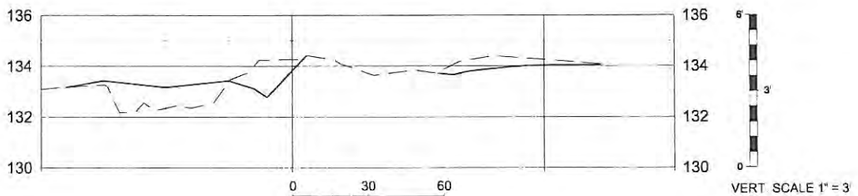


DITCH FG CENTER LINE POINTS			
POINT NUMBER	RE-ROUTED ROAD CL STATION	OFFSET	ELEVATION
1	1+10.04	72.33	133.00
2	1+15.24	60.96	132.89
3	1+20.44	49.59	132.78
4	1+25.63	38.22	132.66
5	1+30.83	26.84	132.55
6	1+33.55	21.50	132.50
7	1+38.48	16.90	132.44
8	1+44.23	14.81	132.38
9	1+52.49	15.67	132.30
10	1+64.74	18.94	132.19
11	1+79.99	21.55	132.08
12	1+93.66	22.58	131.96
13	2+06.30	23.54	131.85
14	2+19.10	24.51	131.73

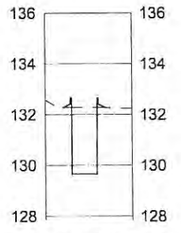
NOTES:
1. ALIGN SE EDGE OF WASH RACK PAD WITH SE APRON EP
2. FG ELEVATION OF ALL EDGES OF WASH RACK PAD = 133.42
3. EXPANSION JOINTS REQUIRED EVERY 12.5 FT EACH WAY



A NORTH SOUTH SECTION THROUGH WASH RACK PAD
NO SCALE



B EAST WEST SECTION THROUGH WASH RACK PAD
NO SCALE



C SECTION THROUGH EVAP. POND
NO SCALE

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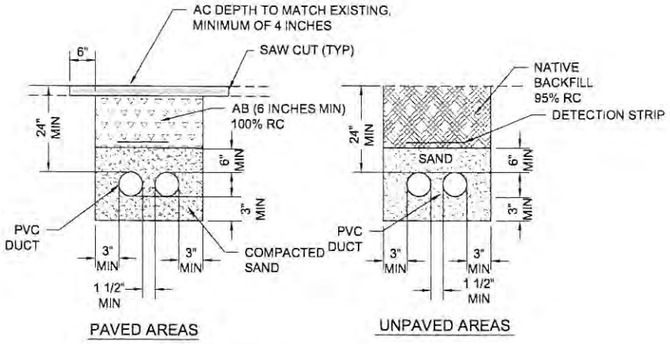
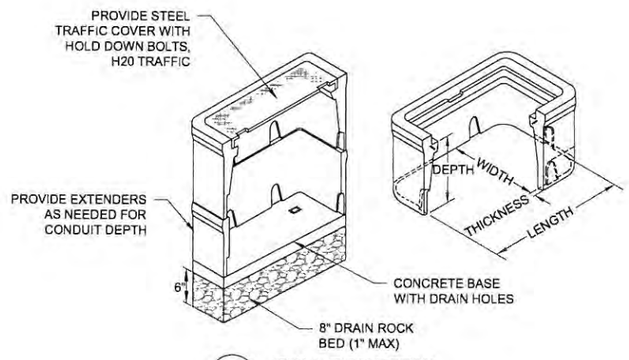
SHEET CONTENTS
WASH RACK AND EVAPORATION POND GRADING PLAN

C-101



NOTES:
1. SIMILAR FOR SINGLE OR TRIPLE DUCTS. FOUR WAY DUCTS OR LARGER SHALL BE STACKED 2 BY 2 OR 3 BY 3.
2. DUCT UNDER NEW PAVEMENT SHALL BE INSTALLED BEFORE THE PAVEMENT IS PLACED.

