

Staff Report for Administrative Approval Hillside Review – Notice of Conditional Approval

Weber County Planning Division

Synopsis

Application Information

Application Request: Consideration and action on a request to approve a Hillside Review for the Rosenthal

residence located on Lot 34R in the Summit Eden Phase 1B.

Applicant: Lisa Rosenthal
Authorized Representative: Warren Lloyd
File Number: HSR 2016-16

Property Information

Approximate Address:

7958 East Heartwood Drive

Project Area:

0.782 acres

Zoning:

DRR-1

Existing Land Use:

Vacant

Proposed Land Use:

Single Family Residence

Parcel ID:

16-112-0034 (Cache County)

Township, Range, Section: 7N 2E Sec 8

Adjacent Land Use

North: Resort

South:

Resort

East:

Resort

West:

Resort

Staff Information

Report Presenter:

Ronda Kippen

rkippen@co.weber.ut.us

801-399-8768

Report Reviewer:

RG

Applicable Ordinances

- Weber County Land Use Code Title 108 (Standards) Chapter 14 (Hillside Development Review)
- Weber County Land Use Code Title 104 (Zones) Chapter 27 (Natural Hazards Overlay District)

Background

The subject lot is described as *All of Lot 34R*, *Summit Eden Phase 1B* and is located in Cache County. The subdivision is part of a PRUD (CUP 2013-03) that was approved by the Weber County Commission on January 21, 2014. Cache and Weber County have entered into an interlocal agreement identifying Weber County as the approval body for the land use and building permit process of the Summit Eden development for all lots located in Cache County. As part of the interlocal agreement, Weber County shall review the development against the requirements in the Uniform Land Use Code of Weber County (LUC). The subject property has been identified as having areas in excess of 25% slope on the site; therefore, the lot has been identified with an "R" which mandates a Hillside Review prior to the issuance of a land use and building permit.

IGES has performed the required geologic and geotechnical investigation to determine if there is a geologic hazard located on the site and to assess the subsurface soils in order to better design the home for slope stability and safety purposes. Information related to the construction of the dwelling including a site plan, landscape plan, grading plan, and the geologic/geotechnical report, have been distributed to the Hillside Review Board for comment. The plans have been reviewed and approved and/or conditionally approved by all applicable review agencies.

Planning Division Review

The Planning Division Staff has determined that the requirements and standards provided by the Hillside Review Chapter have been met for the excavation and construction of the dwelling. The following submittals were required:

- 1. Proposed Building Plans including site plan, grading plan and landscape plan (see Exhibit A)
- 2. Geotechnical and Geologic Investigation Report (see Exhibit B)
- 3. Utah Pollution Discharge Elimination system (UPDES) Permit with Storm water Pollution Prevention Plan (See Building Permit Application Packet for UPDES and SWPPP)

Welter County Hillside Review Board comments

The Weber County Hillside Review Board, on this particular application, made comments related to the following:

<u>Weber County Engineering Division:</u> The Engineering Division granted approval on September 6, 2016. The approval is subject to the applicant following all recommendations found in the applicable Geotechnical and Geological Investigation Reports including the following conditions:

- 1. IGES staff will be on site to observe and test during site preparation and earthwork.
- 2. All suggestions in regards to "Moisture Protection" from the reports will be followed including a perimeter foundation drain constructed according to the International Residential Code.

Subsequent recommendations may be necessary if additional geologic hazards are exposed during the excavation and construction phase of the dwelling.

<u>Weber Fire District:</u> The Fire district has granted approval on September 15, 2016 subject to construction of the home complying with the Wildland Urban Interface Code and based on the documents provided by the applicant's design team and attached as Exhibit A.

<u>Weber County Building Inspection Department:</u> The Building Inspection Office granted approval on August 26, 2016 based on the condition that the geologist and geotechnical engineer will need to approve the soils prior to placement of footings.

<u>Weber-Morgan Health Department:</u> The Health Department has verified that that they will not impose any requirements or conditions for this application due to the proposed residence connecting to the Powder Mountain Water and Sewer District for culinary and wastewater services.

<u>Weber County Planning Division</u>: The Planning Division has granted approval subject to the applicant complying with all Board requirements and conditions. This approval is also subject to the applicant strictly adhering to the recommendations outlined in the geologic and geotechnical investigation report dated August 7, 2014 and amended on August 11, 2014 and February 11, 2016 provided by IGES (IGES Project No. 01628-006) including the following recommendations:

- All excavation should be observed by an IGES representative during proof rolling or otherwise prior to placement of engineered fill to evaluate whether soft, loose, or otherwise deleterious earth materials have been removed and that recommendations presented in the Geotechnical and Geological Report have been compiled with.
- IGES recommends a perimeter foundation drain be constructed for the proposed residential structure in accordance with the IRC.
- IGES will be on site to verify compliance with these recommendations.
- Landscaping at the site should be planned to utilize drought resistant plants that require minimal watering. Hand
 watering only is recommended within 5 feet of the residential dwelling. Roof runoff devices should be installed to
 direct all runoff a minimum of 10 feet away from the structure. Landscape plans must conform to Weber County
 development codes.

Planning Division Recommendations

Based on site inspections and review agency comments, the Planning Division Staff has determined that it is necessary to impose additional requirements and conditions as part of approving HSR #2016-16. The recommendation for approval is subject to adherence to all review agencies conditions and based on the following conditions:

- All excavation should be observed by an IGES representative during proof rolling or otherwise prior to
 placement of engineered fill to evaluate whether soft, loose, or otherwise deleterious earth materials have
 been removed and that recommendations presented in the Geotechnical and Geological Report have been
 compiled with.
- 2. IGES recommends a perimeter foundation drain be constructed for the proposed residential structure in accordance with the IRC.
- 3. IGES will be on site to verify compliance with these recommendations.
- 4. Landscaping at the site should be planned to utilize drought resistant plants that require minimal watering. Hand watering only is recommended within 5 feet of the residential dwelling Roof runoff devices should be installed to direct all runoff a minimum of 10 feet away from the structure.
- 5. As a condition it is understood, by the applicant and the geo-technical engineer and engineering geologist, that if any geologic hazards are revealed during the excavation and construction phase of the dwelling, work on Lot 34R in the Summit Eden Phase 1B will cease pending the development of appropriate mitigation measures and subsequent approval by the County.

The recommendation is based on the following findings:

- 1. The application was submitted and with the required conditions, has been deemed complete.
- 2. The requirements and standards found in the Hillside Development Review Procedures and Standards Chapter have been met or will be met during the excavation and construction phase of the dwelling.
- 3. The Hillside Review Board members reviewed the application individually and have provided their comments.
- 4. The applicant has met or will meet, as part of the building permit process and/or during the excavation and construction phase of the dwelling, the requirements and conditions set forth by the Hillside Review Board. The Planning Division Staff has determined that the proposed improvements have been sited within the required setbacks for the DRR-1 zone with the exception of the driveway and retaining wall(s).

Administrative Approval

Administrative approval of Lot 34R in the Summit Eden Phase 1B Hillside Review (HR#2016-16), is hereby granted based upon its compliance with the Weber County Land Use Code. This approval is subject to the requirements of applicable review agencies and is based on the recommendations, conditions and findings listed in this staff report.

