September 24, 2015

This Addendum to the Invitation for Bids (IFB) serves to notify all interested bidders of clarifications and or changes to IFB No. B15003 General Contractor of Firebaugh Multifamily Apartments, and becomes part of this IFB. Contractors are required to acknowledge receipt of this addendum in their proposal. If not acknowledged, Contractor's proposal may be considered "non-responsive."

Q1: Will the soils report and any abatement reports (lead-based paint, asbestos) be available at tomorrow's job walk? If not, when might they be made available?

A1: All available reports are with Fresno Reprographics for download and review. Said reports are also attached here to this addendum.

All other requirements of this IFB remain unchanged. Thank you for your interest in doing business with the Agency and we look forward to receiving a bid from your firm.

TECHNICON
ENGINEERING SERVICES, INC.
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING ~ CONSTRUCTION TESTING & INSPECTION

August 15, 2012
TES#: 22423.001

Mr. Daniel Guerra
Fresno Housing Authority
1331 Fulton Mall
Fresno, California 93721
Phone: (559) 443-8400 ext. 4905

SUBJECT: **Geotechnical Investigation Report**

PROJECT: **Proposed Multi-Family Residential Complex**
NWC of 13th and P Streets
Firebaugh, California

Dear Mr. Guerra:

The attached report presents the results of a geotechnical investigation for a proposed multi-family residential complex to be located at the northwest corner of the intersection of 13th and P Streets in Firebaugh, California. This report describes the study, findings, conclusions, and recommendations for use in project design and construction.

TECHNICON appreciates the opportunity to provide geotechnical engineering services to the Fresno Housing Authority during the design phase of this project. We trust this information meets your current needs. If there are any questions concerning the information presented in this report, please contact this office at your convenience.

Respectfully submitted,
TECHNICON ENGINEERING SERVICES, INC.

Stephen P. Plauson, PE, GE
Geotechnical Engineering Manager

SPP:env

TECHNICON
ENGINEERING SERVICES, INC.

GEOTECHNICAL INVESTIGATION REPORT
PROPOSED MULTI-FAMILY RESIDENTIAL COMPLEX
NWC OF 13TH AND P STREETS
FIREBAUGH, CALIFORNIA

Prepared for:
Fresno Housing Authority
1331 Fulton Mall
Fresno, California 93721

August 15, 2012

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GEOTECHNICAL INVESTIGATION REPORT
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TECHNICON PROJECT
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Prepared by:

Stephen P. Plauson, PE, GE
Geotechnical Engineering Manager

TECHNICON ENGINEERING SERVICES, INC.
4539 North Brawley Avenue, Suite 108
Fresno, California 93722
(559) 276-9311

August 15, 2012

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Appendices

1 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation for a proposed replacement apartment complex to be located at the northwest corner of the intersection of 13th and P Street in Firebaugh, California. The Vicinity Map, presented on Figure 1, shows the location of the project and the Site Map, presented on Figure 2, shows the proposed improvements and the approximate boring locations.

The purpose of this investigation was to explore and evaluate the subsurface conditions at the site in order to develop geotechnical engineering recommendations to aid in project design and construction.

1.2 PROPOSED CONSTRUCTION

It is understood the project involves the design and construction of a multi-family residential complex to be constructed at the current location of two (2) existing apartment complexes located at the northwest corner of the intersection of 13th and P Streets in Firebaugh, California. The proposed buildings are anticipated to consist of two-story, wood frame structure with concrete slab-on-grade floor. Maximum wall and column loads are anticipated to be less than 2.5 kips per foot and 20 kips, respectively. Appurtenant improvements are anticipated to include asphalt concrete pavements, underground utilities, and landscaping. Cut and fill elevations are anticipated to be less than 1 to 2 feet in vertical extent to provide a level building pad, site access, and positive drainage.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this investigation was to explore the site subsurface conditions to allow for development of recommendations and opinions regarding site development. The report includes the following:

- ❑ A description of the proposed project including a Vicinity Map showing the location of the site and a Site Map showing the of the proposed improvements and the location exploration points for this study

- ❑ A description of the site surface and subsurface conditions encountered during the field investigation, including boring logs
- ❑ A summary of the field exploration and laboratory testing program
- ❑ Discussion of regional and local geology including faults, seismicity, and liquefaction potential and associated effects
- ❑ Recommended seismic design criteria
- ❑ Recommendations for site preparation and earthwork, including the use of on-site soils for engineered fill and recommended import fill specifications
- ❑ Recommendations for conventional foundation design including bearing capacity of foundation soil for sustained loading, total combined loading, and anticipated settlement
- ❑ Recommendations for resistance of lateral loads, including passive pressure and coefficient of friction
- ❑ Recommendations to aid in design of concrete slabs-on-grade, including modulus of subgrade reaction
- ❑ Comments on the corrosion potential of on-site soil to buried metal and concrete
- ❑ Comments on general site drainage

The scope of services consisted of a field exploration program, laboratory testing, design analysis, and preparation of this written report.

2 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

The field exploration, conducted on July 31, 2012 consisted of drilling three (3) exploratory test borings and a site reconnaissance by a staff engineer. The test borings were drilled with a CME 55 truck-mounted drill rig using hollow stem augers. The borings extended to depths of 11.5, 16.5, and 51.5 feet below existing ground surface (bgs). The approximate locations of the test borings are indicated on the Site Map, Figure 2.

The soils encountered in the borings were visually classified in the field and a continuous log was recorded. Relatively undisturbed samples were collected from the test borings at selected depths by driving a 2.5-inch I.D. split barrel sampler containing brass liners into the undisturbed soil with a 140-pound automatic hammer free falling a distance of 30 inches. In addition, samples of the subsurface soils were obtained using a 1.4-inch I.D. standard penetrometer, driven 18 inches in accordance with ASTM D1586 test procedures. The sampler was used without liners. Resistance to sampler penetration was noted as the number of blows per foot over the last 12 inches of sampler penetration on the boring logs. The blow counts listed in the boring logs have not been corrected for the effects of overburden pressure, rod length, sampler size, boring diameter, or hammer efficiency.

2.2 FIELD AND LABORATORY TESTING

2.2.1 Field Testing

Penetration rates, determined in general accordance with ASTM D1586, were used to aid in evaluating the consistency, compression, and strength characteristics of the foundation soils.

2.1.1. Laboratory

Laboratory tests were performed on selected near surface samples to evaluate their physical characteristics. The following laboratory tests were used to develop the design geotechnical parameters:

- ❑ Unit weight (ASTM D2937)
- ❑ Moisture Content (ASTM D2216)

- ❑ Sieve Analysis (ASTM D422)
- ❑ Expansion Index (ASTM D4829)
- ❑ Direct Shear (ASTM D3080)
- ❑ Consolidation (ASTM D2435)
- ❑ Soluble Sulfate and Soluble Chloride Contents (California Test Method No's 417 & 422)
- ❑ pH and Minimum Resistivity (California Test Method No. 643)

The dry density and moisture content test results are shown on the boring logs in Appendix A. The soluble sulfate, soluble chloride, pH, and minimum resistivity are discussed in the "Corrosion Potential" section (Section 6.4). The remaining test results are provided in Appendix B.

3 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The subject site is located at the northwest corner of the intersection of 13th and P Streets in Firebaugh, California. The site is generally bounded by an alleyway and commercial structures to the west, a commercial / multi-residential structure to the north, P Street to the east, and 13th Street to the south. At the time of the field reconnaissance, the site was developed with two separate apartment complexes. The building to the south was observed to be a combination one and two-story structure with grass landscaped courtyard, while the complex to the north was single story structure with a grass landscaped breezeway. The existing topography appeared to be flat and at a relative elevation of 6 to 8-inches above the elevation of adjacent roadways.

According to the Federal Emergency Management Agency (FEMA), the project site lies within a Zone X flood designation (Firebaugh County, Map No. 06019C1430H, dated February 18, 2009), indicating areas of 0.2 percent (500-year) annual chance floodplain, areas of 1 percent (100-year) annual chance flood with average depths of less than 1-foot or with drainage areas less than 1-square mile; and areas protected by levees from 1 percent (100-year) annual chance flood. The civil designer should confirm the flood elevation and plan site grades accordingly.

3.2 EARTH MATERIALS

The subsurface soils consist of Holocene age Great Valley fan deposits. The general earth material profile depicted by the subsurface exploration consisted predominantly of moderately to highly plastic sandy clay underlain by silty clay, further underlain by an layers of silty sand and poorly graded sand to the depth of exploration, 51.5 feet bgs. The fine grained soils had a relative density of medium stiff to stiff and the coarse grained soils had a relative density of medium dense.

The above is a general description of the earth material profile. A more detailed representation of the stratigraphy at the specific exploration locations is provided on the boring logs in Appendix A.

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered a depth of 18 feet bsg. The California Department of Water Resources "Lines of Equal Elevation in Water Wells," Spring 2009, indicates the depth to groundwater exceeds 29 feet bsg. Research of the California Department of Water Resources (DWR) website shows the nearest well to be approximately ½ mile to the west-southwest (Well No. 12S14E29Q001M). Based on the groundwater elevation data collected at this well, the historic high groundwater depth was recorded at 5 feet bsg in the early 2000's. It is possible that groundwater conditions at the site could change at some time in the future due to variations in rainfall, groundwater withdrawal, regional agricultural production, construction activities, or other factors not apparent at the time our test borings were excavated. However, groundwater is not anticipated to impact design or construction. Considering the groundwater trends noted above, it is recommended that a groundwater depth of 10 feet be used for project planning, design, and the evaluation of liquefaction and any seismically induced affects.

4 GEOLOGIC CONDITIONS

4.1 FAULTS LOCAL TO THE PROPOSED SITE

The project site and its vicinity are located in an area traditionally characterized by relatively low seismic activity with the potential for moderate to high seismic activity. The site is not located in an Alquist-Priolo Earthquake Fault Zone as established by the Alquist-Priolo Fault Zoning Act (Section 2622 of Chapter 7.5, Division 2 of the California Public Resources Code).

Based on published data and current understanding of the geologic framework and tectonic setting of the site, the primary sources of seismic shaking at this site is anticipated to be the Coast Range Sierran Block (M_w6.6), the Ortigalita (M_w 7.1), the Quien Sabe (M_w 6.4), the Calaveras (M_w 6.2), the Sargent (M_w 6.8), the Zayante-Vergeles (M_w 6.8), the San Andreas (M_w 7.9), and the Rinconada (M_w 7.3) faults, which are located approximately 27, 42, 69, 70, 86, 90, 94, and 99 kilometers, respectively, from the site. The governing fault at this site is anticipated to be the Coast Ranges-Sierran Block Fault.

4.2 SEISMIC DESIGN CRITERIA

There are no geotechnical factors at this site that are unique and would necessitate special seismic consideration for design. Use of 2010 CBC design criteria would be appropriate, unless the designer deems more specific data (e.g. elastic response spectra or characteristic site period) necessary. The design parameters presented in Table 4.2-1 are recommended.

TABLE 4.2-1
2010 CBC SEISMIC DESIGN PARAMETERS

Seismic Item	Design Value	Seismic Item	Design Value
Site Class	D	S_{MS}	0.994
S_S	0.860	S_{M1}	0.549
S_1	0.307	S_{DS}	0.663
Site Coefficient, F_a	1.156	S_{D1}	0.366
Site Coefficient, F_v	1.786		

4.3 LIQUEFACTION POTENTIAL AND SEISMIC SETTLEMENT

In order for liquefaction, and possible associated effects, of soils due to ground shaking to occur, it is generally accepted that four conditions will exist:

- The subsurface soils are in a relatively loose state,
- The soils are saturated,
- The soils are fine, granular, and uniform,
- Ground shaking of sufficient intensity should occur to act as a triggering mechanism.

Liquefaction analysis used procedures by Youd (2001) and Seed et. al. (2003) and considered the relative density and fines content of the granular sediments and the moisture content and Plasticity Index of the fine grained soils.

Saturated granular sediments can experience liquefaction if subject to seismically induced ground motion of sufficient intensity and duration. Based on the anticipated ground motion and relative consistency of the on-site soils, analysis (Youd, 2001) indicates that liquefaction may occur, however, due to the presence of relatively stiff clay surface soil, bearing loss is unlikely. Analysis indicates that seismically induced settlement will be less than 1-inch. The general guidelines of the California Geologic Survey (CGS) indicate the differential seismically induced settlement across a building would be about one-half the total settlement. This may result in differential settlement across the buildings of approximately 0.5-inch. The anticipated differential settlement is low and is anticipated to be within the tolerance of the proposed structures and will not result in significant damage or collapse. Therefore, no mitigation against liquefaction and/or settlement is necessary.

5 EARTHWORK

5.1 GENERAL

Based on the laboratory data, field exploration, and geotechnical analyses conducted for this study, it is geotechnically feasible to construct the proposed improvements as currently envisioned. Provided that the recommendations presented in this report are incorporated into the project design and construction, use of shallow continuous reinforced concrete footings bearing on undisturbed native soil or approved engineered fill are considered appropriate for structure support.

The investigation has revealed a surface horizon of highly expansive clay soil. These expansive soils are greatly susceptible to volume changes associated with changes in soil moisture content. The potential for future differential movement resulting from these soils can be reduced to normally tolerable levels by following the moisture conditioning and compaction recommendations presented in this report. Moisture conditioning and compaction mitigation implemented during grading should be consistent with the expansiveness determined. Careful attention must be paid to future maintenance, including site drainage and irrigation practices.

It should be noted that moisture established during grading must be maintained or re-established at the time of footing and slab construction.

Recommendations regarding site grading are presented in subsequent sections of this report. All reference to relative compaction, maximum density, and optimum moisture is based on ASTM Test Method D1557.

5.2 SITE PREPARATION

5.2.1 Tree Removal and Demolition

Existing trees and shrubs should be removed from proposed building areas and the root system thoroughly cleared of root balls and isolated roots greater than ½-inch in diameter. The amount of soil lost or disturbed with removal will likely vary with the moisture conditions at the time of removal, soil type and the methods of removal. It is anticipated that much of the fine grained clay site soil will adhere to the root system. Therefore, additional volume loss should be assumed.

In addition, where not to remain existing structures and associated foundation systems underground utilities etc., and other unsuitable structures should be entirely removed.

Following demolition, disturbed soils should be removed to expose firm unyielding subgrade soil approved by the Geotechnical Engineer. All earthwork associated with the demolition of structures should be performed in accordance with Sections 5.2.3, 5.2.4, and 5.2.5.

5.2.2 Stripping

All surface vegetation and any miscellaneous surface obstructions (pavements, hardscape, etc. should be removed from the project area, prior to any site grading. It is anticipated stripping of vegetation could involve the upper 2 to 4 inches of the site. Surface strippings should not be incorporated into fill unless they can be sufficiently blended to result in an organic content less than 3 percent by weight (ASTM D 2974). Stripped topsoil, with an organic content between 3 and 12 percent by weight, may be stockpiled and used as non-structural fill (i.e. landscaped areas). If used in landscape areas soil with an organic content between 3 and 12 percent should be placed within 2 feet of finished grade and at least 5 feet outside of building perimeters. Soil with an organic content greater than 12 percent by weight should be excluded from fill.

If stripping and demolition includes pulverization/crushing of asphalt and concrete, the material may be reused as aggregate base (Caltrans Class 2) provided it meets the gradational requirements of Section 26 of the Caltrans standard specifications and attains a minimum R-value of 78, or the material may be sufficiently blended into general engineered fill soil.

5.2.3 Disturbed Soil, Undocumented Fill and Subsurface Obstructions

Initial site grading should include a reasonable search to locate soil disturbed by previous activity, any undocumented fill soils, abandoned underground structures, or existing utilities that may exist within the area of construction. Any subsurface obstructions should be removed from the project area. Any areas or pockets of soft or loose soils, void spaces made by burrowing animals, undocumented fill, or other disturbed soil that are encountered, should be excavated to expose approved firm native material.

5.2.4 Over-excavation

Soft near surface soils as well as removal of foundations and underground utilities, which is anticipated to disturb the site soils, could lead to non-uniform bearing conditions and differential settlement of proposed improvements. As such, over-excavation is recommended below new structures, hardscape, pavement, and other areas sensitive to settlement to repair near surface loose/disturbed soils and aid in moisture conditioning the expansive clay soils. After performing the removals described in Sections 5.2.1, 5.2.2, and 5.2.3, all areas to support improvements including general fill, structures, pavements, and other improvements that may be sensitive to settlement should be over-excavated to a minimum depth of 18 inches below the existing site grade. The excavated soil may be reused as engineered fill provided the soil meets the requirements of Section 5.3 "Engineered Fill".

5.2.5 Scarification and Compaction

After stripping the site and performing any necessary removals, all areas to receive fill or to support project improvements should be scarified at least 6 inches below exposed subgrade elevation. The subgrade soil should be uniformly moisture conditioned, proof rolled to detect soft or pliant areas, and compacted to the requirements for engineered fill, as indicated in Table 5.3-2. Soft or pliant areas should be mitigated in accordance with Section 5.2.3. The expansive soil condition will necessitate moisture conditioning to a depth of 36 inches below building slabs (see Section 6.2).

5.3 ENGINEERED FILL

5.3.1 Materials

All engineered fill soils should be nearly free of organic or other deleterious debris and less than 3 inches in maximum dimension. The on-site soil exclusive debris may be used as engineered fill, provided it contains less than 3 percent organics by weight (ASTM D2974).