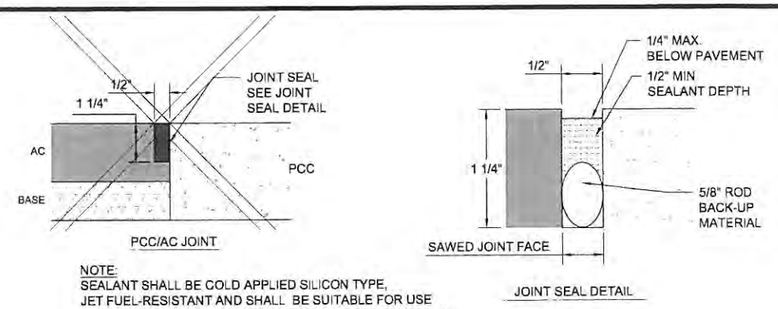
A **PVC DUCT TRENCHING**
NO SCALE



B **PULL BOX DETAIL**
NO SCALE

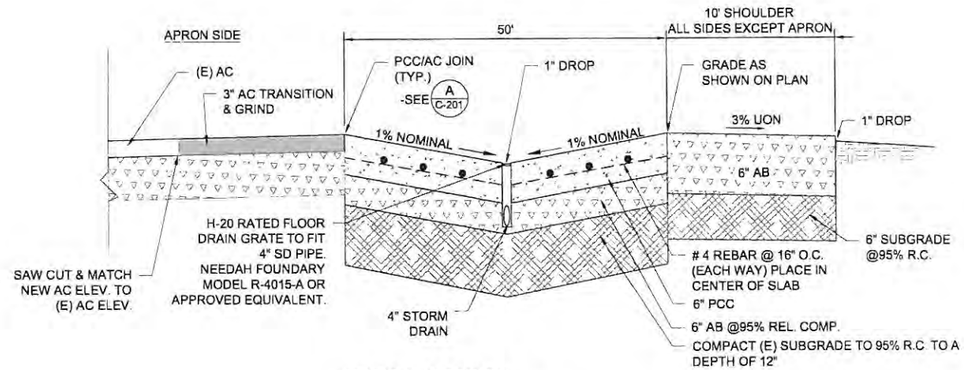
PULL BOX SCHEDULE				
TYPE	LENGTH	WIDTH	DEPTH	THICKNESS
A	22	12"	#	*
B	30"	17 1/4"	#	*

* AS REQUIRED FOR H/20 LOADING
\# AS REQUIRED TO MEET GRADE



NOTE:
SEALANT SHALL BE COLD APPLIED SILICON TYPE, JET FUEL-RESISTANT AND SHALL BE SUITABLE FOR USE WITH BOTH ASPHALT AND PORTLAND CEMENT PAVEMENTS

C **PCC/AC JOINT DETAILS**
NO SCALE



D **TYPICAL SECTION PCC/AC JOINT DETAILS**
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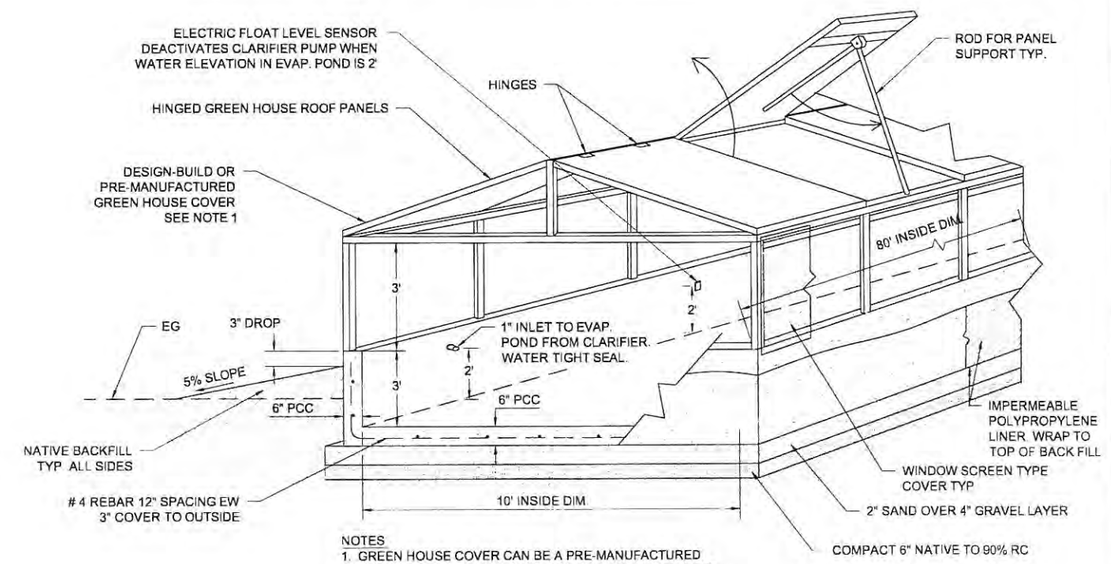

NOTES
1. GREEN HOUSE COVER CAN BE A PRE-MANUFACTURED TYPE, EXACO KIT 10-10 OR APPROVED EQUAL, MADE TO FIT THE EVAPORATION POND FOUNDATION

E **EVAPORATION POND TYPICAL SECTION**
NO SCALE

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SHEET CONTENTS
WASH RACK DETAILS-1