Date of Administrative Approval: September 28, 2016

Rick Grover

Weber County Planning Director

Exhibits

- A. Proposed Building Plans
- B. Geotechnical and Geologic Investigation Report

Map 1



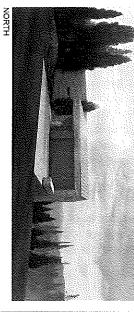
ELECTRICAL ENGINEER
E.C.E.
939 S. WESTTEMPLE
SALT LAKE CITY, UT 84101
P: 801.521.5007
contact: AKBAR MATINKAH

12341 E. WINDFLOWER LANE BRIGHTON, UT 84121 p: 802,453,9434 contact: JOHN EASTERLING

HELIOCENTRIC

SHEET INDEX ROSENTHAL CABIN COVER SHEET / CODE ANALYSIS SYMBOLS & ABBREVIATIONS GENERAL NOTES 7958 E. HEARTWOOD DRIVE EDEN, UTAH 84310

EXTERIOR PERSPECTIVES





ARCHITECTURAL
SD100 AREA SINVEY
SD100 PARGEL SURVEY
SD100 DEVELOPMENT PL
SD100 DEVELOPMENT PL ROOF RCP
LOWER FLOOR FFAMING PLAN
MAIN FLOOR FFAMING PLAN
ROOF FFAMING PLAN
ROOF FFAMING PLAN
BUILDING BEITHONS
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MANNET-LOGR PLAN
MANNET-LOGR PLAN
MONET PLAN
DEVELOPMENT PLA

SITE PLAN
GRADING PLAN
EROSION CONTROL PLAN
EROSION CONTROL DETAILS
DETAILS

MECHANICAL & ENERGY SEE PACKAGE

GENERAL STRUCTURAL NOTES GENERAL STRUCTURAL NOTES FOOTING & FOUNDATION PLAN LOWER FLOOR FRAMING PLAN MAIN FLOOR FRAMING PLAN ROOF FRAMING PLAN ROOF FRAMING PLAN

FOOTING & FOUNDATION DETAILS FOOTING & FOUNDATION DETAILS FLOOR FRAMING DETAILS FLOOR FRAMING DETAILS FLOOR FRAMING DETAILS ROOF FRAMING DETAILS

SEE PACKAGE

CODE ANALYSIS

PARCEL ID: RR, W SUMMIT POWDER MOUNTAIN DEVELOPMENT PRUD OVERLAX, PERMIT REVIEW PERFORMED BY WEBER COUNTY CACHE COUNTY #18-112-0034, LOT 34R

OWNER
LISA ROSENTHAL
214,533,0553

ATTUCTURAL ENGINEERS
MATT JACKSON STRUCTURAL ENGINEERS
5.673 SOUTH RECEWOOD ROAD SUITE 22
5.471 LAVE CITY, UTAH 44123
p. 2014 SEC 1995, 1097
contact MATT JACKSON

NEW CONSTRUCTION OF FAMILY CABIN IN LOT 34R OF SUMMIT POWDER MOUNTAIN DEVELOPMENT

SCOPE

VICINITY MAP

PROJECT TEAM

NORTHWEST

DESIGN ARCHITECT
SAUNDERS ARCHITECTURE
VESTRE TORGGATE 22
5015 BERGEN

COVIL ENGINEER
NVS
S217 SOUTH STATE STREET SUITE 200
S217 SOUTH STATE STREET SUITE 200
MARRAY, UT 94/107
P.
ROMBACT RYAN CATHEY
contact RYAN CATHEY

LOT AREA: STORIES ABOVE GRADE: CONSTRUCTION TYPE: OCCUPANCY TYPE: BUILDING USE: 34,058 SF Š 2 SINGLE FAMILY DWELLING 1 STORY FRONT YARD (STREET FACING), 2 STORY REAR YARD

35 FT / 4500 BUILDING SF / 6309 FOOTPRINT SF ACTUAL HEIGHT: TOTAL FOOTPRINT AREA: TOTAL CONDITIONED AREA; 33.75 FT 4669 SF 4016 SF

ACTUAL HEIGHT/AREA: ALLOWABLE HEIGHT/AREA:

2016 INTERMITIONAL RESIDENTIAL CODE (RC)
2014 MATIONAL ELECTRICAL CODE (RC)
2015 INTERMITIONAL DEMENSIÓN CODE (RC)
2015 INTERMITIONAL ENERGY CONSERVATION CODE (RCC)
2016 INTERMITIONAL FIRE CODE (RC)
2016 INTERMITIONAL FIRE CODE (RC)
2019 INTERMITIONAL FIRE CODE (RC)

APPLICABLE CODES:

G100

COVER SHEET TITLE

LOWER FLOOR CONDITIONED:

1895 SF 2121 SF

DRAWING REVISIONS 9/13/16

PRINT DATE

128 4 of

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REVISION INDEX

ROSENTHAL CABIN
7958 E. HEARTWOOD DRIVE
EDEN, UTAH 84310

Exhibit A	014. Kg(10730s-8-35)	
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SHEET TILE SYMBOLS & ABBREVIAT JONS SHEET WARREN G101	PRINT DATE PRINT DATE ROSENTHAL CABIN 7958 E. HEARTWOOD DRIVE EDEN, UTAH 84310 5 of 12	Lloyd <u>Archkocus</u>

1. Those plan shall be designed and reviewed under 2012 IDC.

The contractor shall be responsible for obtaining all permits required for construction by the permitting authorities having jurisdiction.

3. The contractor shall carolatly read, study, and understand all plans and specifications for fractos. Coordination between trades will be mocassary and the majorability of the contractor, any questions that arise shall be clarified by the architect prior to construction.

Drawings are not to be scaled. Dimensional discrepancies are to be delifted with the architect before proceeding with construction.

The confidency shall worky existing power, water, data enable and other utilities, prior to execution. Contract blue-stakes or authorities having jurisdiction prior to any excevation. 208-2100

The contractor shall notify the designer of discrepancies in the documents and of any field conditions that deviate from the documents.

7. The arrathetes approved must be obtained for any deviations from the construction documents, including but not limited to change in dimensions, design, materiats, products, and follows, in no case may the contractor make those should be approved of the architect.

Shap drawings and ather submitted are to be submitted for approval by the children with sufficient time for review prior to assection of work. Submitties rust conform to the requirements indicated on construction documents, tructural notes, and specifications.

See door and window schedule for sizes, types, and finishes.

All construction shall conform to and streetly comply with all applicable codes, coverants, restrictions, and Webar County building standards.

In no event shall the contractic substitute a transford construction detail for detail specified in these documents. The contractic shall bring all work into ordinatility with the construction detailments, as the designer orders, before persival of that construction will be granted.

12. The contribution is to writing this distinutations, databat. A brothe prior to constitution. Extender republic and enterological constitutional form force of contribution of statements of contributions of countributions of countributions of countributions of countributions of countributions of countributions. Clezing its locations subject to human impact such as panes in doors, lozing within 12" of door opening, glazing within 18" of fleer, and shower oors shall be tempered of temlested earleby glass as per 2012 IBC.

Provide and install arreks detectors as per 2012 IBC.

Provide attle access, minimum 22" x 30" with minimum 30" headroom at tetruded readily accessible opening on per 2012 IBC.

6. Building shall comply with Ulah State Energy Code. The contractor is to seal and caulk all create to prevent oir until ration. The contractor shall insulate the stalls to R-18, callings to R-38, and there over univerted speces to R-38 unless thereting acted.

17. Those drawings are the exclusive properly of Lloyd Archilects and may be reproduced only with the written permission of the architect. Authorized reproductions must beat the name of the architect.

Fireplaces shall conform to 2012 fBC, UL listing on fireplaces are as follows: xd burning units, UL#MH5850 Enclosed gest units, ICBO #4030

In SETTE PLAN & GRACHYKE, reasons marray, a heates and deak end glob life near rouse as in Alexand on all subas including legal dealth elispead of all derigs and unamable file. Scrape looped layer before excessioned and place could be profused to the state of the state of the state of the state of the foundations, labels, sully law, memphoral, described and other works the first described as ordered as the state of the state of the state of the and provide on described as the state of the state of the state of the and provide on described as the state of the state

Contact the Utah Division of Air Quality on all remodel projects: 536-4000

GEOTECHNICAL: SOIL BEARING; Assume 1500 pet soil bad prossure per RADI, A. CCNCRETTE: 3,000 pet in elabs and footings, 3000 pet in foundation walls, 3500 pet in garage state and exterior steps.

CONGRETE FOOTING SIZES AND OLFTIK eso fooling echedule on structural abroats (minimum fooling size 9° by 20°, minimum depth 30° bolow grade), MINIMUM REBARS and structural abrests for minimum reinforcing requirements.

3. ANCHOR BOLTS TO FOUNDATION: minimum 7" embedment per R403.1.6(maximum specing allered by code is 32" O.C.)

4. CONCRETE FOUNDATION WALLS; soo sinclural drawings for size and roinforcing.

HEIGHT ABOVE FINISHED GRADE: concrote foundation wall to be 6" minimum above finish grade. Use treated sill plate where required.

FOUNDATION WALL DAMP-PROOFING AND FOUNDATION DRAIN: bituminous coating or equal to be applied on basement walls per R406, Foundation drain to be installed by new foolings per R405.

7. PLATE WASHERS; Ali plate washers to be 9%9%227 (144) square slotted blate por R602-11.1 s, WINDOW WELLS AND LADDERS: 2 sq & min area, 36 Inches out foon window if deeper than 44 Inches offs a Indder,

. _ EMERGENCY ESCLAPE AND RESCUE OPENINGS; 44 Inches max ebove fro in every sleeping room, 5,7 and 1 or 5 and 11 within 44 Inches of grade, 20 inch min width, 24 inch ratin height.