Should any imported material be used for engineered fill, it should be sampled and tested by a representative of the project Geotechnical Engineer prior to being transported to the site. Table 5.3-1 provides general criteria for imported soil.

TABLE 5.3-1
IMPORT FILL CRITERIA

Gradation (ASTM C136)			
Sieve Size		**Percent Passing**	
76 mm (3-inch)		100	
19 mm (¾-inch)		80 – 100	
No. 4		60 – 100	
No. 200		20 – 50	
Expansion Index (ASTM D4829)		**Plasticity (ASTM D4318)**	
		Liquid Limit	**Plasticity Index**
< 100		< 50	< 25
Organic Content (ASTM D 2974)			
< 3% by dry weight			
Corrosivity			
pH	**Minimum Resistivity (ohm-cm)**	**Soluble Sulfate (ppm)**	**Soluble Chloride (ppm)**
6 to 8	> 2,000	< 2,000	< 500

The import criteria for corrosion are typical threshold limits for non-corrosive soil. Should corrosion concentrations of import soils fall outside of the threshold limits indicated above, revised protection measures will be necessary.

5.3.2 Compaction Criteria

Soils used as engineered fill should be uniformly moisture conditioned to at least the percentages above optimum moisture indicated in Table 5.3-2, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to within the required range of relative compaction indicated in Table 5.3-2. Discing and/or blending may be required to uniformly moisture-condition soils used for engineered fill. The actual level of moisture conditioning and compaction will be based on the expansion potential and moisture density relationships determined during grading. The general intent is to bring the expansive material to about 80 to

85 percent saturation at the time of construction. Preliminary design should consider criteria for the EI greater than 80 (PI greater than 25).

TABLE 5.3-2
MOISTURE CONDITIONING AND COMPACTION

Soils		Relative Compaction (min – max)	Minimum Moisture Conditioning (% Over Optimum)
PI	EI		
< 9	< 20	90%	+ 0%
9 to 15	21-40	90-95%	+ 3%
16 to 25	41-80	88-92%	+ 4%
> 25	**> 80**	**88-92%**	**+ 5%**

5.4 TEMPORARY EXCAVATIONS

5.4.1 General

All excavations must comply with applicable local, State, and Federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. The information provided is a service to the client. Under no circumstances should the information provided be interpreted to mean that **TECHNICON** is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.4.2 Excavations and Slopes

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, State, and/or Federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

All excavations should be constructed and maintained in conformance with current OSHA requirements (29 CFR Part 1926) for a Type B soil. If excavations encounter saturated soils or groundwater, temporary excavations will have to be layed back or shored and the trench dewatered to maintain stability.

5.4.3 Construction Considerations

Heavy construction equipment, building materials, excavated soil, and vehicular traffic should be kept sufficiently away from the top of any excavation to prevent any unanticipated surcharging. If it is necessary to encroach upon the top of an excavation, **TECHNICON** can provide comments on slope gradients or loads on shoring to address surcharging, if provided with the geometry. Shoring, bracing, or underpinning required for the project (if any), should be designed by a professional engineer registered in the State of California.

During wet weather, earthen berms or other methods should be used to prevent runoff water from entering all excavations. All runoff should be collected and disposed of outside the construction limits. Further discussion is provided in section 5.6.

5.5 TRENCH BACKFILL

5.5.1 Materials

Pipe zone backfill (i.e., material beneath and in the immediate vicinity of the pipe) should consist of soil compatible with design requirements for the specific types of pipes. It is recommended the project designer or pipe supplier develop the material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study. Randomly excavated near surface soil will likely be Class IVA material per ASTM D2321.

Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native soil which meets the requirements for engineered fill.

It should be noted that the native clayey material may require significant effort to achieve compaction within narrow trenches. If granular import is used for backfill, a native clay soil or lean concrete slurry dike should be provided in the upper 4 feet where the trenches cross beneath the perimeter of the structures. This dike is intended to minimize the lateral migration of subsurface water into clay soil under the buildings. In addition, the native clay soil should be placed within the upper 2 feet of trenches exposed to surface water. If granular import material

is used for pipe or trench zone backfill, it should have a piping ratio compatible with the adjacent soil, or a geofabric separator should be utilized.

5.5.2 Compaction Criteria

All trench backfill should be placed and compacted in accordance with recommendations provided for engineered fill. Reduced compaction (85 percent minimum) could be specified for trench zone backfill in non-structural areas located a distance equal to the depth of the trench from any structure and appurtenant improvements. Mechanical compaction is recommended; ponding or jetting should not be used.

Table 5.5-1 provides estimated geotechnical parameters for designers to consider in evaluating pipe zone backfill criteria that is compatible with pipe types and deformation tolerances.

TABLE 5.5-1
PIPE ZONE BACKFILL PARAMETERS

Soil Stiffness Modulus (psi)			Backfill Density (pcf)	
E'_n (Trench Sidewall)	E'_b (Backfill)		85% Compaction	90% Compaction
	85% Compaction	90% Compaction		
1,250	700	1,000	115	122

E'_n represents the modulus for the undisturbed natural soil and is based on relative density and data by Howard (1996). E'_b is the modulus for backfill derived from random excavation of on-site soil and is based on data by Hartley and Duncan (1982) and Watkins and Anderson (2000). The design E' will be dependent upon the pipe diameter and trench width, which dictates the relative influence of E'_n and E'_b. Methods by Howard (1996) are suggested for evaluating the design E'. **TECHNICON** can furnish a recommended design E', if provided with pipe diameter and specifications for trench construction.

5.6 CONSTRUCTION CONSIDERATIONS

5.6.1 General

Should site grading encounter saturated subgrade or be performed during or subsequent to wet weather or recent landscape irrigation, near-surface site soils may be significantly above optimum moisture content. These conditions could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Discing to aerate, chemical treatment, replacement with drier material, stabilization with a geotextile fabric or grid, or other methods may be required to mitigate the effects of excessive soil moisture and facilitate earthwork operations. Any consideration of chemical treatment (e.g. lime) to facilitate construction would require additional soil chemistry evaluation and could affect landscape areas and some construction materials (e.g. aluminum).

Specific engineering approaches for mitigation of problematic soil conditions are typically developed based on the site specific soil condition. However, for preliminary planning the following suggestions and options could be considered for protecting the site from inclement weather and mitigating unstable soil conditions.

5.6.2 Prevention

If site grading is performed during periods when the potential exists for pending inclement weather, the Contractor should prepare the site to minimize the affects of rainfall. This includes: compacting and sloping grades to promote runoff to collection points for pumping and removal. In addition, it may become necessary to protect building areas with plastic sheeting, should grading techniques not be practical.

5.6.3 Mitigation

Several approaches can be considered for mitigation of unstable subgrades, however, the selection of the mitigation approach is often based on various considerations, including: cost, impact to the schedule, and constructability. It is also suggested that the option chosen also consider the winterization benefits. For example, discing and drying of overly saturated soils is a suitable option, but provides little protection from site conditions worsening if future rain events occur, whereas, chemical treatment of unstable subgrades provides both stabilization and the benefit of potentially winterizing the site. The following are typical approaches to

subgrade stabilization. Specific engineering approaches for mitigation of problematic soil conditions should be developed based on the specific site conditions at the time of construction.

Mitigation Option A - Discing to aerate wet or saturated soils to promote drying

Mitigation Option B - Over-excavation of unstable soils and replacement with dry soil

Mitigation Option C - Chemical stabilization using Portland cement, high calcium quick lime, or a combination, which reduces the moisture of typical soils approximate 4 percent per 1 percent by dry weight of chemical added. Past experience in the San Joaquin Valley indicates that typically 2 to 4 percent by dry weight of chemical additive is sufficient to dry the subgrade. Commonly, 3 to 5 percent by dry weight of chemical additive is needed to winterize the subgrade.

Mitigation Option D - Mechanical stabilization, which involves placement of geotextile fabrics (e.g. Mirafi 500x, or equivalent) and/or bi/tri-axial geogrids (Tensar BX, 1100, 1200, Trax-G, etc) and between 8 to 12 inches of compacted crushed stone over the grid.

6 DESIGN RECOMMENDATIONS

6.1 SPREAD FOUNDATIONS

6.1.1 General

The proposed structure may be supported by conventional shallow continuous footings bearing on approved undisturbed native soil or properly engineered fill. Due to the expansive soil characteristics, the perimeter of the structure shall be supported on a continuous footing. In addition, slab areas should be periodically stiffened with interior continuous footings. The following recommendations are based on the assumption that the recommendations in Section 5, "Earthwork", have been implemented.

The investigation revealed a surface horizon of highly expansive clay soil. Based on the anticipated expansive nature of the natural soils, it is recommended that footings be embedded a minimum of 24 inches below the lowest adjacent grade. Footings should be reinforced with two #5 bars near the top and two #5 bars near the bottom (4 bars total). Foundation depths and reinforcement should also satisfy structural and constructability considerations.

These recommendations are based on engineering judgment and experience associated with expansive soil and is not based on any structural analysis. Any additional reinforcement for structural considerations should be provided by the structural engineer.

6.1.2 Allowable Vertical Bearing Pressures and Settlements

Conventional spread footing foundations can be supported on approved undisturbed native soil or properly compacted fill. Presented in Table 6.1-1 are the allowable bearing capacity for static loading (D.L. + L.L.) and total combined loading (D.L. + L.L. + transient loading, such as wind or seismic). The un-factored ultimate bearing capacity is also provided.

TABLE 6.1-1
AVAILABLE ALLOWABLE BEARING

	Available Allowable Bearing (psf)
Static Loading	2,000
Total Combined Loading	3,000
Un-factored Ultimate Bearing	6,000

The above expressions are appropriated for design using the Basic and Alternate Load Combinations in Section 1605.3 of the 2010 CBC. The allowable bearing pressure could be increased one-third for evaluating transient loads, such as, wind or seismic.

Analysis based on consolidation theory determined the following estimated static settlement based on a range of assumed structural loads. The estimated settlements are based on the assumption that the sustained load on footings is equal to 80 percent of the total load.

TABLE 6.1-2
ESTIMATED SETTLEMENT

Footing Type	Loading (DL +LL)	Design Bearing (psf)	Estimated Settlement (inch)
Strip	Up to 2.5 kips/ft	2,000	1.0
Column	Up to 20 kips		

Differential settlement is expected to be on the order of 50 percent of the total settlement for similarly loaded footings. If deemed necessary by the design engineer, **TECHNICON** can provide the estimated settlement for other loading conditions.

If evaluating the foundation as a beam on an elastic foundation, a modulus of subgrade reaction, K_p (B_p = 1 foot), of 100 pci can be used for engineered fill. The subgrade modulus is most appropriately applicable to consideration of static loads with deformations within an elastic range.

6.1.3 Lateral Resistance

Lateral loads applied to foundations can be resisted by a combination of passive lateral bearing and base friction. The allowable and ultimate passive pressures and frictional coefficients for the footings are presented in Table 6.1-3.

TABLE 6.1-3
PASSIVE PRESSURES AND FRICTIONAL RESISTANCE

	Allowable		Ultimate
	Static	Total Combined	
Adhesion (psf)	400	600	800
Passive Pressure (psf)	800	1,050	1,600
Lateral Translation Needed to Develop Passive Pressure	0.02 D	0.03 D	0.04 D

Note: D is the footing depth (ft) and N is the normal pressure (psf)

Passive resistance should not be used within the top 12 inches of footing unless abutted by hardscape. If the deflection resulting from the strain necessary to develop the passive pressure is beyond structural tolerance, additional passive pressure values could be provided based on tolerable deflection. The passive pressure and frictional resistance can be used in combination. The allowable values already incorporate a factor of safety and, as such, would be compared directly to the driving loads. If analytical approaches require the input of a safety factor, the ultimate values would be used.

6.1.4 Design and Construction Considerations

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by a representative of the project Geotechnical Engineer just prior to placing steel or concrete. The purpose of these observations is to check that the bearing soils actually encountered in the foundation excavations are similar to those assumed in analysis and to verify the recommendations contained herein are implemented during construction.

6.2 CONCRETE SLABS-ON-GRADE

6.2.1 Subgrade Preparation

Slabs-on-grade should be supported on re-compacted soils or engineered fill placed as described in Sections 5.2 and 5.3 of this report. Clay subgrade soil within 36 inches of pad grade should have a moisture content of at least the percentage above optimum as indicated in Table 5.3-2, immediately prior to pouring the slab or placing the vapor retarding membrane.

6.2.2 Capillary and Moisture/Vapor Break

Considering the potential for shallow groundwater conditions, a capillary break (i.e. clean sand or gravel layer) is recommended. The capillary break should have a minimum thickness of 3 inches.

In areas to receive moisture-sensitive floor coverings, it is recommended that the subgrade be covered by a vapor retarding membrane meeting the specifications of ASTM E1745, (Class C with minimum puncture resistance of 475 grams) such as, Fortifiber Building Systems Group 10 Mil, "Moistop Ultra®", Stego Industries 10 mil "Stego Wrap™", W.R. Meadows Sealtight 10 mil "Perminator®", or approved equivalent. The subgrade surface should be smooth and care should be exercised to avoid tearing, ripping, or otherwise puncturing the vapor retarding membrane. If the vapor retarding membrane becomes torn or disturbed, it should be removed and replaced or properly patched. Considering the soil type and regional groundwater depth, a capillary break (i.e. clean sand or gravel layer) is not considered necessary.

The vapor retarding membrane could be covered with approximately 1 to 2 inches of saturated surface dry (SSD) sand to protect it during construction. Concrete should not be placed if sand overlying the vapor barrier has been allowed to attain a moisture content greater than about 5 percent (due to precipitation or excessive moistening). In addition, penetrations through the concrete slab shall be sealed or protected to prevent inadvertently introducing excess water into the sand cushion layer due to curing water, wash-off water, rainfall, etc. Excessive water beneath interior floor slabs could result in future significant vapor transmission through the slab, adversely affecting moisture-sensitive floor coverings and could inhibit proper concrete curing.

According to American Concrete Institute ACI 302.2R-06, concrete could be placed directly on the vapor retarding membrane to minimize the potential for developing a reservoir of moisture in the sand layer, which could lead to future moisture entrapment and potential moisture and

flooring problems. If concrete is placed directly on the membrane, care shall be taken to not damage the membrane and special concrete curing methods implemented to minimize potential slab curing problems. If the protective sand layer is not used, the building designer should be in agreement. Many slab designers feel the sand cushion is important to proper concrete curing as well as minimizing slab curling issues.

It should be noted that, although the slab support discussed above is currently the industry standard, this system might not be completely effective in preventing floor slab moisture vapor transmission problems. This system will not necessarily assure that floor slab moisture transmission rates will meet floor-covering manufacturer standards and that indoor humidity levels will not inhibit mold growth. A qualified specialist(s) with knowledge of slab moisture protection systems, flooring design and other potential components that may be influenced by moisture, should address these post-construction conditions separately. The purpose of a geotechnical study is to address subgrade conditions only, and consequently, it does not evaluate future potential conditions.

6.2.3 Conventional Slab Design

To accommodate the potential for expansive soils, the minimum reinforcement of concrete floor slabs should consist of #3 bars at 12 inches on center in both principle directions, or equivalent. The reinforcement is based on engineering judgment and experience with expansive soils, not on any structural analysis. The reinforcement assumes a nominal slab thickness of 4 to 5 inches. Slab thickness and reinforcement must also satisfy structural considerations.

A modulus of subgrade reaction, Kp (Bp = 1 foot), of 100 pci may be used for elastic analysis of slabs on properly compacted native subgrade soil.

Slab concrete should have good density, a low water/cement ratio, and proper curing to promote a low porosity. A water/cement ratio of 0.45 to 0.5 is recommended to minimize vapor transfer.

6.2.4 Exterior Concrete Slabs-on-Grade

Exterior slabs-on-grade should be supported on re-compacted soils or engineered fill placed as described in Sections 5.2 and 5.3 of this report. Clay subgrade soil within 18 inches of pad grade should have a moisture content of at least the percentage above optimum as indicated in

Table 5.3-2, immediately prior to pouring the slab or placing the vapor retarding membrane. Consideration should be given to some form of reinforcement of exterior slabs to aid in crack control. Additionally, due to the expansive soils at the site dowelling of exterior slabs should be considered at building doorways to minimize the potential for problematic differential heave between the exterior slab and door threshold and the slabs should be reinforced with a minimum the of #3 bars at 30 inches on center in both principle directions, or equivalent.

6.3 EARTH RETAINING STRUCTURES

The lateral earth pressure against retaining structures will be dependent upon the ability of the wall to deflect. Presented in Table 6.3-1 is the active, at-rest and braced lateral earth pressures for level on-site soil. The active pressure is applicable to walls able to translate 0.0005 radians at the top or bottom. The at-rest soil pressure is applicable to retaining structures that are fully fixed against both rotation and translation. Walls restrained from translation at the top and bottom, but able to deflect 0.0005 radian between restrained points should be designed for the braced lateral pressure.

TABLE 6.3-1
LATERAL EARTH PRESSURES

Loading Conditions	Lateral Earth Pressures	Earth Pressure Coefficient
Active Pressure (psf/ft of depth)	65	0.45
At-Rest Pressure (psf/ft of depth)	115	0.65
Braced Pressure (psf)	43H	0.3

H in the expression represents the retained height in feet (measured from finished grade to bottom of footing). The earth pressures presented in Table 6.3-1 utilize saturated soil weights. The earth pressures do not include hydrostatic pressures; therefore, walls should be adequately drained to prevent the build-up of hydrostatic pressure.