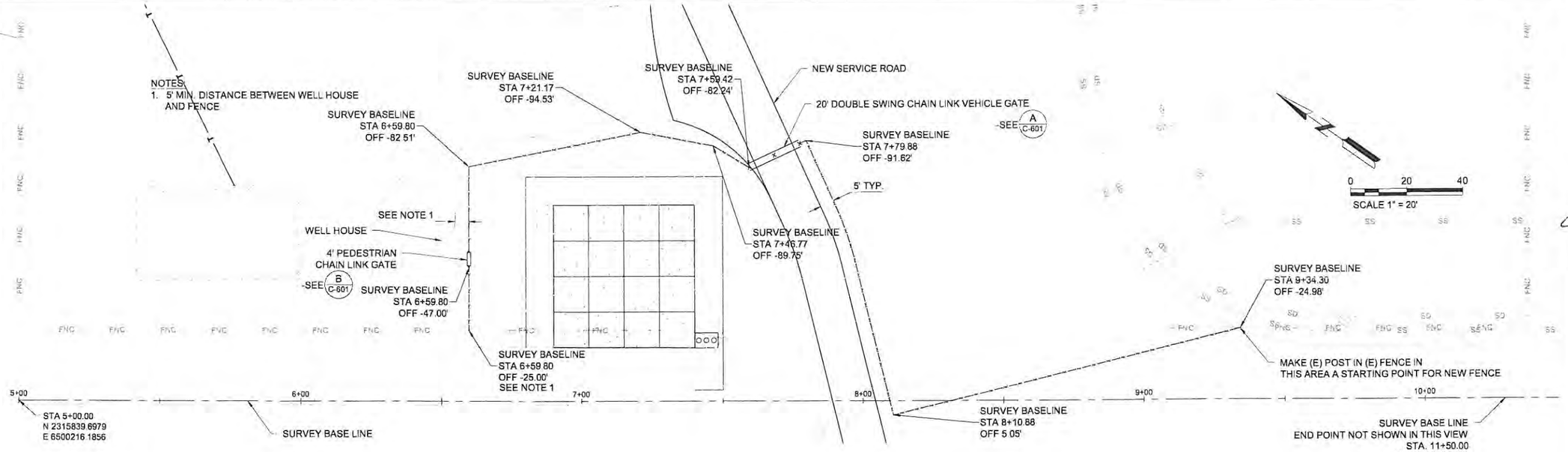
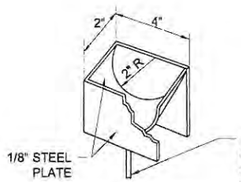
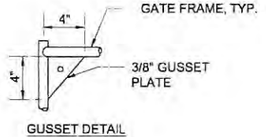


TABLE 1

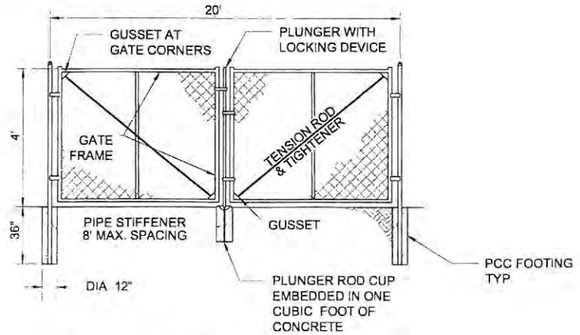
POST DESCRIPTION	FED SPEC. SIZE	MINIMUM OUTSIDE DIAMETER	THICKNESS
TOP OR BRACE RAIL		1.635"	0.11"
LINE	SP2	1.900"	0.12"
TERMINAL	SP3	2.375"	0.13"
GATE- (LESS THAN 6')	SP4	2.875"	0.226"
GATE- (6' OR MORE)	SP6	6.625"	0.28"



PLUNGER ROD CUP DETAIL



GUSSET DETAIL



A SWING GATE
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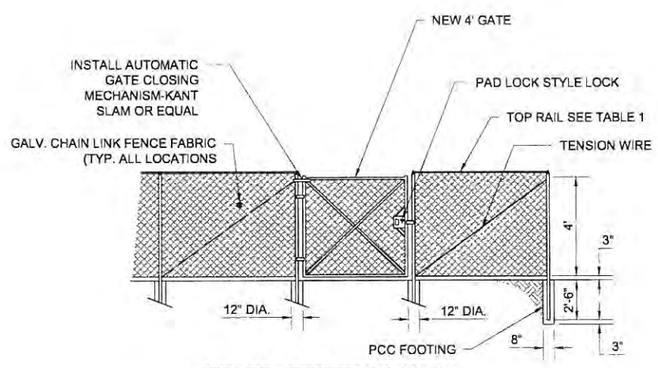

FOR POST SIZE SEE DETAIL-A , TABLE 1

B PEDESTRIAN GATE
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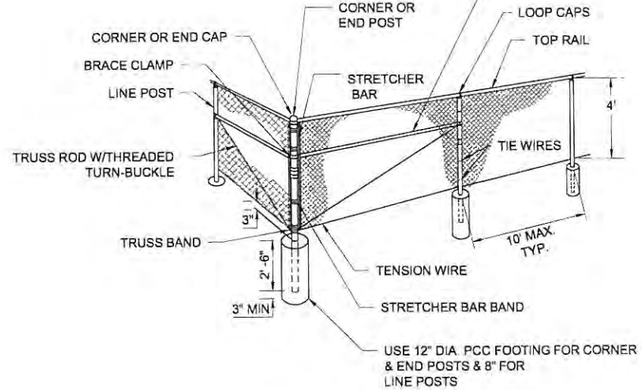

FOR POST SIZE SEE DETAIL-A , TABLE 1

C CHAIN LINK FENCE
NO SCALE

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SHEET CONTENTS
FENCING PLAN AND DETAILS

C-601

X:\07187-00\115019\ENTITLEMENT\ADD\C-601 FENCING PLAN.DWG
7/27/2012 11:36:26 AM