2. EXIT DOORS AND HALLWAYS; one 3'vg" x 5'vg" door required, 36 inch mitu width in halbveys,

STARWAYS: 38" width minimum, TREADS AND RISERS: 8" rise and 9" treed minimum, HEADROOM: 6" 8" minimum, UNDER STAIR PROTECTION: 128" GWB HANDRALE: required with (2) or more states, 34" to 36" in height and 1 44 to 2 58" in diameter if circular.

s, cUARDRÁILS (GUARDS); required at floore over 30° above grade, 35° min height, a 4° sphere shall not pass through with dasign as to eliminate lødder 158et.

I. WODD COLUMNS: required to be 1⁴ above the fibor or finish grade, See dructural for connection to foundation or slab.

WALL CONSTRUCTION

2. EXTERIOR WALL COVERINGS AND WEATHER BARRIERS: 15# 10th paper of approved equal.

L STRUCTURAL COLUMNS: see attuctural shoots for all column sizes and accions.

S. BRACED WALL LINES AND PAIRLIS, are structural notes Minimum recitiement swit to provide within 11-25 of usell commet, et a Coff, the height for physicism with billing 60 str O.C. O segme and 12" O.C. In flad, at 8"ch for CINE OUTER AND WINDOWS
DOUBLE AND WINDOWS

7. GARAGE SEPARATION FROM DWELLING: 1 hour asperation, Walls shall have 1/2" GWB on walls and attle, if parage is below habitable rooms the ceiling shall have 32" yes "Y" GWB. Door shall have a 20 mit. fire-resistance rating and shall be asti-closing.

2. DRAFT-STOPPING: shall be installed in all concealed speces ever 1,000 sq ft. t, FLOGR JOISTS: double joists undor bearing partitions and blocking shall be installed at bearing walls. FLOOR CONSTRUCTION

S, FLOOR JOISTS SUPPORTING BEARING PARTITIONS OFFSETS: offset minimum (IOO7 JOIST GOOD). *. SUBFLOOR SHEATRING: see structural should for all floor sheathing collouis inhibitural requirements are stofflower. Sk inch thick bangue & groove oab for leists @ 16" to 20" O.C. and 3/4" thick tengue & groove oab @ 24" O.C.)

n, EXPOSED LAMINATED TIMBERS; ATC Raied Architoctural grado Glu-Jaminated Timbors; Soo structural sheets for sizes and locations, not applicable

ROOF CONSTRUCTION

2. ATTIC VENTILATION: Provide a 1 to 150 egit. (or 1 to 300 if 50% is in actifit and 50.60% focated more then 30° boxes estifie) of the stift, area in ventilation. Provide insulation belificate to insure at flow through space. Out or drill holes in trues blocking for vontilet passage from earlit vonts.

4. KCE DAM PROTECTION: "Ice and water shield" at eaves to 30" inside the wall plane of the building

3. LANDINGS AT DOORS AND STARWAYS: 35" min. out from door and door width minimum.

4. RAMPS, SLOPES AND RAILS: muchturn slope 1 in 8, railing required on ramps over 1 in 12 slope.

LI JUBBER POTTECTION AGAINST DEEAY: 18" initiation to grade under floor offers, 12" imitivation to grade under floor offers, Provides treated pittle on anaritro; shill be set than 6" above exposed ground and framing and shilly beas from the ground. All Lambers in cough with concepts, seed, or within than 6" in the present related. Pressure that do you again, or within 15" of frinkin lyander shall be pressure treated. Pressure that be you good drain with water-doors generated and camping with MARTE Above ground within with water-doors generated and the pressure treated with vertice-dors and the pressure treated with vertice-doors and the pressure treated with vertice-doors.

MilliatUM AREA DIMENSIONS AND HEIGHTS: see all plen sheets for com tres Auf room minimumes shall bat (1) 120 of room, 72 of bedrooms, 50 at Itchen, 7 feet mir.. heights, aloping 10 5 feet mir.. 3 feet min. passageways in Itchen

IQ. INTERIOR MOISTURE VAPOR RETARDERS: on "warm-in-winter" side of wall

I, INTERIOR WALL COVERINGS: 69" GWB, Green Gyp, board to be limited to 3702.3.8.1 for no direct contact to moleture.

L MID-HEIGHT BRIDGING: in unfinished walls

6. MABITABLE ROOMS AND BATHROOMS: 5% of eros in glazing, 4% in openings, and D af window in bathrooms or bathrooms to have exhaust fan per IRC 103.3

2. FIRESLOCKING: shall be installed in all concessed spaces at 10"-5" 0.C.

. ROOF FRAMING; see structural sheets pre-engineered truss type and syout. Submit shee drawings to architecterginesr for approval.

3, ROOF SLOPES and ORAINAGE: felt paper, 1/4" per foot minimum, provide "los and water shield" at all valleys U.N.O.

i, CHIMNEY TERMINATION; chimney shall be 2^{-6} higher than any portion of suliding within 10^{-6} , 3^{-6} fall minimum,

GENERAL NOTES

SHEET TITLE

G102

. MASDNYV VENEERS, SAX) TIES: see structum steests, provide minimum brick ties et 15 inches neemer in minimum direction, with heritorial 9 gags wire mechanically attached to ties (II applicable)

2. LINTELS: see structural drawings for lintel sizes and locations. SHEARWALLS & HOLDDOWN SCHEDULE: see structural sheets

1. GAS HREPLACE: JCBO #4030 on typical ges unit 는 FIREPLACE HEARTHS: Extend 20" min. from Iront of firebox and 12" 대态. xxtension on both sides,

3. RES-CHECK: 2009 IECG See attached RESchock report. CENTRAL FURNACE, CLEARANCE, ACCESS, PLAYFORM, LIGHT, provide 3" did and rear of platform, space is 12 inches wider then furnose, 5 inches front if deer of 30 inches in front, 30 x 30 inch secses platform with light

 COMBUSTION AIR: provide duct or opening within 12 inches of ceiling and size of 1 eq inch for every 3000 btu/h. 5. BTU SIZES OF WATER HEATERS, FURNACES: see mechanical drawings for all mechanical sizing.

8. APPLIANCE PROTECTION FROM IMPACT: WA (mechanical not in garage). . ELEVATION OF COMBUSTION SOURCE OF APPLIANCES; see floor plans for loor hoights,

t. CONDENSATE DISPOSAL: provide an indirect drain, secondary condensate il located in stilic or on wood fluor (to be trap sed primer type)

II. WATER HAVES, LOCATIONS, EXPANSION FAMES, AND RESISTING BELLEY WATER, AND TRESSING BELLEY WATER, CAN TO SECRETARISE AND RESISTING CONTINUES AND THE CONTI 10. GAS LINE SCHEMATIC: See mechanical sheets.

12. WATER HEATER ANCHORAGE, FLOOR DRAIN, AND PANS FOR DRAINGE: provide salaric strap to top third and bottom third of water heater. Provide an indirect drain for water heaters. Provide pan for water heaters. Provide pan for water heaters.

13, CLOTHES DRYER EXHAUST; maximum 25-0" to outside with 5-0" reduction for 90 degree bands

IS, SHOWER SIZE AND DOOR: 900 sq inches and 30" diameter, door swings outward 14, EXHAUST VENT TERRISHATIONS: 4'-0" below or bealds and 1'-0" above done or windows, 12" above grade

18. NEATHG: new construction to have a gae fired forced sir furnace with air conditioning condenser unit, Heating facility to maintain 68 degrees.

2. VENT FIPING: shall be ABS.

3. HOSE CONNECTION BACKFLOW PREVENTER: provide at all exterior heas bib locations. Use insetpreed type with vacuum breaker.

1, WATER PIPING: Shall be pex

4. FLOOR DRAINS: Deep seal or Trap seal primer required in foundry or mechanical rooms per IbC 3201,2

S. WASTE INTERIOR TO BE ABS, WASTE INTERIOR UNDER SLAB AND EXTERIOR TO BE ABS.

t, WHIRLPOOL BATHTUB ACCESS PANEL; see plans for size and locations. 2. ELECTRICAL SERVICE PARKEL (OCATION: shall not be located in bethrooms or trevialia, provide 00" electricas side to side and 35" charlance in front. Provide a minkmum of 6-5" in balght.