Retaining wall foundation design can utilize the passive pressures and sliding resistance given in Table 6.1-3 and the allowable bearing capacity given in Table 6.1-1. When utilizing the available allowable bearing capacities of Table 6.2-1, the value for static loading would

represent the average bearing for the footing and the value for total combined loading would represent the allowable maximum toe pressure.

6.4 CORROSION POTENTIAL

A soil sample obtained from the near surface site soil was tested to evaluate pH, minimum electrical resistivity, and soluble sulfate and chloride content.

The pH of the soil tested was 7.9 and the minimum electrical resistivity was 522 ohm-cm. These values are generally representative of an environment that could be moderately to highly corrosive to buried unprotected metals. An example of the corrosion characteristics was evaluated using methods provided in Caltrans California Test 643, "Method for Estimating the Service Life of Steel Culverts". The analysis indicates an 18-gauge steel zinc-coated culvert is estimated to have a maintenance-free service life (years to perforation) of 19 years. Therefore, if project improvements will involve metal that comes into contact with the on-site soil, the design should consider the potential soil corrosiveness described.

Test results suggest that a low level of soluble sulfates (203 ppm) and soluble chlorides (283 ppm) are present in on-site soils. Normal cement (Type II) should be adequate in foundation concrete that comes in contact with the foundation soils. Reinforcement cover need not be increased for concrete that comes in contact with the on-site soil.

Corrosion is dependent upon a complex variety of conditions, which are beyond the geotechnical practice. Consequently, a qualified corrosion engineer should be consulted if the owner desires more specific recommendations.

6.5 PAVEMENTS

6.5.1 Asphalt Concrete Pavement Design

The site soils consist of sandy clay soil (Expansion Index of 105) with low stability characteristics for support of asphalt concrete pavements. Considering the poor stability characteristics of the on-site clay soil, an R-value of 5 is recommended for design of on-site pavements.

Detailed vehicular load and frequency information is not available for this project. Consequently, a range of pavement sections have been provided based on Traffic Indexes

(T.I.'s) of 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, and 7.0. These traffic design assumptions should be reviewed for compatibility with the actual building, and revised pavement sections developed, as necessary. The flexible, asphalt concrete pavement sections associated with the given T.I.'s are summarized in Table 6.5-1.

TABLE 6.5-1
RECOMMENDED MINIMUM PAVEMENT SECTIONS

Traffic Index	Asphalt Concrete (inches)	Aggregate Base – Class 2 (R-value 78) (inches)	Aggregate Sub-base – Class 2 (R-value 50) (inches)
4.0	2.5 or 2.5	7.5 4.0	--- 4.0
4.5	2.5 or 2.5	9.0 4.0	--- 5.5
5.0	2.5 or 2.5	11.0 4.0	--- 7.5
5.5	3.0 or 3.0	11.5 4.0	--- 8.5
6.0	3.0 or 3.0	13.5 4.0	--- 10.5
6.5	3.5 or 3.5	14.5 4.5	--- 11.0
7.0	4.0 or 4.0	15.5 4.5	--- 12.0

The relatively high cost of paving aggregates may dictate the need to reduce pavements using alternative methods, such as chemical treatment. Table 6.5-2 provides recommended pavement sections assuming the R-value of the subgrade is improved to a minimum R-value of 50. **TECHNICON** should be contacted to provide the necessary testing and analysis to assess the appropriate treatment chemical (e.g. cement, high calcium lime, or Quick Lime Plus) and required percentage to satisfy the design recommendation.

TABLE 6.5-2
RECOMMENDED MINIMUM PAVEMENT SECTIONS (R= 50)

Traffic Index	Asphalt Concrete (inches)	Aggregate Base – Class 2 (inches)
Up to 5.0	2.5	4.0
5.5 & 6.0	3.0	4.0
6.5	3.5	4.5
7.0	4.0	4.5

The design criteria assumes a 20-year design period and that normal maintenance (crack sealing, etc.) is performed. The traffic index is a measure of the volume of truck traffic that will be applied to a pavement section in the design life. The pavement section associated with a TI of 4.0 would be appropriate for areas subject to automobile traffic. The allowable average daily truck traffic (ADTT) for the assumed traffic indexes is presented in Table 6.5-3.

TABLE 6.5-3
AVERAGE DAILY TRUCK TRAFFIC

Traffic Index	2-Axle Vehicle	Or	3-Axle Vehicle	or	5-Axle Vehicle
4.5	2.2		0.8		0.2
5.0	5.2		2.0		0.5
5.5	11.6		4.3		1.1
6.0	24.1		9.0		2.4
6.5	47.3		17.7		4.7
7.0	88.1		33.0		8.8

The flexible pavement should conform to, and be placed in accordance with the Caltrans Standard Specifications, May 2009. The aggregate base (Class 2) and aggregate sub-base (Class 2) should comply with the specifications in Sections 26 and 25, respectively. The upper 6 inches of subgrade should be moisture conditioned to 2 percent above optimum and compacted to between 92 and 95 percent relative compaction as determined by Caltrans Test Method No. 216 (dry weight comparison) or ASTM D1557 test procedures. The aggregate base and aggregate sub-base should be compacted to a minimum of 95 percent relative

compaction as determined by Caltrans Test Method No. 216 (dry weight comparison) or ASTM D1557 test procedures.

6.5.2 Moisture Considerations

The pavement design should consider both the vehicular loading, as well as the environmental factors. The vehicular loading will depend on the amount and type of traffic anticipated for the pavement design life. Environmental factors include the potential for moisture variations beneath the pavement structural section. It is recommended that all pavement areas conform to the following criteria:

- ❑ All trench backfill, including utility and sprinkler lines, should be properly placed and adequately compacted to provide a stable subgrade.
- ❑ Adequate drainage should be provided to prevent surface water from ponding and saturating the subgrade soil.
- ❑ A periodic maintenance program should be incorporated.
- ❑ All concrete curbs separating pavement and landscaped areas should extend to the subgrade.

6.5.3 Construction Considerations

In the event unstable (pumping) subgrades are encountered within planned pavement areas, we recommend a heavy, rubber-tired vehicle (typically a loaded water truck) be used to test the load/deflection characteristics of the finished subgrade materials. It is recommended this vehicle have a minimum rear axle load (at the time of testing) of 16,000 pounds with tires inflated to at least 65 psi pressure. If the tested surface shows a visible deflection extending more than 6 inches from the wheel track at the time of loading, or a visible crack remains after loading, corrective measures should be implemented. Such measures could include disking to aerate, chemical treatment, replacement with drier material, or other methods. It is recommended **TECHNICON** be retained to assist in developing which method (or methods) would be applicable for this project.

6.6 SITE DRAINAGE

Providing and maintaining adequate site drainage to prevent entrapment and ponding of surface water and excessive moisture migration into the subgrade soil is very important. Poor perimeter or surface drainage could cause reduced subgrade support. The design and construction needs to provide the basis for good drainage. This includes:

- Sufficient pad height to allow for proper drainage
- Defined drainage gradients away from the structure to points of conveyance, such as drainage swales and/or area drains and discharge pipe
- Roof drainage connected to proper areas of discharge

Future operation of the property must maintain the established site drainage by not blocking or obstructing gradients away from the building or swales which convey surface run-off to the street, without providing some alternative drainage means (e.g. area drains and subsurface pipes). Only maintenance and landscape personnel can avoid over-watering. Where planter areas near the building are established, it is important to prevent surface run-off from entering the planter and watering practices must strive to use only sufficient water to sustain and promote plant growth. Well-maintained low-volume emitter irrigation (drip system) is best suited for planters adjacent to buildings. All irrigation should strive to promote a soil moisture condition that is relatively uniform year round.

7 ADDITIONAL SERVICES

7.1 DESIGN REVIEW AND CONSULTATION

It is recommended that **TECHNICON** be retained to review those portions of the contract drawings and specifications that pertain to earthwork, foundations, and pavements prior to finalization to determine whether they are consistent with our recommendations.

7.2 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that a representative of **TECHNICON** observe the excavation, earthwork, foundation, and pavement phases of work to determine that the subsurface conditions are compatible with those used in the analysis and design. **TECHNICON** can conduct the necessary field testing and provide results on a timely basis so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, a written summary of our observations, field testing, and conclusions regarding the conformance of the completed work to the intent of the plans and specifications will be provided. This additional service is not part of this current contractual agreement. **TECHNICON** firm will not be responsible for establishing or confirming building or foundations depths or locations unless retained to do so.

8 LIMITATIONS

The conclusions and recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of our field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations. The nature and extent of the variations between borings may not become evident until construction. If variations or undesirable conditions are encountered during construction, our firm should be notified promptly so that these conditions can be reviewed and our recommendations reconsidered where necessary. The unexpected conditions frequently require additional expenditures for proper construction of the project. **TECHNICON Engineering Services, Inc.** will not assume any responsibility for errors or omissions if the final extent and depth of earthwork is not determined by our firm at the time of construction due to said variations or undesirable conditions encountered.

If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes, or construction operations at or adjacent to the site, the conclusions and recommendations contained in this report should be considered invalid unless the changes are reviewed and our conclusions and recommendations modified or approved in writing. Such conditions may require additional field and laboratory investigations to determine if our conclusions and recommendations are applicable considering the changed conditions or time lapse.

It is the responsibility of the contractor to provide safe working conditions with respect to excavation slope stability. This report does not relieve the contractors of responsibility for temporary excavation construction, bracing and shoring in accordance with CAL OSHA requirements.

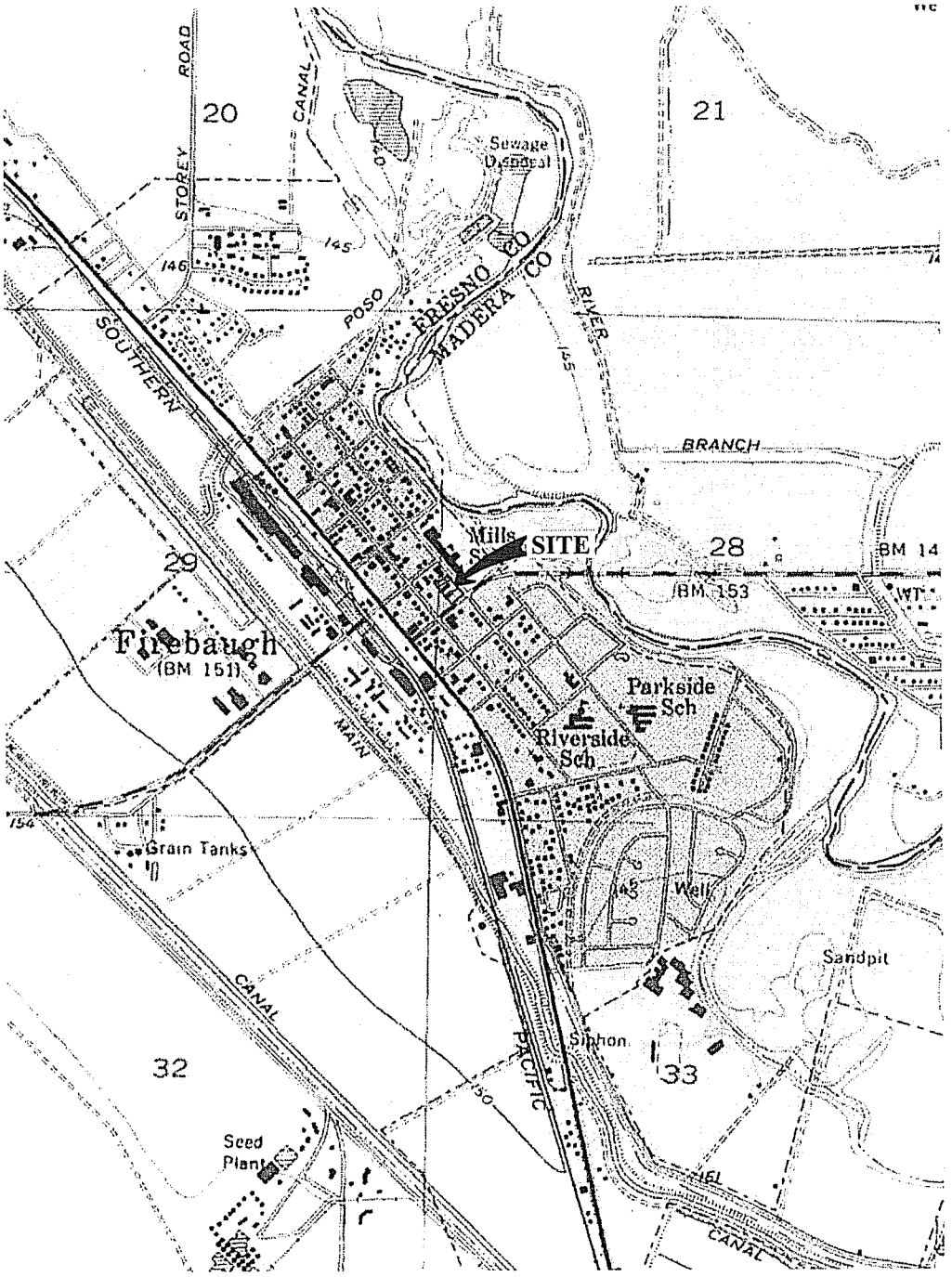
Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This report should not be construed as an environmental audit or study.

This report has been prepared for the sole use by the Fresno Housing Authority and their designated consultants for the proposed replacement Multi-Family Residential Complex to be located northwest of the intersection of 13th and P Streets in Firebaugh, California. Recommendations presented in this report should not be extrapolated to other areas or used for other projects without prior review. This report has been prepared with the intent that the firm of **TECHNICON** will be performing the construction testing and observation for the complete project. If, however, another firm or individual(s) should be retained or employed to use this geotechnical investigation report for the purpose of construction testing and observation, notice is hereby given that **TECHNICON** will not assume any responsibility for errors or omissions, if any, which may occur and which could have been avoided, corrected, or mitigated if **TECHNICON**, had performed the work. This notice also applies to the misuse or misinterpretation of the conclusions and recommendations outlined in this report. Furthermore, the other firm or individual(s) performing construction testing and observation should accept transfer of responsibility of the work, as required by the California Building Code, in writing to the project owner and **TECHNICON**. The firm accepting transfer of responsibility should perform additional investigation(s) as may be necessary to develop their own conclusions, evaluations, and recommendations for design and construction.

FIGURE 1

&

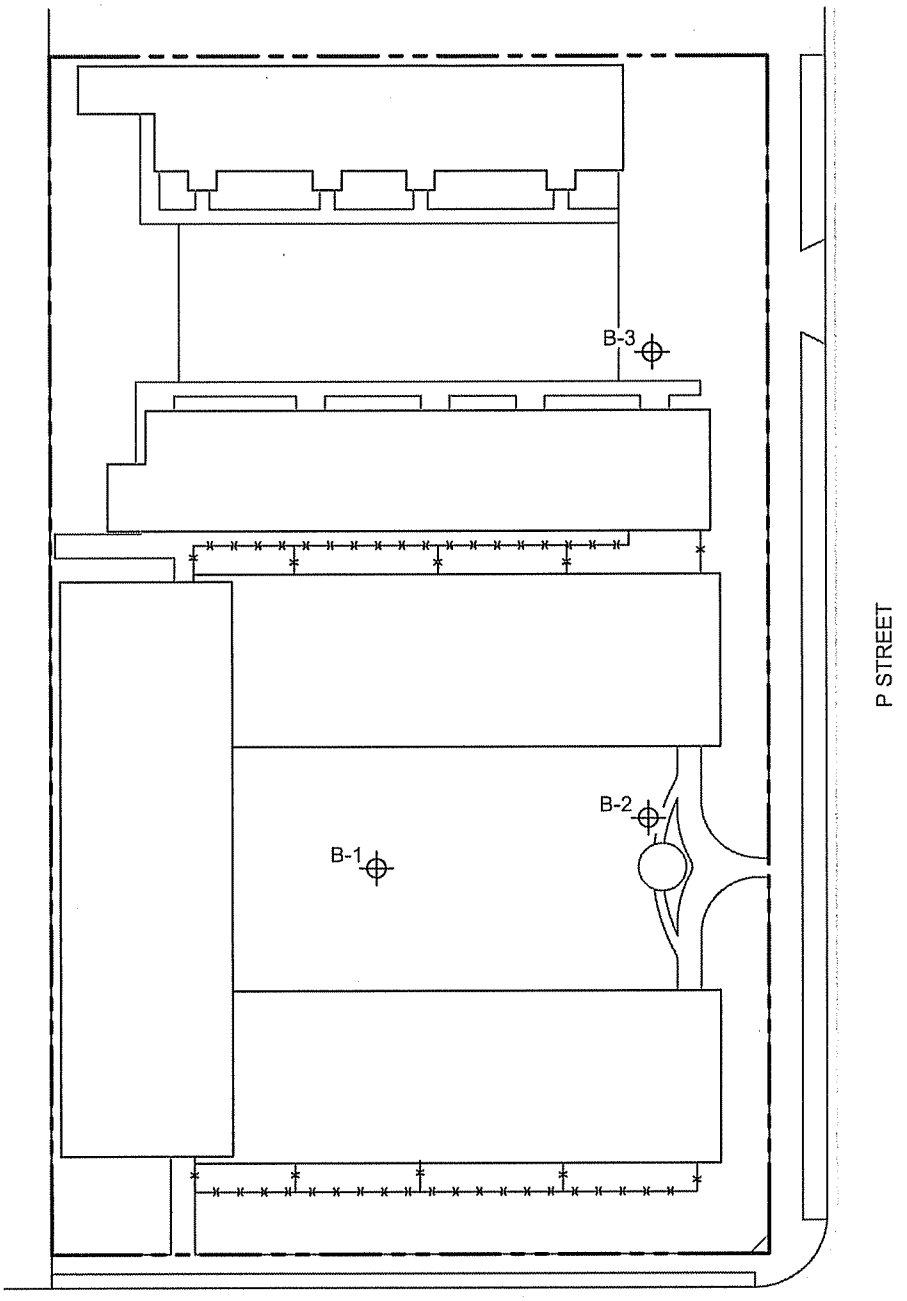
FIGURE 2



N

LAT.: 36.8577°N, LONG.: 120.4539°W, 28-T12S-R14E, MDB&M, USGS MAP: FIREBAUGH, DATE: 1956, PHOTO REV.: 1984

TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 22423 SOURCE: USGS TOPOGRAPHIC MAPS	VICINITY MAP PROPOSED MULTI-FAMILY RESIDENTIAL NW OF 13TH AND P STREETS FIREBAUGH, CALIFORNIA	FIGURE 1 NTS



B-3 =SOIL BORING LOCATIONS

TECHNICON ENGINEERING SERVICES, INC.	PROJECT: 22423	SITE MAP PROPOSED MULTI-FAMILY RESIDENTIAL NW OF 13TH AND P STREETS FIREBAUGH, CALIFORNIA	FIGURE 2
	CAD BY: MH		

BORING LOGS AND LOG KEY

APPENDIX A

TECHNICON ENGINEERING SERVICES, INC.
4539 N BRAWLEY AVE #108
FRESNO CA, 93722
Telephone: 559-276-9311
Fax: 559-276-9344

KEY TO SYMBOLS

PROJECT NAME Proposed Firebaugh Apt. Develop. **DATE OF EXPLORATION** 7/31/2012

PROJECT LOCATION Firebaugh, CA **PROJECT NUMBER** TES# 22423

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

		FILL
	SW	WELL GRADED SAND
	SP	POORLY GRADED SAND
	SM	SILTY SAND
	SC	CLAYEY SAND
	PT	PEAT
	OL	LOW PLASTICITY ORGANIC SILT
	OH	HIGH PLASTICITY ORGANIC SILT
	ML	LOW PLASTICITY SILT
	MH	HIGH PLASTICITY SILT
	GW	WELL GRADED GRAVEL
	GP	POORLY GRADED GRAVEL
	GM	SILTY GRAVEL
	GC	CLAYEY GRAVEL
	CL	LOW PLASTICITY CLAY
	CH	HIGH PLASTICITY CLAY

SAMPLER SYMBOLS

- STANDARD PENETRATION TEST
- CALIFORNIA SAMPLER
- MODIFIED CALIFORNIA SAMPLER
- SHELBY TUBE SAMPLER
- ROCK CORE BARREL
- BULK SAMPLE

- Water Level at Time of Drilling
- Water Level at End of Drilling
- Water Level After 24 Hours
- Assumed stratum line
- Observed stratum line

Note 1: The degree of saturation shown on the boring logs is based on an assumed specific gravity of 2.65. The actual degree of saturation may vary.

Note 2: The stratum lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual.

ABBREVIATIONS

LL	- LIQUID LIMIT (%)
PI	- PLASTIC INDEX (%)
W	- MOISTURE CONTENT (%)
DD	- DRY DENSITY (PCF)
S	- DEGREE OF SATURATION (%)
NP	- NON PLASTIC
-200	PERCENT PASSING NO. 200 SIEVE
PP	- POCKET PENETROMETER (TSF)
TV	- TORVANE
PID	- PHOTOIONIZATION DETECTOR
UC	- UNCONFINED COMPRESSION
ppm	- PARTS PER MILLION

TECHNICON ENGINEERING SERVICES, INC.
4539 N BRAWLEY AVE #108
FRESNO CA, 93722
Telephone: 559-276-9311
Fax: 559-276-9344

BORING B-1

PROJECT NAME Proposed Firebaugh Apt. Develop.
PROJECT NUMBER TES# 22423
PROJECT LOCATION Firebaugh, CA
SURFACE DESCRIPTION Flat, grass landscaping
DATE STARTED 7/31/12 **COMPLETED** 7/31/12
GROUND ELEVATION
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE CME 55
BORING DEPTH 51.5 ft
DRILLING METHOD 7.5-inch Hollow Stem Auger
LOGGED BY S. Reich **CHECKED BY** S. Plauson

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0	GB CAL	2-2-3 (5)		**Silty SAND (SM)** - loose, brown, moist, fine to medium grained				
5	CAL	4-9-14 (23)		**Sandy CLAY (CH)** - soft, olive, moist, high plasticity, with fine sand Stiff	98.8 91.5	17.7 28.8	S = 70 % S = 95 %	
10	SPT	2-5-5 (10)		Medium stiff		21.7		
15	CAL	8-9-10 (19)		**Poorly Graded SAND (SP)** - medium dense, light brown, fine to medium grained, trace silt	97.5	5.8		
20	SPT	2-4-4 (8)		Wet Fine to coarse grained, increased silt		20.9		
25	CAL	4-6-8 (14)						
30	SPT	3-5-7 (12)		**Silty SAND (SM)** - medium dense, light brown, wet, fine to medium grained				
35								

(Continued Next Page)

TECHNICON ENGINEERING SERVICES, INC.
4539 N BRAWLEY AVE #108
FRESNO CA, 93722
Telephone: 559-276-9311
Fax: 559-276-9344

BORING B-1

PROJECT NAME Proposed Firebaugh Apt. Develop.
PROJECT NUMBER TES# 22423
PROJECT LOCATION Firebaugh, CA
SURFACE DESCRIPTION Flat, grass landscaping
DATE STARTED 7/31/12 **COMPLETED** 7/31/12
GROUND ELEVATION
DRILLING CONTRACTOR TECHNICON Engineering Services, Inc.
GROUND WATER LEVEL No groundwater encountered.
DRILL RIG TYPE CME 55
BORING DEPTH 51.5 ft
DRILLING METHOD 7.5-inch Hollow Stem Auger
LOGGED BY S. Reich **CHECKED BY** S. Plauson

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
35	CAL	5-7-11 (18)		**Silty SAND (SM)** - medium dense, light brown, wet, fine to medium grained *(continued)*				
40				**Poorly Graded SAND (SP)** - medium dense, light brown, wet, fine to coarse grained				
	SPT	4-7-7 (14)						
45	CAL	6-8-9 (17)						
50	SPT	4-7-8 (15)						

NOTES:
1. Bottom of boring at 51.5 feet.
2. No groundwater encountered.
3. Boring backfilled with soil cuttings 7/31/12.

TECHNICON ENGINEERING SERVICES, INC.
4539 N BRAWLEY AVE #108
FRESNO CA, 93722
Telephone: 559-276-9311
Fax: 559-276-9344

BORING B-2

PROJECT NAME Proposed Firebaugh Apt. Develop. **PROJECT NUMBER** TES# 22423

PROJECT LOCATION Firebaugh, CA **SURFACE DESCRIPTION** Flat, grass landscaping

DATE STARTED 7/31/12 **COMPLETED** 7/31/12 **GROUND ELEVATION**

DRILLING CONTRACTOR TECHNICON Engineering Services, Inc. **GROUND WATER LEVEL** No groundwater encountered.

DRILL RIG TYPE CME 55 **BORING DEPTH** 11.5 ft

DRILLING METHOD 7.5-inch Hollow Stem Auger **LOGGED BY** S. Reich **CHECKED BY** S. Plauson

DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0	CAL GB	1-2-3 (5)		**Sandy CLAY (CH)** - soft, olive, moist, high plasticity, with fine sand				
					84.3	35.5	S = 98 %	
	CAL	5-5-8 (13)		Stiff	89.5	28.1	S = 88 %	
5	SPT	2-4-5 (9)		Medium stiff				
10	CAL	4-11-19 (30)		**Poorly Graded SAND (SP)** - medium dense, light brown, moist, fine to coarse grained, trace silt				

NOTES:
1. Bottom of boring at 11.5 feet.
2. No groundwater encountered.
3. Boring backfilled with soil cuttings 7/31/12.

TECHNICON ENGINEERING SERVICES, INC.
4539 N BRAWLEY AVE #108
FRESNO CA, 93722
Telephone: 559-276-9311
Fax: 559-276-9344

BORING B-3

PROJECT NAME Proposed Firebaugh Apt. Develop. **PROJECT NUMBER** TES# 22423

PROJECT LOCATION Firebaugh, CA **SURFACE DESCRIPTION** Flat, bare surface

DATE STARTED 7/31/12 **COMPLETED** 7/31/12 **GROUND ELEVATION**

DRILLING CONTRACTOR TECHNICON Engineering Services, Inc. **GROUND WATER LEVEL** No groundwater encountered.

DRILL RIG TYPE CME 55 **BORING DEPTH** 16.5 ft

DRILLING METHOD 7.5-inch Hollow Stem Auger **LOGGED BY** S. Reich **CHECKED BY** S. Plauson

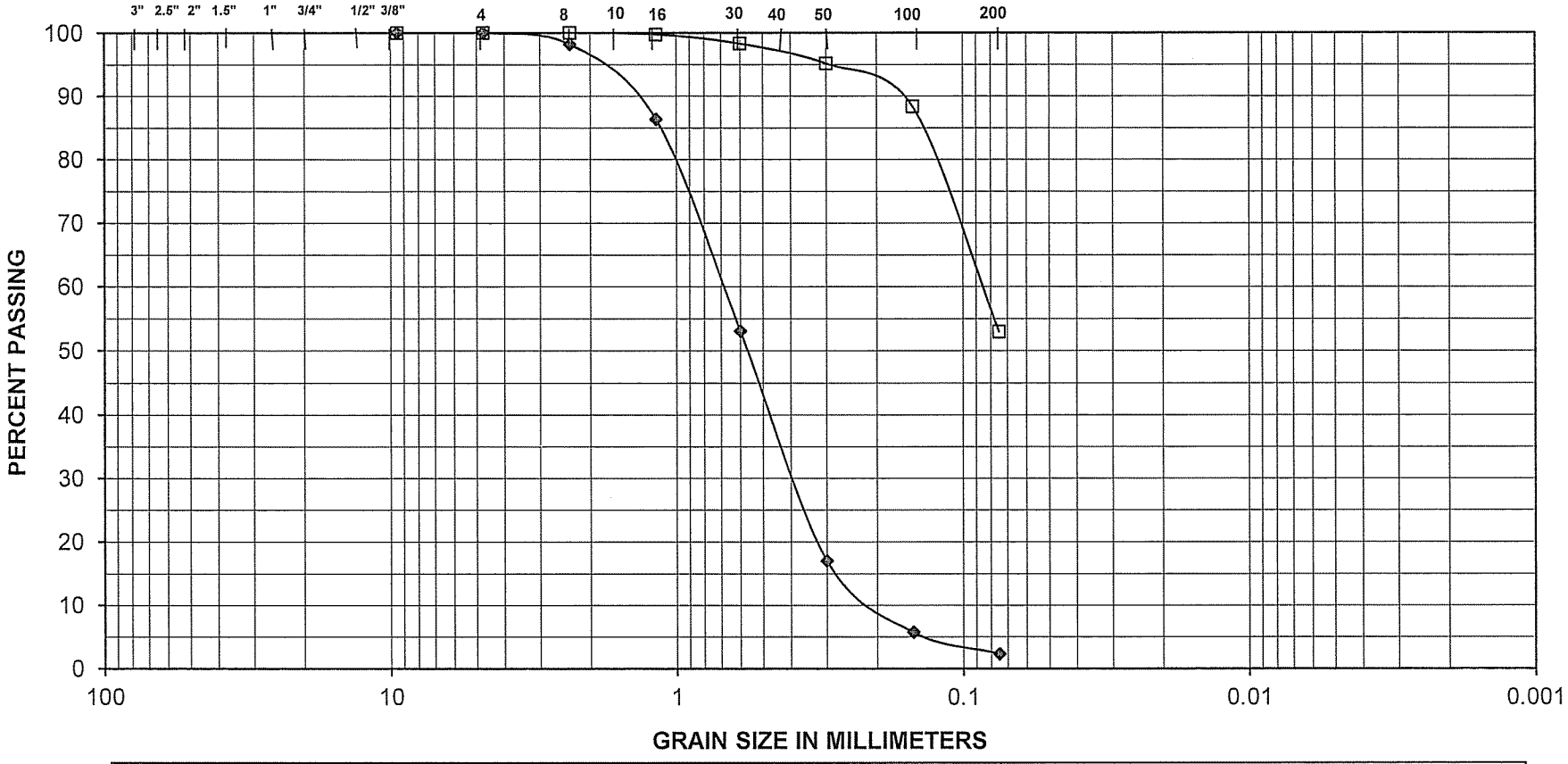
DEPTH (ft)	SAMPLE TYPE	BLOWS/ft	GRAPHIC LOG	MATERIAL DESCRIPTION	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	REMARKS
0				**Sandy CLAY (CH)** - medium stiff, dark brown, moist, high plasticity				
	CAL GB	3-5-6 (11)			88.1	25.5	S = 77 %	
5	CAL	2-4-8 (12)			88.1	31.5	S = 95 %	
10	SPT	3-8-8 (16)		**Silty SAND (SM)** - medium dense, reddish brown, moist, fine to medium grained				
				Poorly Graded SAND (SP) - medium dense, light brown, moist, fine to coarse grained, trace silt				
15	CAL	6-7-9 (16)		Wet	92.2	13.5	S = 45 %	

NOTES:
1. Bottom of boring at 16.5 feet.
2. No groundwater encountered.
3. Boring backfilled with soil cuttings 7/31/12.

LABORATORY TESTS

APPENDIX B

TECHNICON
ENGINEERING SERVICES, INC.



Sample #	Classification	% Gravel	% Sand	% Fines	% Moist.	LL	PL	PI
B-1 @ 10'	Sandy SILT (ML)	0	47.0	53.0	21.7			
B-1 @ 20'	Poorly Graded SAND (SP)	0	97.7	2.3	20.8			

Project:	Proposed Multi-Family Develop.
	Firebaugh, California
TES#:	22423
Date:	8/7/2012

TECHNICON
ENGINEERING SERVICES, INC.

*Construction Testing & Inspection * Geotechnical & Environmental Engineering*

Sieve Analysis
for
Coarse and Fine Aggregate

Project:	Proposed Multi-Family Develop.	Technician:	MK
	Firebaugh, California	Date:	8/7/2012
TES#:	22423	Sample No.:	B-1 @ 10'
Lab #:		Remarks:	Sandy SILT (ML)

	Weight (lbs. or grams)	Maximum Sieve Size	Minimum Weight of Test Specimen, lbs. (kg)
Total Dry Sample + Tare Wt.		Sand	1.0 (0.5)
Tare Weight		3/8"	2.0 (1.0)
Total Dry Sample Wt.	164.4	1/2"	4.0 (2.0)
Initial Weight Fine Aggregate Before Wash		3/4"	11.0 (5.0)
		1"	22.0 (10.0)
Final Weight Fine Aggregate After Wash	88.3	1 1/2"	33.0 (15.0)
		2"	44.0 (20.0)

Sieve Size	Individual Weight Retained	Individual % Retained	Cumulative % Retained	Cumulative % Passing	Specs.
3 in.		0.0	0.0	100.0	
2 1/2 in.		0.0	0.0	100.0	
2 in.		0.0	0.0	100.0	
1 1/2 in.		0.0	0.0	100.0	
1 in.		0.0	0.0	100.0	
3/4 in.		0.0	0.0	100.0	
1/2 in.		0.0	0.0	100.0	
3/8 in.		0.0	0.0	100.0	
#4		0.0	0.0	100.0	
#8	0.0	0.0	0.0	100.0	
#16	0.4	0.2	0.2	99.8	
#30	2.4	1.5	1.7	98.3	
#50	5.2	3.2	4.9	95.1	
#100	11.1	6.8	11.6	88.4	
#200	58.2	35.4	47.0	53.0	
Pan					

4539 N. Brawley Avenue, #108, Fresno, CA 93722
Phone (559) 276-9311 Fax (559) 276-9344

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ENGINEERING SERVICES, INC.
Construction Testing & Inspection • Geotechnical & Environmental Engineering

Sieve Analysis for Coarse and Fine Aggregate

Project:	Proposed Multi-Family Develop.	Technician:	MK
	Firebaugh, California	Date:	8/7/2012
TES#:	22423	Sample No.:	B-1 @ 20'
Lab #:		Remarks:	Poorly Graded SAND (SP)

	Weight (lbs. or grams)	Maximum Sieve Size	Minimum Weight of Test Specimen, lbs. (kg)
Total Dry Sample + Tare Wt.		Sand	1.0 (0.5)
Tare Weight		3/8"	2.0 (1.0)
Total Dry Sample Wt.	165.5	1/2"	4.0 (2.0)
Initial Weight Fine Aggregate Before Wash		3/4"	11.0 (5.0)
		1"	22.0 (10.0)
Final Weight Fine Aggregate After Wash	162.1	1 1/2"	33.0 (15.0)
		2"	44.0 (20.0)