6 of

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l, ARC-FAULT CIRCUIT-INTERRUPTER PROTECTION: provide in bedrooms. SFCI PROTECTION: eoo electrical aboots for all locations. Provido in Proome and jetted tub meters, garage, outdoor, orawispace, kitchen sniers, kitchen lalands, and wel-bar.

RECEPTACLE OUTLETS; was electrical drewings for all couled tocations. Isotrical sub-contractor to walls through project with owner to scrity sit professional fixture locations prior to commencing work. Follow all local electrical

ING WALL SWITCHES; see electrical drawings for all switch locations, as sub-contractor to walk through project with owner to verify all shakes of locations prior to commonizing work, Follow all local i cordes.

JECEPTACLES AND LIGHTING IN DAMP AND WET LOCATIONS; provide sinerproof covers for outlets, lighting to be listed for wet or damp locations.

9. SUPPORT OF CEILING FANS: as per manufacturer's recommendations. l, LIGHT FIXTURES IN CLOSETS: Incandescent fixtures 12" πilnimum to storage lucrescent fixtures 6" minimum to storage

(b. ELECTRICAL: all wring to be in accordance with the Netional Electrical Zord and applicable local codds. Locats this panol and motor where ratiosated on the Drawings. Provide underground power connection from source to main panel 40.

12. CO2 DETECTORS: Locate (1) on each fevel It. SMOKE DETECTORS; locate (1) inside each steeping room, in confidera eataids sleeping rooms, and on each level. All smoke calactors to be wired in softer.

1. Home shall be provided with an NFPA 13D or 13R compliant fire suppression systems to be included as a deferred submittal. Temporary address marker to be provided at building site during onebuction. building is equipped with an fire suppression system, there stall be a ther proof homeleobe device located on the street jets of the building as roved by the Fire Prevention Division (coordinate wifire inspector). the Sulfing is equipped with a fre department controllon (FDC) there shall content pad monsuring 3 ft x 3 ft under the FDC (coordinate w/ fire exter).

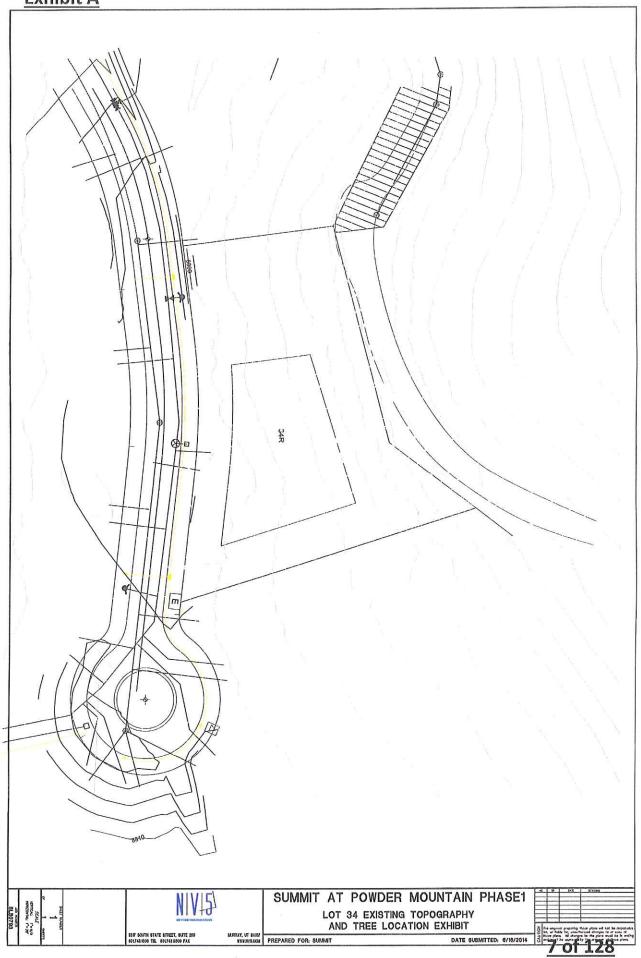
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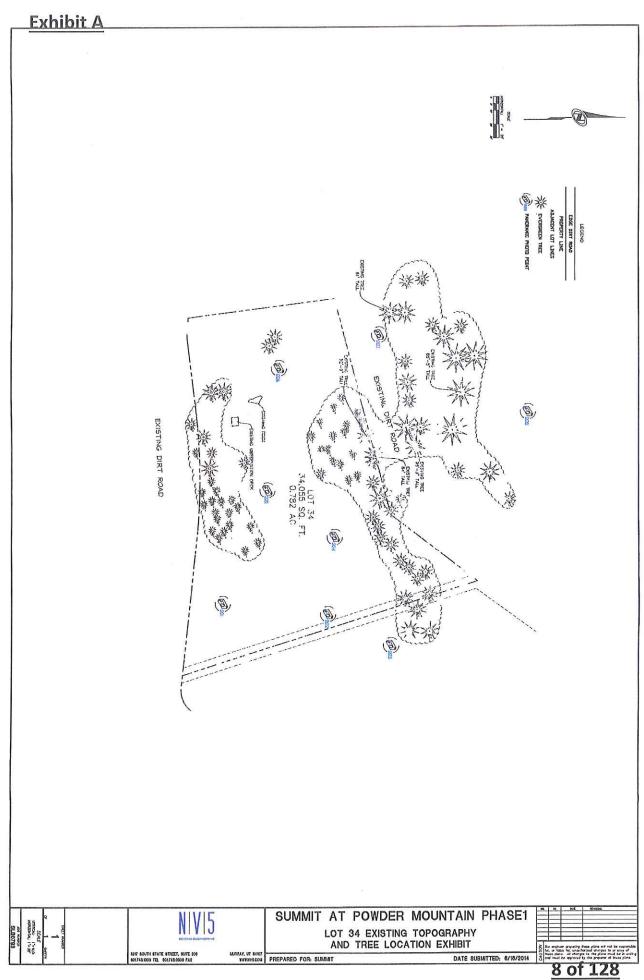
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DRAWING REVISIONS

Exhibit A



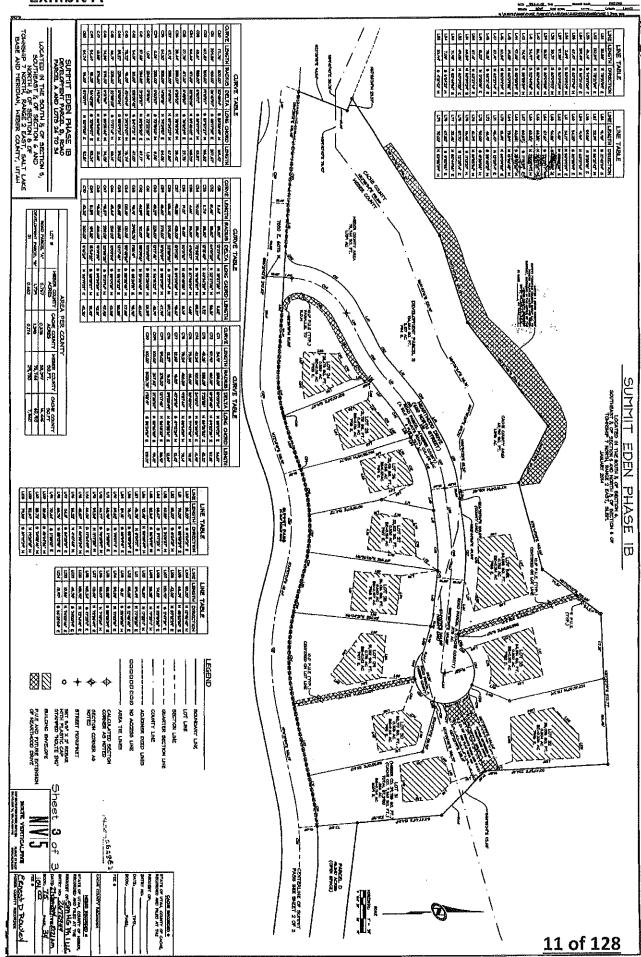


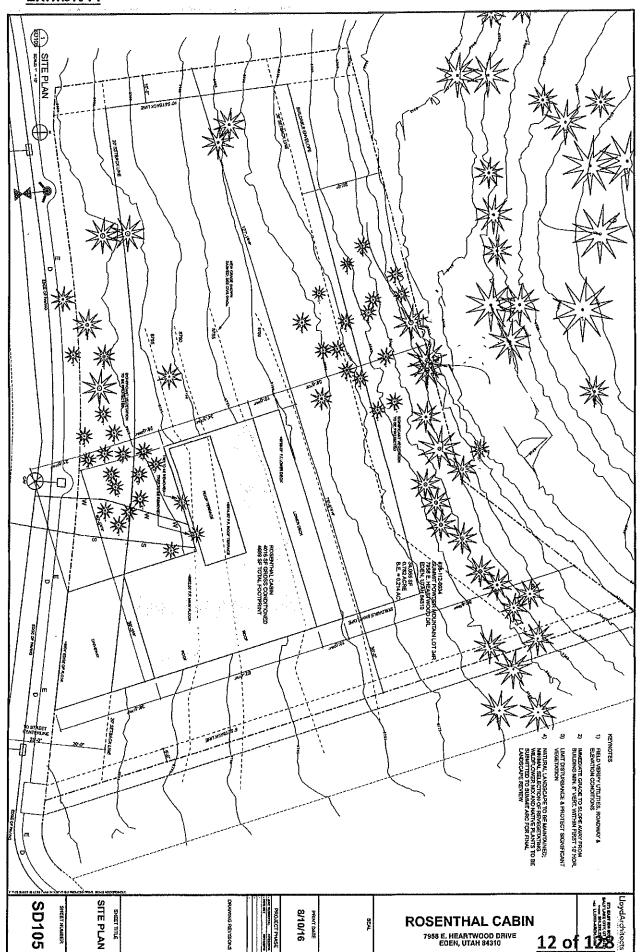
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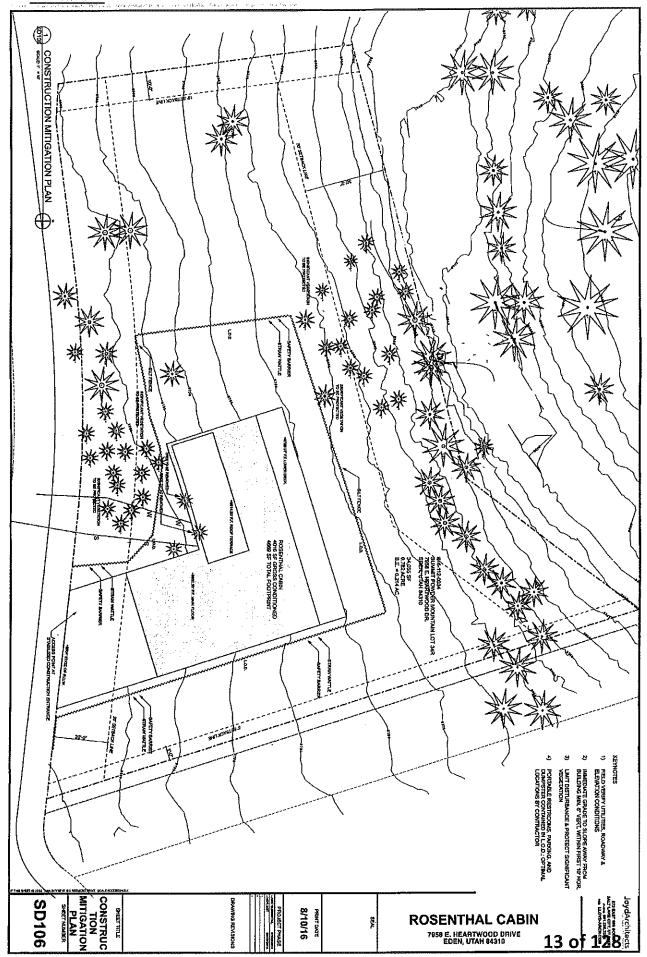
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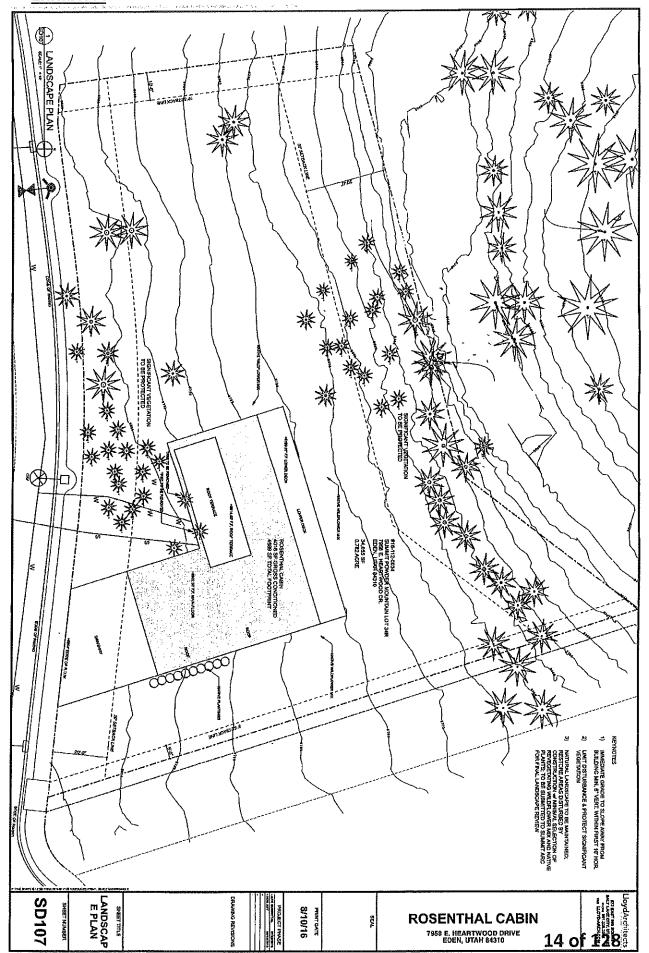
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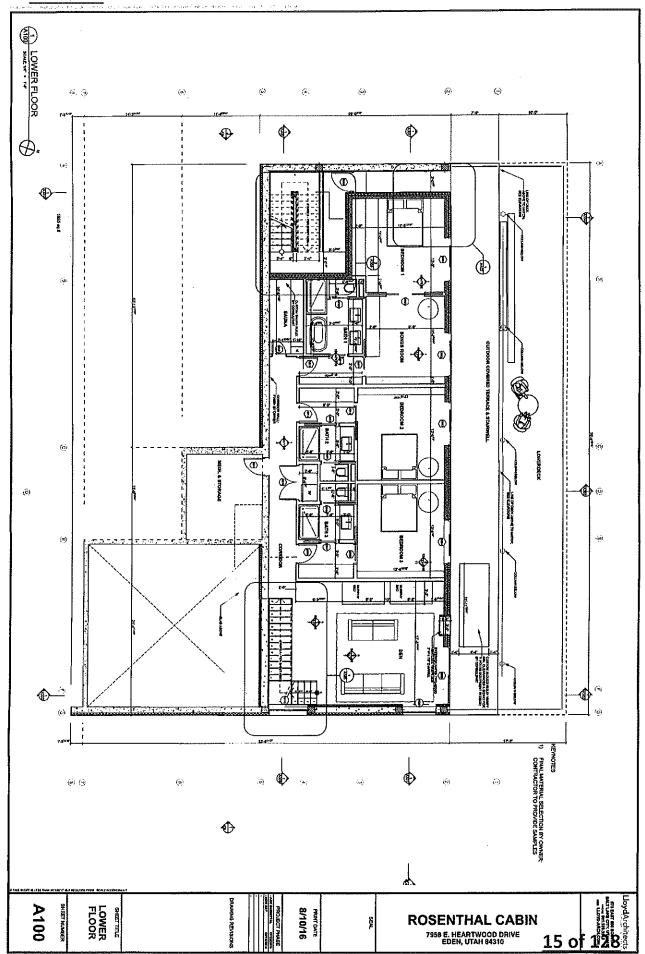
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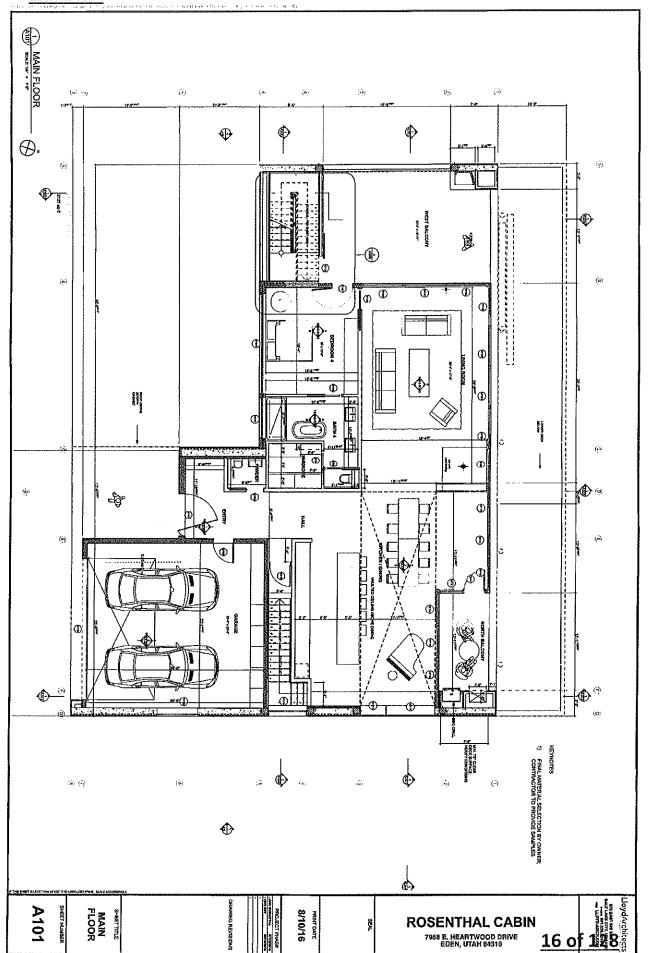