Sieve Size	Individual Weight Retained	Individual % Retained	Cumulative % Retained	Cumulative % Passing	Specs.
3 in.		0.0	0.0	100.0	
2 1/2 in.		0.0	0.0	100.0	
2 in.		0.0	0.0	100.0	
1 1/2 in.		0.0	0.0	100.0	
1 in.		0.0	0.0	100.0	
3/4 in.		0.0	0.0	100.0	
1/2 in.		0.0	0.0	100.0	
3/8 in.		0.0	0.0	100.0	
#4	0.0	0.0	0.0	100.0	
#8	3.0	1.8	1.8	98.2	
#16	19.6	11.8	13.7	86.3	
#30	55.1	33.3	46.9	53.1	
#50	59.7	36.1	83.0	17.0	
#100	18.7	11.3	94.3	5.7	
#200	5.6	3.4	97.7	2.3	
Pan					

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*Construction Testing & Inspection * Geotechnical & Environmental Engineering*

Expansion Index Test
UBC Standard 29-2 / ASTM D4829

Project: Proposed Multi-Family Develop.
TES#: 22423
Lab #:

Technician: MK
Date: 8/8/2012
Sample No.: B-1 @ 0'-3'
Remarks: Sandy CLAY (CL)

Water Added (ml)				
Wt. Of Soil + Mold (g)	790.8			
Wt. of Mold (g)	367.1			
Wt. of Soil (g)	423.7			
Wt. of Soil (lb)	0.934			
Wet Density (pcf)	127.8			
Moisture Sample, wet (g)	300.0			
Moisture Sample, dry (g)	273.0			
Moisture Content (%)	9.9			
Dry Density (pcf)	116.3			
Specific Gravity	2.7			
Degree of Saturation (%)	**59.5**			

Time	Dial Reading
8/8/12 15:00	0.0000
8/9/12 7:00	0.0930
8/9/12 8:30	0.0933
8/10/12 8:30	0.0951
8/13/12 14:30	0.0961
FINAL	0.0961

Expansion meas. = 0.0961
Exp. Index meas. = 96.1
Exp. Index 50 = 105.6

EXPANSION INDEX = 105.6

Expansion Potential Table	
Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	**High**
>130	Very High

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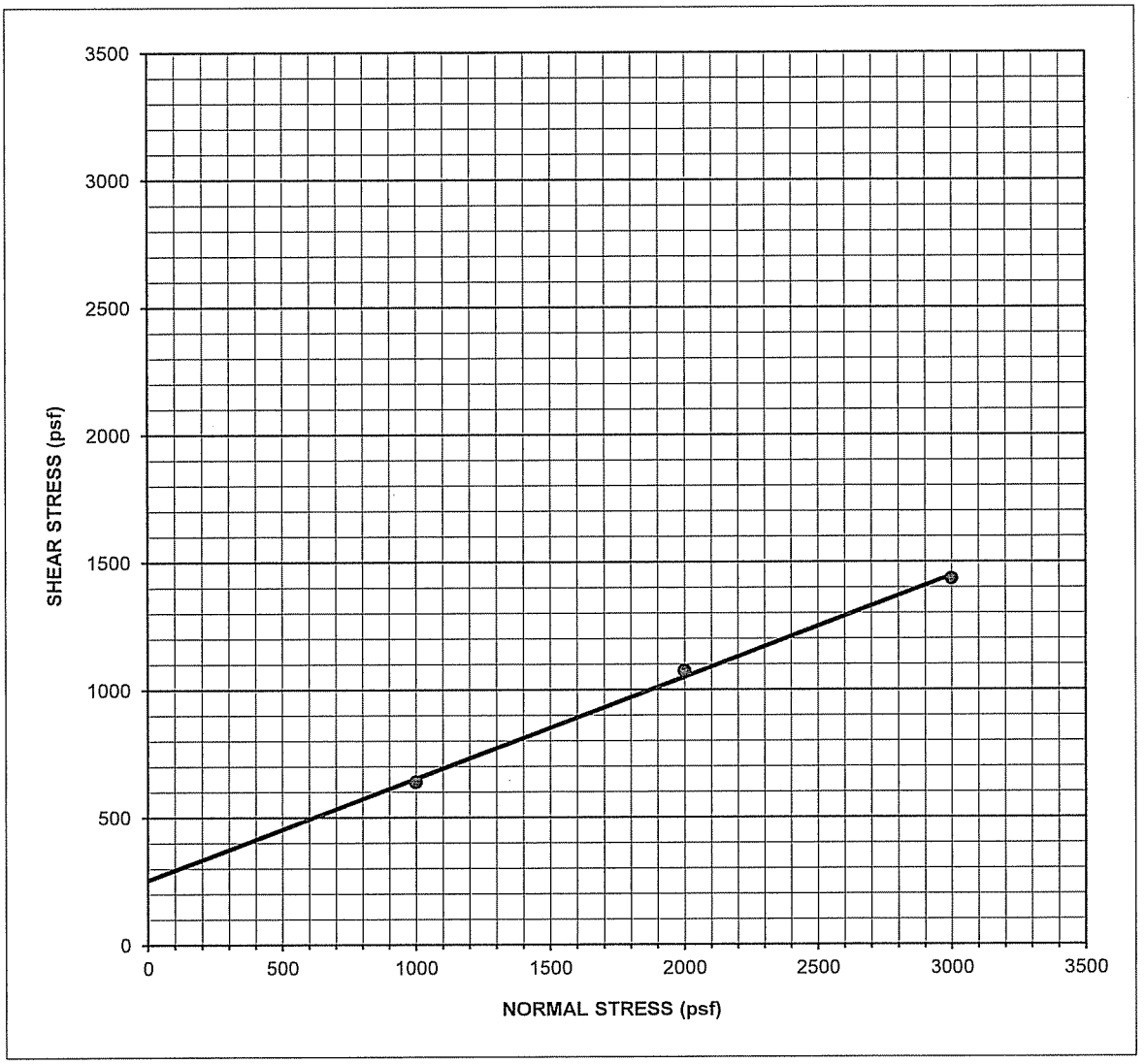
Direct Shear Test

ASTM D3080



PROJECT:	Proposed Multi-Family Develop.
TES NO.:	22423
SAMPLE DATE.:	7/31/2012
SAMPLE NO.:	B-3 @ 1.5'
DESCRIPTION:	Sandy CLAY (CL)

Cohesion (psf)	**250**
Internal Friction Angle (ϕ)	**22**

SPECIMEN	A	B	C	D	E
DRY DENSITY (pcf)	121.9	121.9	121.9	---	---
INITIAL WATER CONTENT (%)	4.1	4.1	4.1	---	---
FINAL WATER CONTENT (%)	32.2	29.4	28.9	---	---
NORMAL STRESS (psf)	1000	2000	3000	---	---
MAXIMUM SHEAR (psf)	639	1074	1434	---	---

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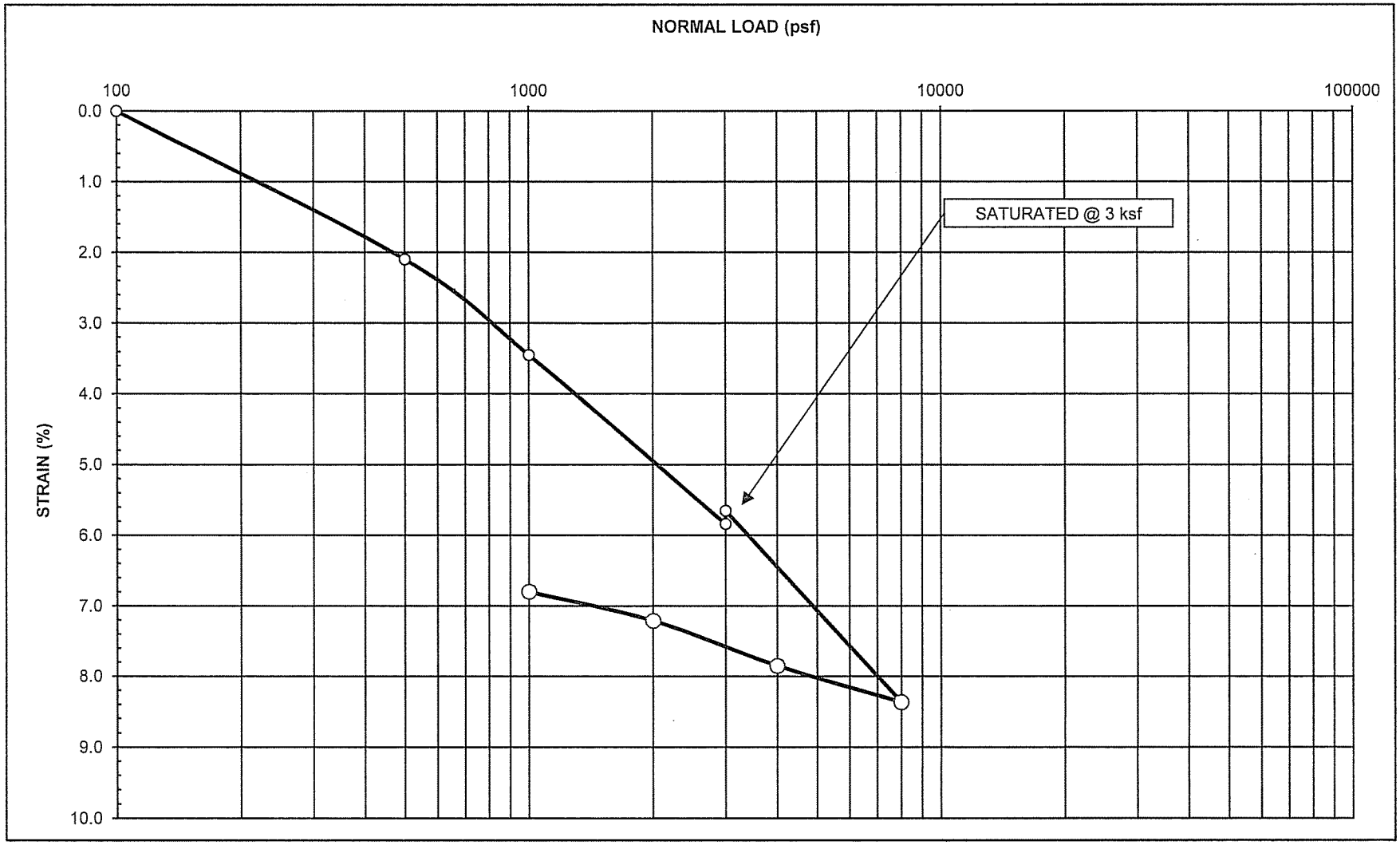
COLLAPSE POTENTIAL TEST DATA



BORING NO.	DEPTH (ft)	SAMPLE DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
B-2	3.5	Silty SAND (SM) Saturated @ 2 ksf.	28.1	90.2
			FINAL	FINAL
			5.1	98.4

PROJECT:	Proposed Multi-Family Develop.
PROJECT NO.:	22423
TEST DATE:	8/7/2012
TESTED BY:	MK
CONDITION:	Undisturbed

TECHNICON
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COLLAPSE POTENTIAL TEST DATA SUMMARY

PROJECT: Proposed Multi-Family Develop.
TES # : 22423
BORING #: B-2 DEPTH (ft) 3.5
DATE: 8/7/2012
DESCRIPTION: Silty SAND (SM)
TESTED BY: MK
REMARKS: Saturated @ 2 ksf.
DIAMETER (in) 2.42

	INITIAL	FINAL
THICKNESS (in)	1.0000	0.9163
VOLUME (cc)		
GROSS WET	184.0	182.8
GROSS DRY		176.1
TARE	44.5	44.5
WATER		6.7
SOIL		131.6
MOISTURE CONTENT (%)	28.1	5.1
WET DENSITY (pcf)	115.5	125.0
DRY DENSITY (pcf)	90.2	98.4

PRESSURE (psf)	DIAL READING (in)	APPARATUS CORRECTION	t (in)	% COMPRESSION	REMARKS
100	0.0000	FALSE	1.0000	0.00	
500	0.0095	0.0000	0.9905	0.95	
1000	0.0345	0.0000	0.9655	3.45	
3000	0.0584	0.0000	0.9416	5.84	
3000	0.0565	0.0000	0.9435	5.65	SATURATED
8000	0.0837	0.0000	0.9163	8.37	
4000	0.0785	0.0000	0.9215	7.85	
2000	0.0721	0.0000	0.9279	7.21	
1000	0.0680	0.0000	0.9320	6.80	

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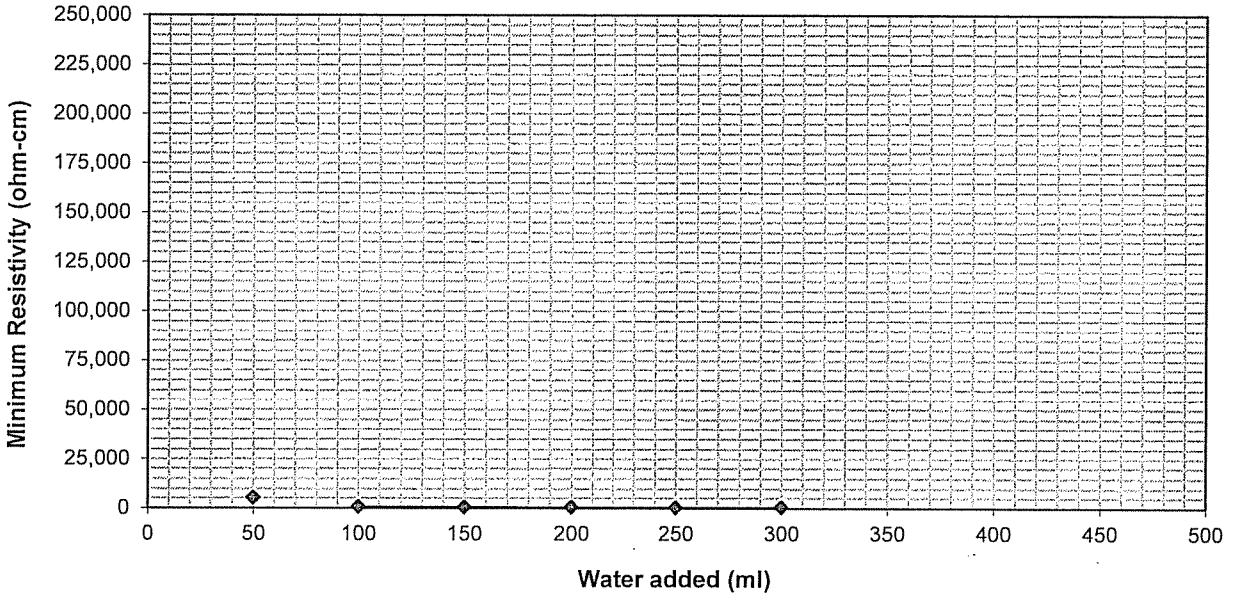
Project Name	Proposed Multi-Family Develop.	Sample Number	B-1 @ 0 - 3'
Project Number	22423	Sample Location	
Sample Date	7/31/2012	Material Description	Sandy CLAY (CL)
Sampled By	SR		

Sample Condition	As Received	Minimum Resistivity					
Water Added (ml)	50	100	150	200	250	300	
Resistance (ohm)	5,000	660	610	520	490	510	
Resistivity (ohm-cm)	5,325	703	650	554	522	543	

Minimum Resistivity (ohm-cm)	**522**	**Field Resistivity (ohm-cm)**	**5,325**

pH = 7.88 **EC =**

Box Constant=1.065



Years to perforation*	19.00

* Caltrans California Test 643 - Method for Estimating the Service Life of Steel Culverts

NEW HOME RATING SYSTEM, VERSION 6.0

MULTIFAMILY CHECKLIST

Total Points Targeted: 103

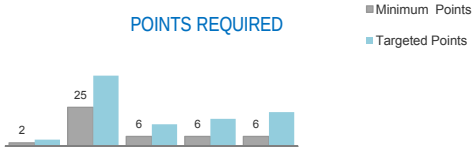
Certfication Level: Silver

The GreenPoint Rated checklist tracks green features incorporated into the home. GreenPoint Rated is administered by Build It Green, a non-profit whose mission is to promote healthy, energy and resource efficient buildings in California.
The minimum requirements of GreenPoint Rated are: verification of 50 or more points; Earn the following minimum points per category: Commuity (2) Energy (25), Indoor Air Quality/Health (6), Resources (6), and Water (8); and meet the prerequisites CALGreen Mandatory, E5.2 , H6.1, J5.1, O1, O7.

The criteria for the green building practices listed below are described in the GreenPoint Rated Single Family Rating Manual. For more information please visit **www.builditgreen.org/greenpointrated**
Build It Green is not a code enforcement agency.

A home is only GreenPoint Rated if all features are verified by a Certified GreenPoint Rater through Build It Green.
This is the public version of the Checklist and cannot be used for certification.