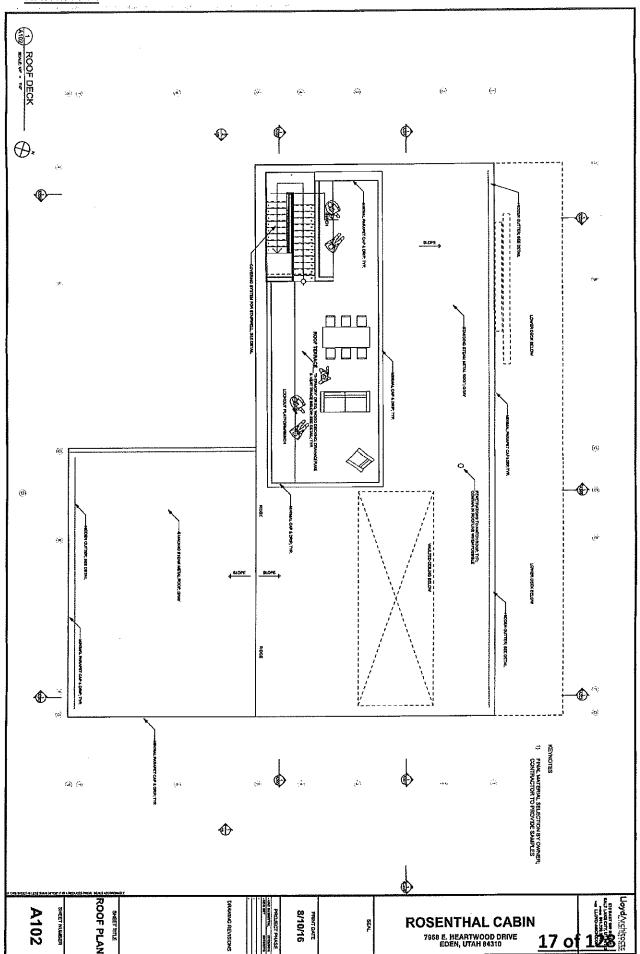


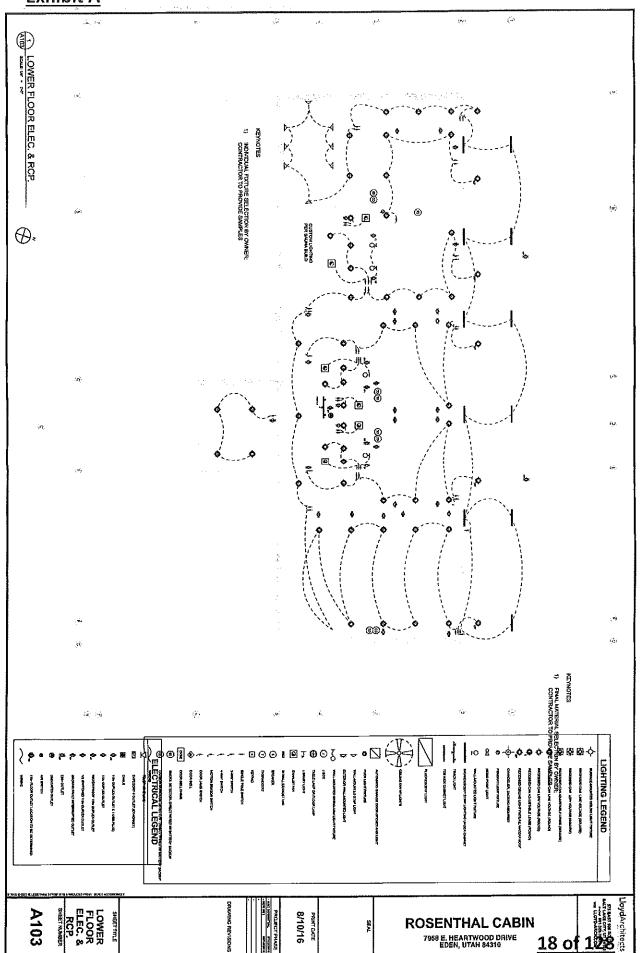


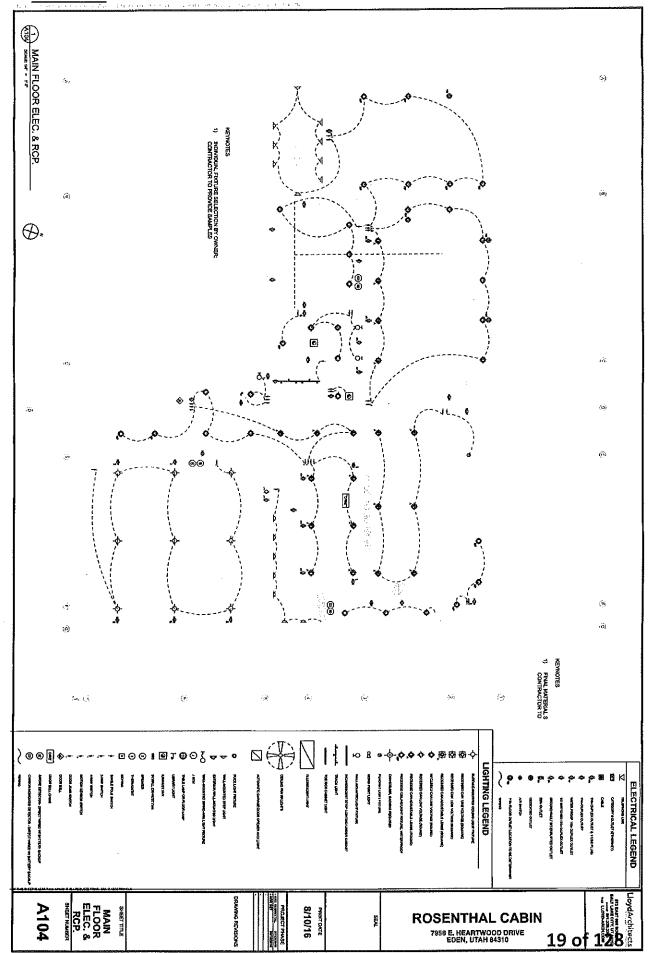


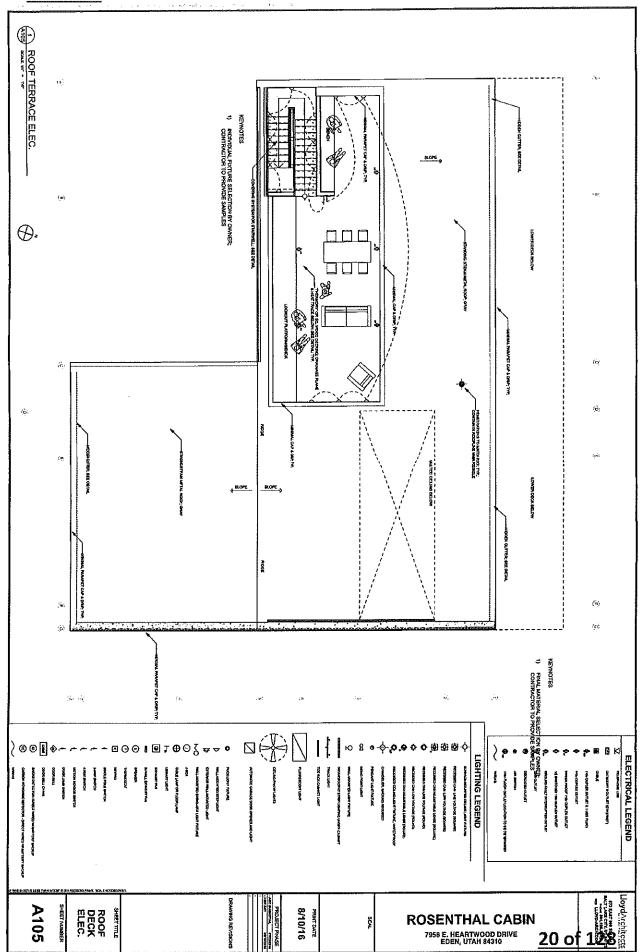


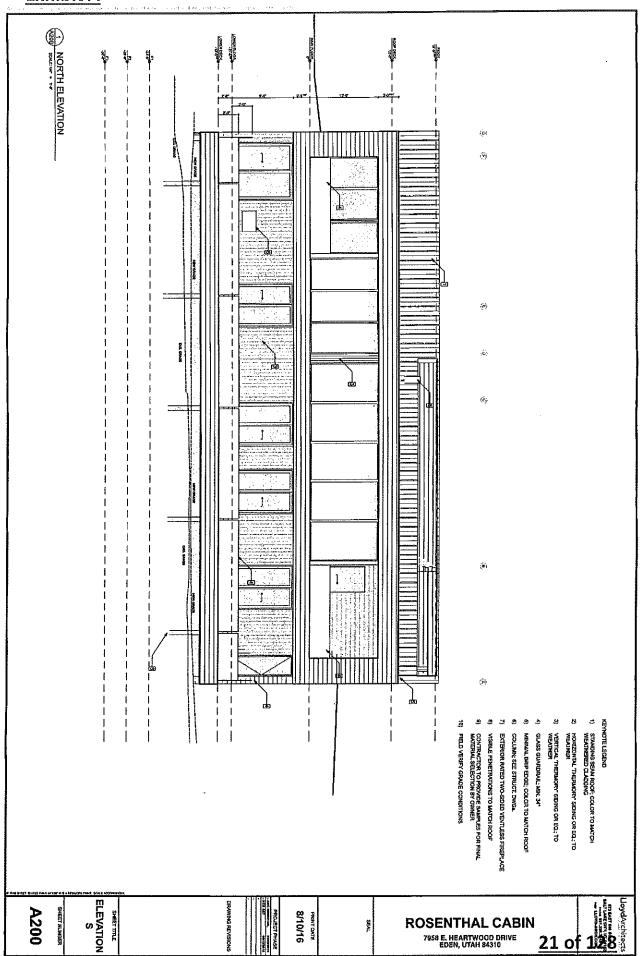


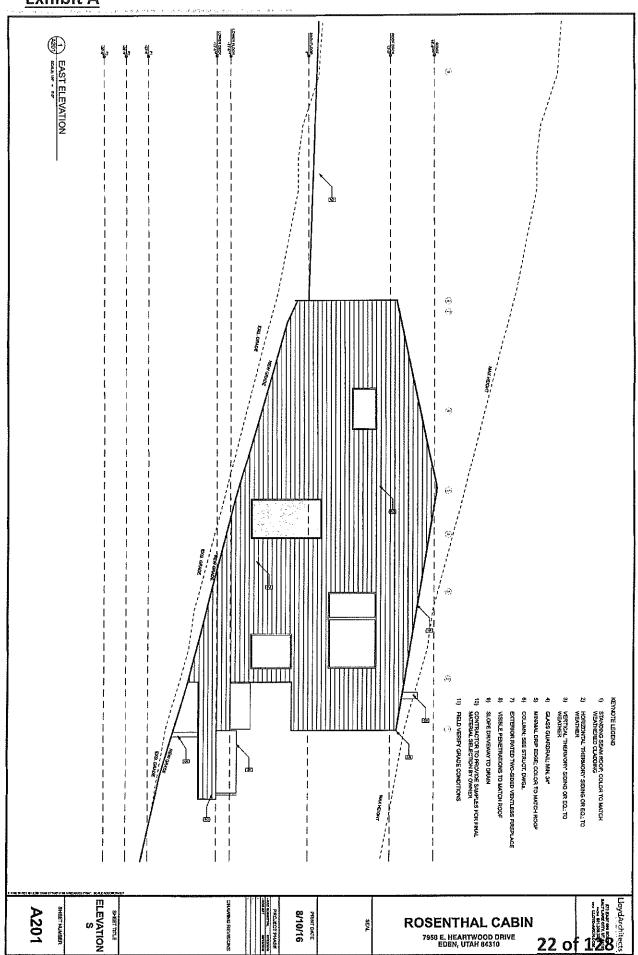