POINTS REQUIRED



New Home Multifamily Version 6.0.2

Project Name / Measures		Points Achieved	Possible Points: Community	Energy	IAQ/Health	Resources	Water	Notes
CALGreen								
Yes	**CALGreen Res (REQUIRED)**	4		1	1	1	1	
A. SITE								
Yes	**A1. Construction Footprint**	1				1		
	A2. Job Site Construction Waste Diversion							
TBD	A2.1 65% C&D Waste Diversion **(Including** Alternative Daily Cover)					2		
≥65%	A2.2 65% C&D Waste Diversion **(Excluding** Alternative Daily Cover)	4				2		
TBD	A2.3 Recycling Rates from Third-Party Verified Mixed-Use Waste Facility					1		
TBD	**A3. Recycled Content Base Material**					1		
TBD	**A4. Heat Island Effect Reduction (Non-Roof)**			1				
TBD	**A5. Construction Environmental Quality Management Plan Including Flush-Out**				1			
	A6. Stormwater Control: Prescriptive Path							
TBD	A6.1 Permeable Paving Material						1	
Yes	A6.2 Filtration and/or Bio-Retention Features	1					1	
TBD	A6.3 Non-Leaching Roofing Materials						1	
TBD	A6.4 Smart Stormwater Street Design		1					
TBD	**A7. Stormwater Control: Performance Path**						3	
B. FOUNDATION								
TBD	**B1. Fly Ash and/or Slag in Concrete**					1		
TBD	**B2. Radon-Resistant Construction**				2			
TBD	**B3. Foundation Drainage System**					2		
TBD	**B4. Moisture Controlled Crawlspace**				1			
	B5. Structural Pest Controls							
TBD	B5.1 Termite Shields and Separated Exterior Wood-to-Concrete Connections					1		
TBD	B5.2 Plant Trunks, Bases, or Stems at Least 36 Inches from the Foundation					1		
C. LANDSCAPE								
22.00%	Enter the landscape area percentage							
Yes	**C1. Plants Grouped by Water Needs (Hydrozoning)**	1					1	
TBD	**C2. Three Inches of Mulch in Planting Beds**						1	
	C3. Resource Efficient Landscapes							
Yes	C3.1 No Invasive Species Listed by Cal-IPC	1				1		
Yes	C3.2 Plants Chosen and Located to Grow to Natural Size	1				1		
Yes	C3.3 Drought Tolerant, California Native, Mediterranean Species, or Other Appropriate Species	3					3	
	C4. Minimal Turf in Landscape							
Yes	C4.1 No Turf on Slopes Exceeding 10% and No Overhead Sprinklers Installed in Areas Less Than Eight Feet Wide	2					2	
Yes	C4.2 Turf on a Small Percentage of Landscaped Area	2					2	
TBD	**C5. Trees to Moderate Building Temperature**		1	1			1	
Yes	**C6. High-Efficiency Irrigation System**	2					2	
Yes	**C7. One Inch of Compost in the Top Six to Twelve Inches of Soil**	2					2	
TBD	**C8. Rainwater Harvesting System**						3	
TBD	**C9. Recycled Wastewater Irrigation System**						1	
TBD	**C10. Submeter or Dedicated Meter for Landscape Irrigation**						2	
TBD	**C11. Landscape Meets Water Budget**						2	
	C12. Environmentally Preferable Materials for Site							
TBD	C12.1 Environmentally Preferable Materials for 70% of Non-Plant Landscape Elements and Fencing					1		
TBD	C12.2 Play Structures and Surfaces Have an Average Recycled Content ≥20%					1		
TBD	**C13. Reduced Light Pollution**		1					
TBD	**C14. Large Stature Tree(s)**		1					
TBD	**C15. Third Party Landscape Program Certification**						1	
Yes	**C16. Maintenance Contract with Certified Professional**	1					1	
TBD	**C17. Community Garden**		2					
D. STRUCTURAL FRAME AND BUILDING ENVELOPE								
	D1. Optimal Value Engineering							
TBD	D1.1 Joists, Rafters, and Studs at 24 Inches on Center			1		2		
Yes	D1.2 Non-Load Bearing Door and Window Headers Sized for Load	1				1		
TBD	D1.3 Advanced Framing Measures					2		
TBD	**D2. Construction Material Efficiencies**					1		
	D3. Engineered Lumber							
Yes	D3.1 Engineered Beams and Headers	1				1		
Yes	D3.2 Wood I-Joists or Web Trusses for Floors	1				1		
TBD	D3.3 Engineered Lumber for Roof Rafters					1		
TBD	D3.4 Engineered or Finger-Jointed Studs for Vertical Applications					1		
Yes	D3.5 OSB for Subfloor	0.5				0.5		
Yes	D3.6 OSB for Wall and Roof Sheathing	0.5				0.5		
TBD	**D4. Insulated Headers**			1				
	D5. FSC-Certified Wood							
TBD	D5.1 Dimensional Lumber, Studs, and Timber					6		
TBD	D5.2 Panel Products					3		
	D6. Solid Wall Systems							
TBD	D6.1 At Least 90% of Floors					1		
TBD	D6.2 At Least 90% of Exterior Walls			1		1		
TBD	D6.3 At Least 90% of Roofs			1		1		
TBD	**D7. Energy Heels on Roof Trusses**			1				
TBD	**D8. Overhangs and Gutters**			1		1		
	D9. Reduced Pollution Entering the Home from the Garage							
Yes	D9.1 Detached Garage	2			2			
TBD	D9.2 Mitigation Strategies for Attached Garage				1			

Project Name		Points Achieved	Community	Energy	IAQ/Health	Resources	Water	
	D10. Structural Pest and Rot Controls							
TBD	D10.1 All Wood Located At Least 12 Inches Above the Soil					1		
TBD	D10.2 Wood Framing Treating With Borates or Factory-Impregnated, or Wall Materials Other Than Wood					1		
Yes	**D11. Moisture-Resistant Materials in Wet Areas (such as Kitchen, Bathrooms, Utility Rooms, and Basements)**	2			1	1		
E. EXTERIOR								
TBD	**E1. Environmentally Preferable Decking**					1		
TBD	**E2. Flashing Installation Third-Party Verified**					2		
TBD	**E3. Rain Screen Wall System**					2		
Yes	**E4. Durable and Non-Combustible Cladding Materials**	1				1		
	E5. Durable Roofing Materials							
Yes	E5.1 Durable and Fire Resistant Roofing Materials or Assembly	1				1		
TBD	E5.2 Roofing Warranty for Shingle Roofing		R	R	R	R	R	
TBD	**E6. Vegetated Roof**		2	2				
F. INSULATION								
	F1. Insulation with 30% Post-Consumer or 60% Post-Industrial Recycled Content							
TBD	F1.1 Walls and Floors					1		
TBD	F1.2 Ceilings					1		
	F2. Insulation that Meets the CDPH Standard Method—Residential for Low Emissions							
Yes	F2.1 Walls and Floors	1			1			
Yes	F2.2 Ceilings	1			1			
	F3. Insulation That Does Not Contain Fire Retardants							
TBD	F3.1 Cavity Walls and Floors				1			
TBD	F3.2 Ceilings				1			
TBD	F3.3 Interior and Exterior Insulation				1			
G. PLUMBING								
	G1. Efficient Distribution of Domestic Hot Water							
TBD	G1.1 Insulated Hot Water Pipes			1				
TBD	G1.2 WaterSense Volume Limit for Hot Water Distribution						1	
TBD	G1.3 Increased Efficiency in Hot Water Distribution						2	
	G2. Install Water-Efficient Fixtures							
Yes	G2.1 WaterSense Showerheads with Matching Compensation Valve	2					2	
Yes	G2.2 WaterSense Bathroom Faucets	1					1	
Yes	G2.3 WaterSense Toilets with a Maximum Performance (MaP) Threshold of No Less Than 500 Grams	1					1	
TBD	G2.4 Urinals with Flush Rate of ≤ 0.1 Gallons/Flush						1	
TBD	**G3. Pre-Plumbing for Graywater System**						1	
TBD	**G4. Operational Graywater System**						3	
TBD	**G5. Submeter Water for Tenants**						2	
H. HEATING, VENTILATION, AND AIR CONDITIONING								
	H1. Sealed Combustion Units							
TBD	H1.1 Sealed Combustion Furnace				1			
TBD	H1.2 Sealed Combustion Water Heater				2			
TBD	**H2. High Performing Zoned Hydronic Radiant Heating System**			1	1			
	H3. Effective Ductwork							
Yes	H3.1 Duct Mastic on Duct Joints and Seams	1		1				
TBD	H3.2 Pressure Balance the Ductwork System			1				
Yes	**H4. ENERGY STAR® Bathroom Fans Per HVI Standards with Air Flow Verified**	1			1			
	H5. Advanced Practices for Cooling							
TBD	H5.1 ENERGY STAR Ceiling Fans in Living Areas and Bedrooms			1				
TBD	H5.2 Operable Windows and Skylights Located to Induce Cross Ventilation in At Least One Room in 80% of Units			1				
	H6. Whole House Mechanical Ventilation Practices to Improve Indoor Air Quality							
Yes	H6.1 Meet ASHRAE Standard 62.2-2010 Ventilation Residential Standards	Y	R	R	R	R	R	
TBD	H6.2 Advanced Ventilation Standards				1			
TBD	H6.3 Outdoor Air Ducted to Bedroom and Living Areas				2			
	H7. Effective Range Design and Installation							
TBD	H7.1 Effective Range Hood Ducting and Design				1			
TBD	H7.2 Automatic Range Hood Control				1			
I. RENEWABLE ENERGY								
TBD	**I1. Pre-Plumbing for Solar Water Heating**			1				
TBD	**I2. Preparation for Future Photovoltaic Installation**			1				
	I3. Onsite Renewable Generation (Solar PV, Solar Thermal, and Wind)			25				
	I4. Net Zero Energy Home							
TBD	I4.1 Near Zero Energy Home			2				
TBD	I4.2 Net Zero Electric			4				
TBD	**I5. Solar Hot Water Systems to Preheat Domestic Hot Water**			4				
TBD	**I6. Photovoltaic System for Multifamily Projects**			12				
J. BUILDING PERFORMANCE AND TESTING								
TBD	**J1. Third-Party Verification of Quality of Insulation Installation**				1			
TBD	**J2. Supply and Return Air Flow Testing**			1	1			
Yes	**J3. Mechanical Ventilation Testing and Low Leakage**	1			1			
TBD	**J4. Combustion Appliance Safety Testing**				1			
2013	**J5. Building Performance Exceeds Title 24 Part 6**							
16.6%	J5.1 Home Outperforms Title 24	38.2		30				
0.0%	J5.2 Non-Residential Spaces Outperform Title 24	0		15				
Yes	**J6. Title 24 Prepared and Signed by a CABEC Certified Energy Analyst**	1		1				
TBD	**J7. Participation in Utility Program with Third-Party Plan Review**			1				
TBD	**J8. ENERGY STAR for Homes**			1				
No	**J9. EPA Indoor airPlus Certification**				1			
K. FINISHES								
	K1. Entryways Designed to Reduce Tracked-In Contaminants							
TBD	K1.1 Entryways to Individual Units				1			
TBD	K1.2 Entryways to Buildiings				1			
TBD	**K2. Zero-VOC Interior Wall and Ceiling Paints**				2			
Yes	**K3. Low-VOC Caulks and Adhesives**	1			1			
	K4. Environmentally Preferable Materials for Interior Finish							
TBD	K4.1 Cabinets					2		
TBD	K4.2 Interior Trim					2		
TBD	K4.3 Shelving					2		
TBD	K4.4 Doors					2		
TBD	K4.5 Countertops					1		
	K5. Formaldehyde Emissions in Interior Finish Exceed CARB							
Yes	K5.1 Doors	1			1			
Yes	K5.2 Cabinets and Countertops	2			2			
Yes	K5.3 Interior Trim and Shelving	2			2			
TBD	**K6. Products That Comply With the Health Product Declaration Open Standard**				2			
TBD	**K7. Indoor Air Formaldehyde Level Less Than 27 Parts Per Billion**				2			
No	**K8. Comprehensive Inclusion of Low Emitting Finishes**				1			
TBD	**K9. Durable Cabinets**				2			
TBD	**K10. At Least 25% of Interior Furniture Has Environmentally Preferable Attributes**				1			

Project Name		Points Achieved	Community	Energy	IAQ/Health	Resources	Water	
L. FLOORING								
TBD	**L1. Environmentally Preferable Flooring**					3		
TBD	**L2. Low-Emitting Flooring Meets CDPH 2010 Standard Method—Residential**				3			
TBD	**L3. Durable Flooring**					1		
TBD	**L4. Thermal Mass Flooring**			1				
M. APPLIANCES AND LIGHTING								
Yes	**M1. ENERGY STAR® Dishwasher**	1					1	
CEE Tier 2	**M2. CEE-Rated Clothes Washer**	2		1			2	
<20 cubic feet	**M3. Size-Efficient ENERGY STAR Refrigerator**	2		2				
	M4. Permanent Centers for Waste Reduction Strategies							
TBD	M4.1 Built-In Recycling Center					1		
TBD	M4.2 Built-In Composting Center					1		
	M5. Lighting Efficiency							
TBD	M5.1 High-Efficacy Lighting			2				
TBD	M5.2 Lighting System Designed to IESNA Footcandle Standards or Designed by Lighting Consultant			2				
Yes	**M6. Central Laundry**	1					1	
TBD	**M7. Gearless Elevator**			1				
N. COMMUNITY								
	N1. Smart Development							
Yes	N1.1 Infill Site	2	1			1		
TBD	N1.2 Designated Brownfield Site		1		1			
>30	N1.3 Conserve Resources by Increasing Density	3		2		2		
TBD	N1.4 Cluster Homes for Land Preservation		1			1		
	N1.5 Home Size Efficiency	0				9		
709	Enter the area of the home, in square feet							
1	Enter the number of bedrooms							
TBD	**N2. Home(s)/Development Located Within 1/2 Mile of a Major Transit Stop**		2					
	N3. Pedestrian and Bicycle Access							
	N3.1 Pedestrian Access to Services Within 1/2 Mile of Community Services		2					
	Enter the number of Tier 1 services							
	Enter the number of Tier 2 services							
TBD	N3.2 Connection to Pedestrian Pathways		1					
TBD	N3.3 Traffic Calming Strategies		2					
TBD	N3.4 Sidewalks Buffered from Roadways and 5-8 Feet Wide		1					
TBD	N3.5 Bicycle Storage for Residents		1					
TBD	N3.6 Bicycle Storage for Non-Residents		1					
TBD	N3.7 Reduced Parking Capacity		2					
	N4. Outdoor Gathering Places							
TBD	N4.1 Public or Semi-Public Outdoor Gathering Places for Residents		1					
TBD	N4.2 Public Outdoor Gathering Places with Direct Access to Tier 1 Community Services		1					
	N5. Social Interaction							
TBD	N5.1 Residence Entries with Views to Callers		1					
TBD	N5.2 Entrances Visible from Street and/or Other Front Doors		1					
TBD	N5.3 Porches Oriented to Street and Public Space		1					
Yes	N5.4 Social Gathering Space	1	1					
	N6. Passive Solar Design							
TBD	N6.1 Heating Load			2				
TBD	N6.2 Cooling Load			2				
	N7. Adaptable Building							
TBD	N7.1 Universal Design Principles in Units		1		1			
TBD	N7.2 Full-Function Independent Rental Unit		1					
	N8. Affordability							
≥50%	N8.1 Dedicated Units for Households Making 80% of AMI or Less	2	2					
TBD	N8.2 Units with Multiple Bedrooms for Households Making 80% of AMI or Less		1					
TBD	N8.3 At Least 20% of Units at 120% AMI or Less are For Sale		1					
	N9. Mixed-Use Developments							
TBD	N9.1 Live/Work Units Include a Dedicated Commercial Entrance		1					
TBD	N9.2 At Least 2% of Development Floor Space Supports Mixed Use		1					
TBD	N9.3 Half of the Non-Residential Floor Space is Dedicated to Community Service		1					
O. OTHER								
Yes	**O1. GreenPoint Rated Checklist in Blueprints**	Y	R	R	R	R	R	
TBD	**O2. Pre-Construction Kickoff Meeting with Rater and Subcontractors**			0.5		1	0.5	
TBD	**O3. Orientation and Training to Occupants—Conduct Educational Walkthroughs**			0.5	0.5	0.5	0.5	
TBD	**O4. Builder's or Developer's Management Staff are Certified Green Building Professionals**			0.5	0.5	0.5	0.5	
TBD	**O5. Home System Monitors**			2			1	
	O6. Green Building Education							
TBD	O6.1 Marketing Green Building		2					
TBD	O6.2 Green Building Signage			0.5			0.5	
TBD	**O7. Green Appraisal Addendum**		R	R	R	R	R	
TBD	**O8. Detailed Durability Plan and Third-Party Verification of Plan Implementation**					1		
TBD	**O9. Residents Are Offered Free or Discounted Transit Passes**		2					
TBD	**O10. Vandalism Deterrence Practices and Vandalism Management Plan**					1		
P. DESIGN CONSIDERATIONS								
	P1. Acoustics: Noise and Vibration Control		1		1			
	Enter the number of Tier 1 practices							
	Enter the number of Tier 2 practices							
	P2. Mixed-Use Design Strategies							
TBD	P2.1 Tenant Improvement Requirements for Build-Outs				1		1	
TBD	P2.2 Commercial Loading Area Separated for Residential Area				1			
TBD	P2.3 Separate Mechanical and Plumbing Systems				1			
	P3. Commissioning							
TBD	P3.1 Design Phase			1	1			
TBD	P3.2 Construction Phase			1	1			
TBD	P3.3 Post-Construction Phase			1	1			
TBD	**P4. Building Enclosure Testing**			1	1	1		
Summary								
	Total Available Points in Specific Categories	381	43	138	61	86	53	
	Minimum Points Required in Specific Categories	50	2	25	6	6	6	
Total Points Achieved		**103.2**	**4.0**	**45.7**	**14.0**	**17.5**	**22.0**	

GENERAL INFORMATION					
01	**Project Name**	Firebaugh Gateway Apartments			
02	**Calculation Description**	Title 24 Analysis			
03	**Project Location**	P St.			
04	**City**	Firebaugh, CA	05	**Standards Version**	Compliance 2015
06	**Zip Code**		07	**Compliance Manager Version**	BEMCmpMgr 2013-4 (744)
08	**Climate Zone**	CZ13	09	**Software Version**	CBECC-Res 2013-4 (744)
10	**Building Type**	Multifamily	11	**Front Orientation (deg/Cardinal)**	55
12	**Project Scope**	Newly Constructed	13	**Number of Dwelling Units**	30
14	**Total Cond. Floor Area (ft^2)**	21266	15	**Number of Zones**	4
16	**Slab Area (ft^2)**	9976	17	**Number of Stories**	2
18	**Addition Cond. Floor Area**	N/A	19	**Natural Gas Available**	Yes
20	**Addition Slab Area (ft^2)**	N/A	21	**Glazing Percentage (%)**	12.8%

COMPLIANCE RESULTS	
01	**Building Complies with Computer Performance**
02	**This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.**
03	**This building incorporates one or more Special Features shown below**

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft^2-yr)	**Standard Design**	**Proposed Design**	**Compliance Margin**	**Percent Improvement**
Space Heating	12.47	9.09	3.38	27.1%
Space Cooling	55.31	51.96	3.35	6.1%
IAQ Ventilation	2.45	2.45	0.00	0.0%
Water Heating	28.87	23.59	5.28	18.3%
Photovoltaic Offset	----	0.00	0.00	----
Compliance Energy Total	**99.10**	**87.09**	**12.01**	**12.1%**

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- **Ceiling has high level of insulation**
- **Window overhangs and/or fins**

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building components tables below.