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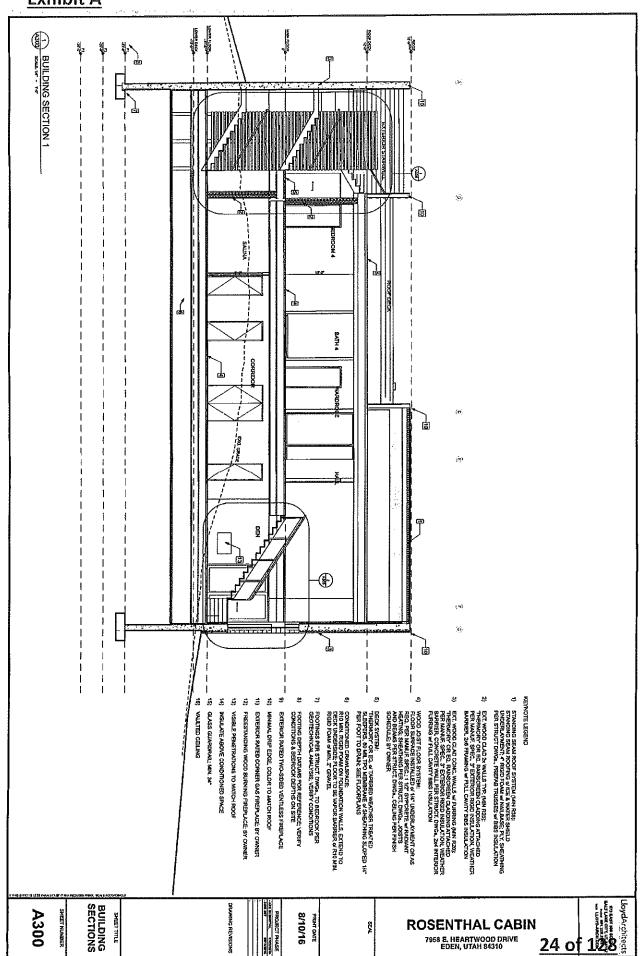
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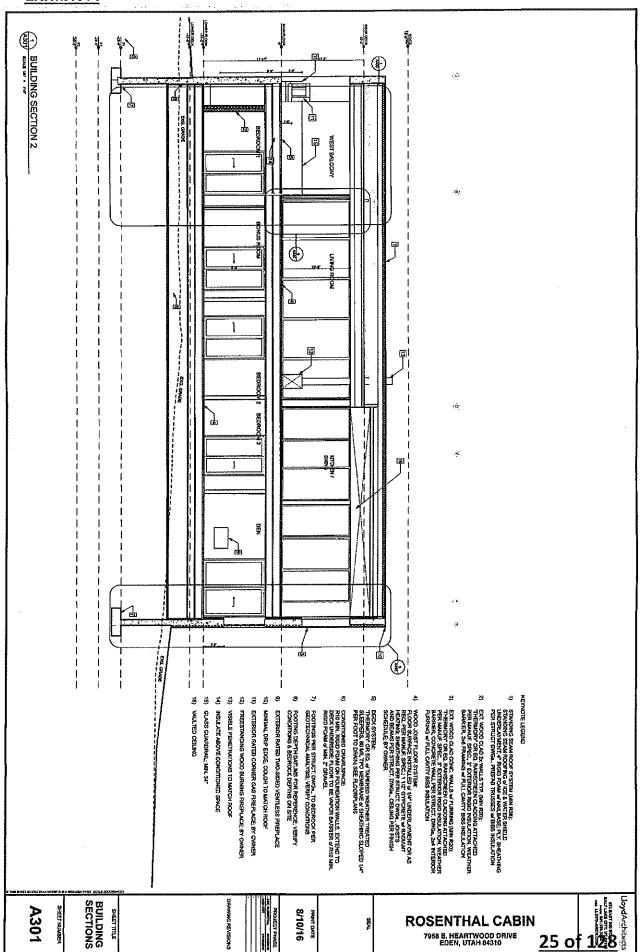
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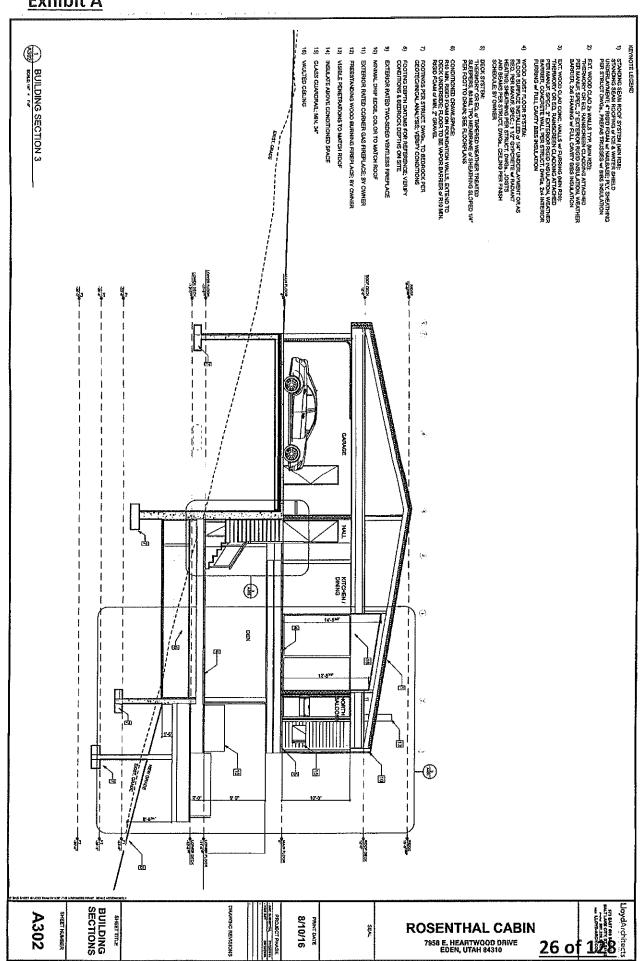