Building-level Verifications:
- **IAQ mechanical ventilation**

Cooling System Verifications:
- **Minimum Airflow**
- **Verified EER**
- **Verified SEER**
- **Refrigerant Charge**
- **Fan Efficacy Watts/CFM**

HVAC Distribution System Verifications:
- **Duct Sealing**
- **Verified low-leakage ducts entirely in conditioned space**

Domestic Hot Water System Verifications:
- **-- None --**

ENERGY DESIGN RATING

This is the sum of the annual TDV energy consumption for energy use components included in the performance compliance approach for the Standard Design Building (Energy Budget) and the annual TDV energy consumption for lighting and components not regulated by Title 24, Part 6 (such as domestic appliances and consumer electronics) and accounting for the annual TDV energy offset by an on-site renewable energy system.

	Reference Energy Use	Energy Design Rating	Margin	Percent Improvement
Total Energy (kTDV/f2-yr)*	**196.61**	**184.60**	**12.01**	**6.1%**

* includes calculated Appliances and Miscellaneous Energy Use (AMEU)

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	**Conditioned Floor Area (sft)**	**Number of Dwelling Units**	**Number of Bedrooms**	**Number of Zones**	**Number of Ventilation Cooling Systems**	**Number of Water Heating Systems**
Firebaugh Gateway Apartments	21266	30	34	4	0	30

ZONE INFORMATION

01	02	03	04	05
Zone Name	**Zone Type**	**Zone Floor Area (ft^2)**	**Avg. Ceiling Height**	**Number of Dwelling Units**
1 bedroom lower level	Conditioned	8004	10	12
2 bedroom lower level	Conditioned	1976	10	2
1 bedroom Upper level	Conditioned	9310	10	14
2 bedroom upper level	Conditioned	1976	10	2

DWELLING UNIT INFORMATION		
01	02	03
Dwelling Unit Name	**Dwelling Unit Type**	**Zone**
DDU-1 1 bedroom lower level-(1/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(2/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(3/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(4/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(5/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(6/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(7/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(8/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(9/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(10/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(11/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-1 1 bedroom lower level-(12/12)	DU-1 1 bedroom lower level	1 bedroom lower level
DDU-2 2 bedroom lower level-(1/2)	DU-2 2 bedroom lower level	2 bedroom lower level
DDU-2 2 bedroom lower level-(2/2)	DU-2 2 bedroom lower level	2 bedroom lower level
DDU-3 1 bedroom Upper level-(1/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(2/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(3/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(4/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(5/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(6/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(7/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(8/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(9/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(10/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(11/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(12/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(13/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-3 1 bedroom Upper level-(14/14)	DU-3 1 bedroom Upper level	1 bedroom Upper level
DDU-4 2 bedroom upper level-(1/2)	DU-4 2 bedroom upper level	2 bedroom upper level
DDU-4 2 bedroom upper level-(2/2)	DU-4 2 bedroom upper level	2 bedroom upper level

DWELLING UNIT TYPES

01	02	03	04	05	06	07
Name	CFA (ft2)	Number of Bedrooms	Number in Building	Space Conditioning System Name (Count)	DHW System Name	IAQ Vent Fan Name
DU-1 1 bedroom lower level	667	1	12	:Heat Pump System 1:Air Distribution System 1:HVAC Fan 1:2 (1)	DHW Sys 1	Default Minimum IAQ Fan
DU-2 2 bedroom lower level	988	2	2	:Heat Pump System 2:Air Distribution System 2:HVAC Fan 2:2 (1)	DHW Sys 1	Default Minimum IAQ Fan
DU-3 1 bedroom Upper level	665	1	14	:Heat Pump System 3:Air Distribution System 3:HVAC Fan 3:2 (1)	DHW Sys 1	Default Minimum IAQ Fan
DU-4 2 bedroom upper level	988	2	2	:Heat Pump System 4:Air Distribution System 4:HVAC Fan 4:2 (1)	DHW Sys 1	Default Minimum IAQ Fan

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	**Zone**	**Construction**	**Azimuth**	**Orientation**	**Gross Area (ft^2)**	**Window & Door Area (ft^2)**	**Tilt (deg)**
Front Wall	1 bedroom lower level	R-21 Wall R-3 ext	55	Front	2105	320.997	90
Front Wall 2	1 bedroom lower level	R-15 Wall R-3 ext	55	Front	415		90
Right Wall	1 bedroom lower level	R-21 Wall R-3 ext	325	Right	1736	314.991	90
Right Wall 2	1 bedroom lower level	R-15 Wall R-3 ext	325	Right	510		90
Back Wall	1 bedroom lower level	R-21 Wall R-3 ext	235	Back	2105	320.997	90
Back Wall 2	1 bedroom lower level	R-15 Wall R-3 ext	235	Back	415		90
Left Wall	1 bedroom lower level	R-21 Wall R-3 ext	145	Left	1736	236.997	90
Left Wall 2	1 bedroom lower level	R-15 Wall R-3 ext	145	Left	510		90
Front Wall 3	2 bedroom lower level	R-21 Wall R-3 ext	55	Front	552	93.5	90
Right Wall 3	2 bedroom lower level	R-21 Wall R-3 ext	325	Right	808		90
Back Wall 3	2 bedroom lower level	R-21 Wall R-3 ext	235	Back	552	93.5	90
Left Wall 3	2 bedroom lower level	R-21 Wall R-3 ext	145	Left	695	150	90
Front Wall 4	1 bedroom Upper level	R-21 Wall R-3 ext	55	Front	2137	343.497	90
Front Wall 2 2	1 bedroom Upper level	R-15 Wall R-3 ext	55	Front	603		90
Right Wall 4	1 bedroom Upper level	R-21 Wall R-3 ext	325	Right	2235	484.011	90
Right Wall 2 2	1 bedroom Upper level	R-15 Wall R-3 ext	325	Right	459		90
Back Wall 4	1 bedroom Upper level	R-21 Wall R-3 ext	235	Back	2137	343.497	90
Back Wall 2 2	1 bedroom Upper level	R-15 Wall R-3 ext	235	Back	603		90
Left Wall 4	1 bedroom Upper level	R-21 Wall R-3 ext	145	Left	2235	278.991	90
Left Wall 2 2	1 bedroom Upper level	R-15 Wall R-3 ext	145	Left	459		90
Roof	1 bedroom Upper level	R-49 Roof Attic RB			9306		
Front Wall 5	2 bedroom upper level	R-21 Wall R-3 ext	55	Front	701	108.5	90
Right Wall 5	2 bedroom upper level	R-21 Wall R-3 ext	325	Right	931		90
Back Wall 5	2 bedroom upper level	R-21 Wall R-3 ext	235	Back	701	108.5	90
Left Wall 5	2 bedroom upper level	R-21 Wall R-3 ext	145	Left	830	159	90
Roof 2	2 bedroom upper level	R-49 Roof Attic RB			1976		

ATTIC

01	02	03	04	05	06	07	08
Name	**Construction**	**Type**	**Roof Rise**	**Roof Reflectance**	**Roof Emittance**	**Radiant Barrier**	**Cool Roof**
Attic 1 bedroom Upper level	Attic Roof1 bedroom Upper level	Ventilated	5.0937	0.1	0.85	Yes	No
Attic 2 bedroom upper level	Attic Roof2 bedroom upper level	Ventilated	5.0937	0.1	0.85	Yes	No

WINDOWS

01	02	03	04	05	06	07	08	09	10
Name	Type	Surface (Orientation-Azimuth)	Width (ft)	Height (ft)	Multiplier	Area (ft^2)	U-factor	SHGC	Exterior Shading
Front Glass 1	Window	Front Wall (Front-55)	----	----	1	49.5	0.28	0.25	Insect Screen (default)
Front Glass 2	Window	Front Wall (Front-55)	----	----	1	10.5	0.28	0.25	Insect Screen (default)
Front Glass 3	Window	Front Wall (Front-55)	----	----	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 4	Window	Front Wall (Front-55)	4.0	4.5	2	36.0	0.28	0.25	Insect Screen (default)
Front Glass 5	Window	Front Wall (Front-55)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Front Glass 6	Window	Front Wall (Front-55)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Front Glass 7	Window	Front Wall (Front-55)	3.0	7.0	3	63.0	0.28	0.25	Insect Screen (default)
Right Glass 1	Window	Right Wall (Right-325)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Right Glass 2	Window	Right Wall (Right-325)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Right Glass 3	Window	Right Wall (Right-325)	3.0	7.0	2	42.0	0.28	0.25	Insect Screen (default)
Right Glass 4	Window	Right Wall (Right-325)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Right Glass 5	Window	Right Wall (Right-325)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Right Glass 6	Window	Right Wall (Right-325)	3.0	4.5	2	27.0	0.28	0.25	Insect Screen (default)
Right Glass 7	Window	Right Wall (Right-325)	3.0	5.5	2	33.0	0.28	0.25	Insect Screen (default)
Right Glass 8	Window	Right Wall (Right-325)	3.0	5.5	2	33.0	0.28	0.25	Insect Screen (default)
Right Glass 9	Window	Right Wall (Right-325)	3.0	8.0	2	48.0	0.28	0.25	Insect Screen (default)
Back Glass 1	Window	Back Wall (Back-235)	----	----	1	49.5	0.28	0.25	Insect Screen (default)
Back Glass 2	Window	Back Wall (Back-235)	----	----	1	10.5	0.28	0.25	Insect Screen (default)
Back Glass 3	Window	Back Wall (Back-235)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Back Glass 4	Window	Back Wall (Back-235)	4.0	4.5	2	36.0	0.28	0.25	Insect Screen (default)
Back Glass 5	Window	Back Wall (Back-235)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Back Glass 6	Window	Back Wall (Back-235)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Back Glass 7	Window	Back Wall (Back-235)	3.0	7.0	3	63.0	0.28	0.25	Insect Screen (default)
Left Glass 1	Window	Left Wall (Left-145)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Left Glass 2	Window	Left Wall (Left-145)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Left Glass 3	Window	Left Wall (Left-145)	3.0	7.0	2	42.0	0.28	0.25	Insect Screen (default)
Left Glass 4	Window	Left Wall (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 5	Window	Left Wall (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 6	Window	Left Wall (Left-145)	3.0	4.5	1.556	21.0	0.28	0.25	Insect Screen (default)

Front Glass 1 2	Window	Front Wall 3 (Front-55)	----	----	1	14.0	0.28	0.25	Insect Screen (default)
Front Glass 2 2	Window	Front Wall 3 (Front-55)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 3 2	Window	Front Wall 3 (Front-55)	3.0	5.5	1	16.5	0.28	0.25	Insect Screen (default)
Front Glass 4 2	Window	Front Wall 3 (Front-55)	3.0	8.0	1	24.0	0.28	0.25	Insect Screen (default)
Front Glass 1 3	Window	Back Wall 3 (Back-235)	----	----	1	14.0	0.28	0.25	Insect Screen (default)
Front Glass 2 3	Window	Back Wall 3 (Back-235)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 3 3	Window	Back Wall 3 (Back-235)	3.0	5.5	1	16.5	0.28	0.25	Insect Screen (default)
Front Glass 4 3	Window	Back Wall 3 (Back-235)	3.0	8.0	1	24.0	0.28	0.25	Insect Screen (default)
Left Glass 1 2	Window	Left Wall 3 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 2 2	Window	Left Wall 3 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 3 2	Window	Left Wall 3 (Left-145)	3.0	8.0	2	48.0	0.28	0.25	Insect Screen (default)
Left Glass 4 2	Window	Left Wall 3 (Left-145)	6.0	5.5	1	33.0	0.28	0.25	Insect Screen (default)
Left Glass 5 2	Window	Left Wall 3 (Left-145)	6.0	5.5	1	33.0	0.28	0.25	Insect Screen (default)
Front Glass 1 4	Window	Front Wall 4 (Front-55)	----	----	1	40.5	0.28	0.25	Insect Screen (default)
Front Glass 2 4	Window	Front Wall 4 (Front-55)	----	----	1	10.5	0.28	0.25	Insect Screen (default)
Front Glass 3 4	Window	Front Wall 4 (Front-55)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 4 4	Window	Front Wall 4 (Front-55)	4.0	4.5	2	36.0	0.28	0.25	Insect Screen (default)
Front Glass 5 2	Window	Front Wall 4 (Front-55)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Front Glass 6 2	Window	Front Wall 4 (Front-55)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Front Glass 7 2	Window	Front Wall 4 (Front-55)	3.0	7.0	3	63.0	0.28	0.25	Insect Screen (default)
Front Glass 8	Window	Front Wall 4 (Front-55)	----	----	1	31.5	0.28	0.25	Insect Screen (default)
Right Glass 1 2	Window	Right Wall 4 (Right-325)	3.0	3.5	5.143	54.0	0.28	0.25	Insect Screen (default)
Right Glass 2 2	Window	Right Wall 4 (Right-325)	3.0	3.5	5.143	54.0	0.28	0.25	Insect Screen (default)
Right Glass 3 2	Window	Right Wall 4 (Right-325)	3.0	7.0	4	84.0	0.28	0.25	Insect Screen (default)
Right Glass 4 2	Window	Right Wall 4 (Right-325)	4.0	4.5	1.778	32.0	0.28	0.25	Insect Screen (default)
Right Glass 5 2	Window	Right Wall 4 (Right-325)	4.0	4.5	1.778	32.0	0.28	0.25	Insect Screen (default)
Right Glass 6 2	Window	Right Wall 4 (Right-325)	3.0	4.5	2	27.0	0.28	0.25	Insect Screen (default)
Right Glass 7 2	Window	Right Wall 4 (Right-325)	3.0	4.5	2	27.0	0.28	0.25	Insect Screen (default)
Right Glass 8 2	Window	Right Wall 4 (Right-325)	3.0	4.5	2	27.0	0.28	0.25	Insect Screen (default)
Right Glass 9 2	Window	Right Wall 4 (Right-325)	3.0	7.0	2	42.0	0.28	0.25	Insect Screen (default)
Right Glass 10	Window	Right Wall 4 (Right-325)	----	----	1	63.0	0.28	0.25	Insect Screen (default)
Back Glass 1 2	Window	Back Wall 4 (Back-235)	----	----	1	40.5	0.28	0.25	Insect Screen (default)
Back Glass 2 2	Window	Back Wall 4 (Back-235)	----	----	1	10.5	0.28	0.25	Insect Screen (default)

Back Glass 3 2	Window	Back Wall 4 (Back-235)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Back Glass 4 2	Window	Back Wall 4 (Back-235)	4.0	4.5	2	36.0	0.28	0.25	Insect Screen (default)
Back Glass 5 2	Window	Back Wall 4 (Back-235)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Back Glass 6 2	Window	Back Wall 4 (Back-235)	3.0	3.5	3.857	40.5	0.28	0.25	Insect Screen (default)
Back Glass 7 2	Window	Back Wall 4 (Back-235)	3.0	7.0	3	63.0	0.28	0.25	Insect Screen (default)
Back Glass 8	Window	Back Wall 4 (Back-235)	----	----	1	31.5	0.28	0.25	Insect Screen (default)
Left Glass 1 3	Window	Left Wall 4 (Left-145)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Left Glass 2 3	Window	Left Wall 4 (Left-145)	3.0	3.5	2.571	27.0	0.28	0.25	Insect Screen (default)
Left Glass 3 3	Window	Left Wall 4 (Left-145)	3.0	7.0	2	42.0	0.28	0.25	Insect Screen (default)
Left Glass 4 3	Window	Left Wall 4 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 5 3	Window	Left Wall 4 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 6 2	Window	Left Wall 4 (Left-145)	3.0	3.5	2	21.0	0.28	0.25	Insect Screen (default)
Front Glass 1 5	Window	Front Wall 5 (Front-55)	----	----	1	14.0	0.28	0.25	Insect Screen (default)
Front Glass 2 5	Window	Front Wall 5 (Front-55)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 3 5	Window	Front Wall 5 (Front-55)	3.0	4.5	1	13.5	0.28	0.25	Insect Screen (default)
Front Glass 4 5	Window	Front Wall 5 (Front-55)	3.0	7.0	1	21.0	0.28	0.25	Insect Screen (default)
Front Glass 5 3	Window	Front Wall 5 (Front-55)	----	----	1	21.0	0.28	0.25	Insect Screen (default)
Front Glass 1 6	Window	Back Wall 5 (Back-235)	----	----	1	14.0	0.28	0.25	Insect Screen (default)
Front Glass 2 6	Window	Back Wall 5 (Back-235)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Front Glass 3 6	Window	Back Wall 5 (Back-235)	3.0	4.5	1	13.5	0.28	0.25	Insect Screen (default)
Front Glass 4 6	Window	Back Wall 5 (Back-235)	3.0	7.0	1	21.0	0.28	0.25	Insect Screen (default)
Front Glass 5 4	Window	Back Wall 5 (Back-235)	----	----	1	21.0	0.28	0.25	Insect Screen (default)
Left Glass 1 4	Window	Left Wall 5 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 2 4	Window	Left Wall 5 (Left-145)	4.0	4.5	1	18.0	0.28	0.25	Insect Screen (default)
Left Glass 3 4	Window	Left Wall 5 (Left-145)	3.0	4.5	2	27.0	0.28	0.25	Insect Screen (default)
Left Glass 4 4	Window	Left Wall 5 (Left-145)	6.0	4.5	1	27.0	0.28	0.25	Insect Screen (default)
Left Glass 5 4	Window	Left Wall 5 (Left-145)	6.0	4.5	1	27.0	0.28	0.25	Insect Screen (default)
Left Glass 6 3	Window	Left Wall 5 (Left-145)	----	----	1	42.0	0.28	0.25	Insect Screen (default)

DOORS			
01	**02**	**03**	**04**
Name	**Side of Building**	**Area (ft^2)**	**U-factor**
Door	Front Wall	63.0	0.70
Door 2	Right Wall	42.0	0.70
Door 3	Back Wall	63.0	0.70
Door 4	Left Wall	84.0	0.70
Door 5	Front Wall 3	21.0	0.70
Door 6	Back Wall 3	21.0	0.70
Door 7	Front Wall 4	63.0	0.70
Door 8	Right Wall 4	42.0	0.70
Door 9	Back Wall 4	63.0	0.70
Door 10	Left Wall 4	126.0	0.70
Door 11	Front Wall 5	21.0	0.70
Door 12	Back Wall 5	21.0	0.70

OVERHANGS AND FINS

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	Overhang					Left Fin				Right Fin			
Window	Depth	Dist Up	Left Extent	Right Extent	Flap Ht.	Depth	Top Up	DistL	Bot Up	Depth	Top Up	Dist R	Bot Up
Front Glass 4	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Front Glass 5	5.5	2	8	8	0	3.5	0	2	0	0	0	0	0
Front Glass 6	5.5	2	8	8	0	3.5	0	0.5	0	3.5	0	7.5	0
Front Glass 7	5.5	2	8	8	0	3.5	0	4	0	3.5	0	4	0
Right Glass 1	5.5	2	8	8	0	3.5	0	2	0	0	0	0	0
Right Glass 2	5.5	2	8	8	0	3.5	0	0.5	0	3.5	0	7.5	0
Right Glass 3	5.5	2	8	8	0	3.5	0	4	0	3.5	0	4	0
Right Glass 4	0	0	0	0	0	0	0	0	0	3.5	0	2	0
Right Glass 5	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Right Glass 6	0	0	0	0	0	3.5	0	2	0	3.5	0	2	0
Right Glass 7	4	2	8	8	0	2	0	0.5	0	0	0	0	0
Right Glass 8	4	2	8	8	0	0	0	0	0	2	0	0.5	0
Right Glass 9	4	2	8	8	0	2	0	0.5	0	2	0	0.5	0
Back Glass 3	0	0	0	0	0	3.5	0	2	0	3.5	0	2	0
Back Glass 4	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Back Glass 5	5.5	2	8	8	0	3.5	0	2	0	0	0	0	0
Back Glass 6	5.5	2	8	8	0	3.5	0	0.5	0	3.5	0	7.5	0
Back Glass 7	5.5	2	8	8	0	3.5	0	4	0	3.5	0	4	0
Left Glass 1	5.5	2	8	8	0	3.5	0	2	0	0	0	0	0
Left Glass 2	5.5	2	8	8	0	3.5	0	0.5	0	3.5	0	7.5	0
Left Glass 3	5.5	2	8	8	0	3.5	0	4	0	3.5	0	4	0
Left Glass 4	0	0	0	0	0	0	0	0	0	3.5	0	2	0
Left Glass 5	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Left Glass 6	20	1	8	8	0	0	0	0	0	0	0	0	0
Front Glass 2 2	0	0	0	0	0	2.5	0	2.5	0	6	0	3	0
Front Glass 3 2	5	1	8	8	0	0	0	0	0	6	0	4.5	0
Front Glass 4 2	5	1	8	8	0	0	0	0	0	6	0	0.5	0
Front Glass 2 3	0	0	0	0	0	6	0	3	0	2.5	0	2.5	0

Front Glass 3 3	5	1	8	8	0	6	0	4.5	0	0	0	0	0
Front Glass 4 3	5	1	8	8	0	6	0	0.5	0	0	0	0	0
Left Glass 1 2	0	0	0	0	0	2.5	0	3.5	0	6	0	2.5	0
Left Glass 2 2	0	0	0	0	0	6	0	2.5	0	2.5	0	3.5	0
Left Glass 3 2	0	0	0	0	0	4	0	2	0	4	0	2	0
Left Glass 4 2	5	1	8	8	0	4	0	0.5	0	0	0	0	0
Left Glass 5 2	5	1	8	8	0	0	0	0	0	4	0	0.5	0
Front Glass 3 4	0	0	0	0	0	3.5	0	2	0	3.5	0	2	0
Front Glass 4 4	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Front Glass 5 2	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Front Glass 6 2	0	0	0	0	0	3.5	0	0.5	0	3.5	0	7.5	0
Front Glass 7 2	0	0	0	0	0	3.5	0	4	0	3.5	0	4	0
Right Glass 1 2	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Right Glass 2 2	0	0	0	0	0	3.5	0	0.5	0	3.5	0	7.5	0
Right Glass 3 2	0	0	0	0	0	3.5	0	4	0	3.5	0	4	0
Right Glass 4 2	0	0	0	0	0	0	0	0	0	3.5	0	2	0
Right Glass 5 2	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Right Glass 6 2	0	0	0	0	0	3.5	0	2	0	3.5	0	2	0
Right Glass 7 2	0	0	0	0	0	2	0	0.5	0	0	0	0	0
Right Glass 8 2	0	0	0	0	0	0	0	0	0	2	0	0.5	0
Right Glass 9 2	0	0	0	0	0	2	0	0.5	0	2	0	0.5	0
Back Glass 3 2	0	0	0	0	0	3.5	0	2	0	3.5	0	2	0
Back Glass 4 2	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Back Glass 5 2	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Back Glass 6 2	0	0	0	0	0	3.5	0	0.5	0	3.5	0	7.5	0
Back Glass 7 2	0	0	0	0	0	3.5	0	4	0	3.5	0	4	0
Left Glass 1 3	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Left Glass 2 3	0	0	0	0	0	3.5	0	0.5	0	3.5	0	7.5	0
Left Glass 3 3	0	0	0	0	0	3.5	0	4	0	3.5	0	4	0
Left Glass 4 3	0	0	0	0	0	0	0	0	0	3.5	0	2	0
Left Glass 5 3	0	0	0	0	0	3.5	0	2	0	0	0	0	0
Left Glass 6 2	20	1	8	8	0	0	0	0	0	0	0	0	0
Front Glass 2 5	0	0	0	0	0	2.5	0	2.5	0	6	0	3	0

Front Glass 3 5	0	0	0	0	0	0	0	0	0	6	0	4.5	0
Front Glass 4 5	0	0	0	0	0	0	0	0	0	6	0	0.5	0
Front Glass 2 6	0	0	0	0	0	6	0	3	0	2.5	0	2.5	0
Front Glass 3 6	0	0	0	0	0	6	0	4.5	0	0	0	0	0
Front Glass 4 6	0	0	0	0	0	6	0	0.5	0	0	0	0	0
Left Glass 1 4	0	0	0	0	0	2.5	0	3.5	0	6	0	2.5	0
Left Glass 2 4	0	0	0	0	0	6	0	2.5	0	2.5	0	3.5	0
Left Glass 3 4	0	0	0	0	0	4	0	2	0	4	0	2	0
Left Glass 4 4	0	0	0	0	0	4	0	0.5	0	0	0	0	0
Left Glass 5 4	0	0	0	0	0	0	0	0	0	4	0	0.5	0

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07
Construction Name	**Surface Type**	**Construction Type**	**Framing**	**Total Cavity R-value**	**Winter Design U-value**	**Assembly Layers**
R-21 Wall R-3 ext	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O.C.	R 21	0.052	• *Inside Finish: Gypsum Board* • *Cavity / Frame: R-21 / 2x6* • *Sheathing / Insulation: R3 Sheathing* • *Exterior Finish: Wood Siding/sheathing/decking*
R-15 Wall R-3 ext	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	R 15	0.067	• *Inside Finish: Gypsum Board* • *Cavity / Frame: R-15 / 2x4* • *Sheathing / Insulation: R3 Sheathing* • *Exterior Finish: Wood Siding/sheathing/decking*
Attic Roof1 bedroom Upper level	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	• *Cavity / Frame: no insul. / 2x4 Top Chrd* • *Roof Deck: Wood Siding/sheathing/decking* • *Roofing: Light Roof (Asphalt Shingle)*
R-49 Roof Attic RB	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 49	0.020	• *Inside Finish: Gypsum Board* • *Cavity / Frame: R-9.1 / 2x4* • *Over Floor Joists: R-39.9 insul.*
R-19 Floor Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O.C.	R 19	0.048	• *Floor Surface: Carpeted* • *Floor Deck: Wood Siding/sheathing/decking* • *Cavity / Frame: R-19 / 2x6* • *Ceiling Below Finish: Gypsum Board*
Attic Roof2 bedroom upper level	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	• *Cavity / Frame: no insul. / 2x4 Top Chrd* • *Roof Deck: Wood Siding/sheathing/decking* • *Roofing: Light Roof (Asphalt Shingle)*

SLAB FLOORS

01	02	03	04	05	06	07
Name	Zone	Area (ft^2)	Perimeter (ft)	Edge Insul. R-value & Depth	Carpeted Fraction	Heated
Slab-on-Grade	1 bedroom lower level	8000	953	None	0.8	No
Slab-on-Grade 2	2 bedroom lower level	1976	261	None	0.8	No

BUILDING ENVELOPE - HERS VERIFICATION

01	02	03	04
Quality Insulation Installation (QII)	Quality Installation of Spray Foam Insulation	Building Envelope Air Leakage	ACH @ 50 Pa
Not Required	Not Required	Not Required	---

WATER HEATING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Number of Systems in Building	Multi-Family Distribution Type	Water Heater	Number of Water Heaters/System	Solar Fraction (%)
DHW Sys 1	Pipe Insulation, All Lines	30	- none -	DHW Heater 1	1	0

WATER HEATERS

01	02	03	04	05	06	07	08
Name	Heater Element Type	Tank Type	Tank Volume (gal)	Energy Factor or Efficiency	Input Rating	Tank Exterior Insulation R-value	Standby Loss (Fraction)
DHW Heater 1	Heat Pump	Small Storage	50	3.1	3662-watts	0	0.015

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06
SC Sys Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name
:Heat Pump System 1:Air Distribution System 1:HVAC Fan 1:2	Heat Pump Heating and Cooling System	Heat Pump System 1	Heat Pump System 1	HVAC Fan 1	Air Distribution System 1
:Heat Pump System 2:Air Distribution System 2:HVAC Fan 2:2	Heat Pump Heating and Cooling System	Heat Pump System 2	Heat Pump System 2	HVAC Fan 2	Air Distribution System 2
:Heat Pump System 3:Air Distribution System 3:HVAC Fan 3:2	Heat Pump Heating and Cooling System	Heat Pump System 3	Heat Pump System 3	HVAC Fan 3	Air Distribution System 3
:Heat Pump System 4:Air Distribution System 4:HVAC Fan 4:2	Heat Pump Heating and Cooling System	Heat Pump System 4	Heat Pump System 4	HVAC Fan 4	Air Distribution System 4

HVAC - HEAT PUMPS

01	02	03	04	05	06	07	08	09	10
		Heating			Cooling		Zonally	Multispeed	HERS
Name	Type	HSPF/COP	Cap 47	Cap 17	SEER	EER	Controlled	Compressor	Verification
Heat Pump System 1	SplitHeatPump	9	16000	12000	15	12	No	No	Heat Pump System 1-hers-cool
Heat Pump System 2	SplitHeatPump	9	22000	18000	15	12	No	No	Heat Pump System 2-hers-cool
Heat Pump System 3	SplitHeatPump	9	16000	12000	15	12	No	No	Heat Pump System 3-hers-cool
Heat Pump System 4	SplitHeatPump	9	22000	18000	15	12	No	No	Heat Pump System 4-hers-cool

HVAC COOLING - HERS VERIFICATION

01	02	03	04	05	06
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge
Heat Pump System 1-hers-cool	Required	350	Required	Required	Required
Heat Pump System 2-hers-cool	Required	350	Required	Required	Required
Heat Pump System 3-hers-cool	Required	350	Required	Required	Required
Heat Pump System 4-hers-cool	Required	350	Required	Required	Required

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07
Name	**Type**	**Duct Leakage**	**Insulation R-value**	**Duct Location**	**Bypass Duct**	**HERS Verification**
Air Distribution System 1	LowLlCod	Sealed and tested	6	Conditioned zone (VLL)	None	Air Distribution System 1-hers-dist
Air Distribution System 2	LowLlCod	Sealed and tested	6	Conditioned zone (VLL)	None	Air Distribution System 1-hers-dist
Air Distribution System 3	LowLlCod	Sealed and tested	6	Conditioned zone (VLL)	None	Air Distribution System 1-hers-dist
Air Distribution System 4	LowLlCod	Sealed and tested	6	Conditioned zone (VLL)	None	Air Distribution System 1-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION

01	02	03	04	05	06	07	08
Name	**Duct Leakage Verification**	**Duct Leakage Target (%)**	**Verified Duct Location**	**Verified Duct Design**	**Buried Ducts**	**Deeply Buried Ducts**	**Low-leakage Air Handler**
Air Distribution System 1-hers-dist	Required	total leakage <= 12.0 or leakage to outdoors <= 6.0	Required	Not Required	Not Required	Not Required	---
Air Distribution System 2-hers-dist	Required	total leakage <= 12.0 or leakage to outdoors <= 6.0	Required	Not Required	Not Required	Not Required	---
Air Distribution System 3-hers-dist	Required	total leakage <= 12.0 or leakage to outdoors <= 6.0	Required	Not Required	Not Required	Not Required	---
Air Distribution System 4-hers-dist	Required	total leakage <= 12.0 or leakage to outdoors <= 6.0	Required	Not Required	Not Required	Not Required	---

HVAC - FAN SYSTEMS

01	02	03	04
Name	**Type**	**Fan Power (Watts/CFM)**	**HERS Verification**
HVAC Fan 1	Single Speed PSC Furnace Fan	0.58	HVAC Fan 1-hers-fan
HVAC Fan 2	Single Speed PSC Furnace Fan	0.58	HVAC Fan 1-hers-fan
HVAC Fan 3	Single Speed PSC Furnace Fan	0.58	HVAC Fan 1-hers-fan
HVAC Fan 4	Single Speed PSC Furnace Fan	0.58	HVAC Fan 1-hers-fan

HVAC FAN SYSTEMS - HERS VERIFICATION

01	02	03
Name	**Verified Fan Watt Draw**	**Required Fan Efficiency (Watts/CFM)**
HVAC Fan 1-hers-fan	Required	0.58
HVAC Fan 2-hers-fan	Required	0.58
HVAC Fan 3-hers-fan	Required	0.58
HVAC Fan 4-hers-fan	Required	0.58

IAQ (Indoor Air Quality) FANS

01	02	03	04	05	06
Dwelling Unit	**IAQ CFM**	**IAQ Watts/CFM**	**IAQ Fan Type**	**IAQ Recovery Effectiveness(%)**	**HERS Verification**
DDU-1 1 bedroom lower level 1/12	35.01	0.25	Default	0	Required
DDU-2 2 bedroom lower level 1/2	52.14	0.25	Default	0	Required
DDU-3 1 bedroom Upper level 1/14	34.95	0.25	Default	0	Required
DDU-4 2 bedroom upper level 1/2	52.14	0.25	Default	0	Required

PROJECT NOTES

Standard Building (Compliance)

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name: Christopher Miller	Documentation Author Signature: Christopher Miller
Company: Melas Energy Engineering	Signature Date: 2015-08-10 11:08:38
Address: 547 Uren St.	CEA/HERS Certification Identification (If applicable):
City/State/Zip: Nevada City, CA 95959	Phone: 530 265-2492

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design identified on this Certificate of Compliance.
2. I certify that the energy features and performance specifications identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
3. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

Responsible Designer Name: Bob Davidson	Responsible Designer Signature:
Company: RL Davidson	Date Signed: 2015-08-11 10:27:02
Address: 7600 N. Ingram, #232	License: 1
City/State/Zip: Fresno, CA 93711	Phone: 5594353303

Digitally signed by CalCERTS. This digital signature is provided in order to secure the content of this registered document, and in no way implies Registration Provider responsibility for the accuracy of the information.