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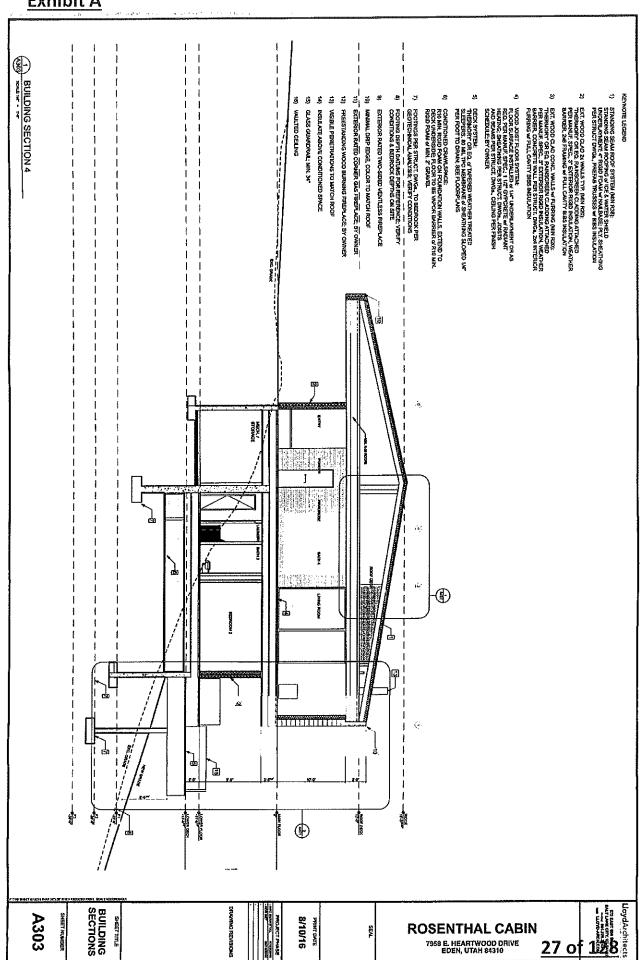
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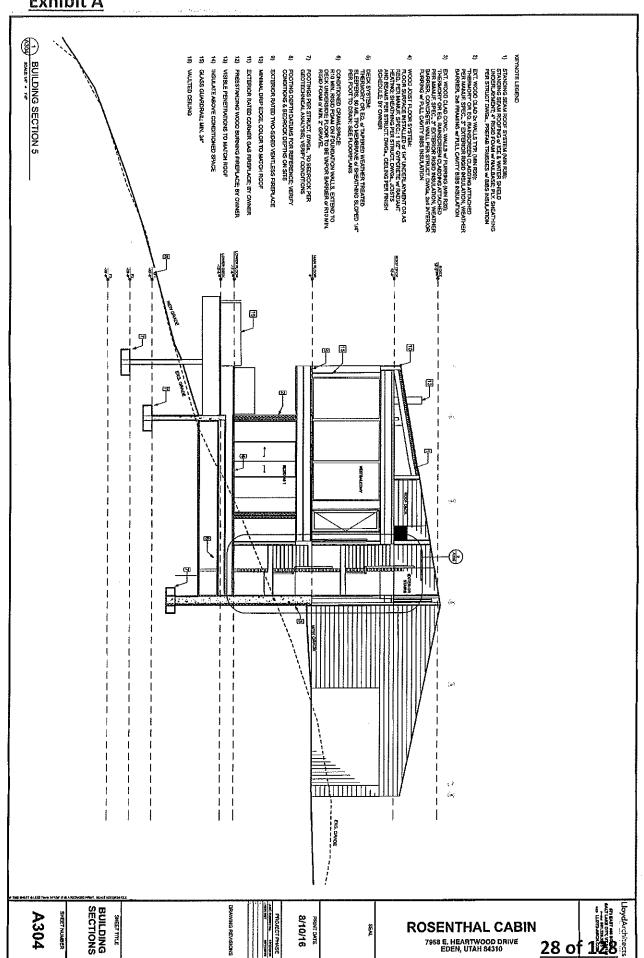
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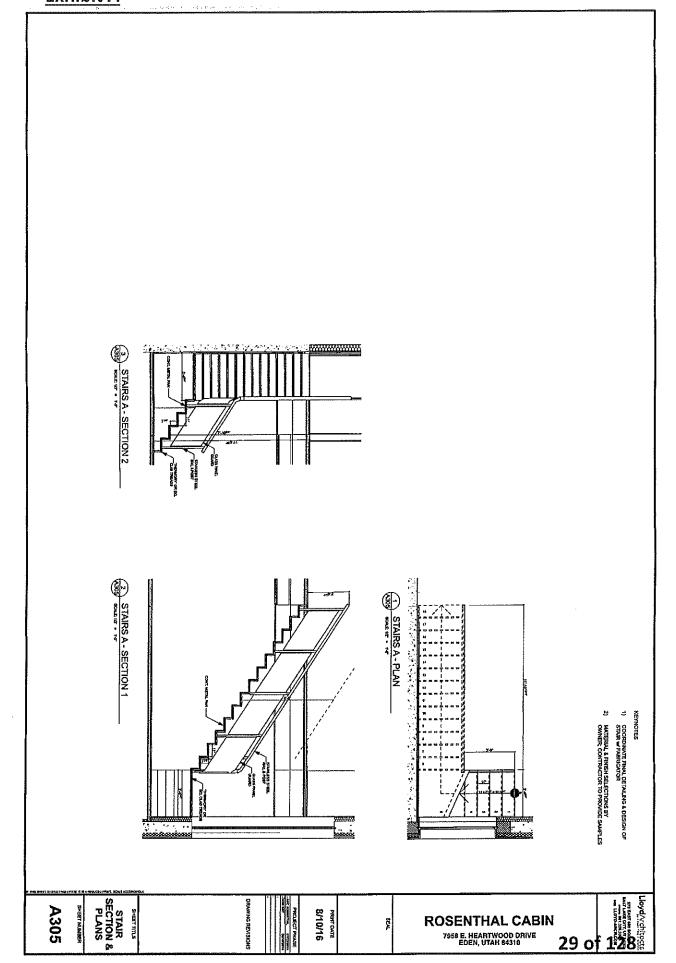


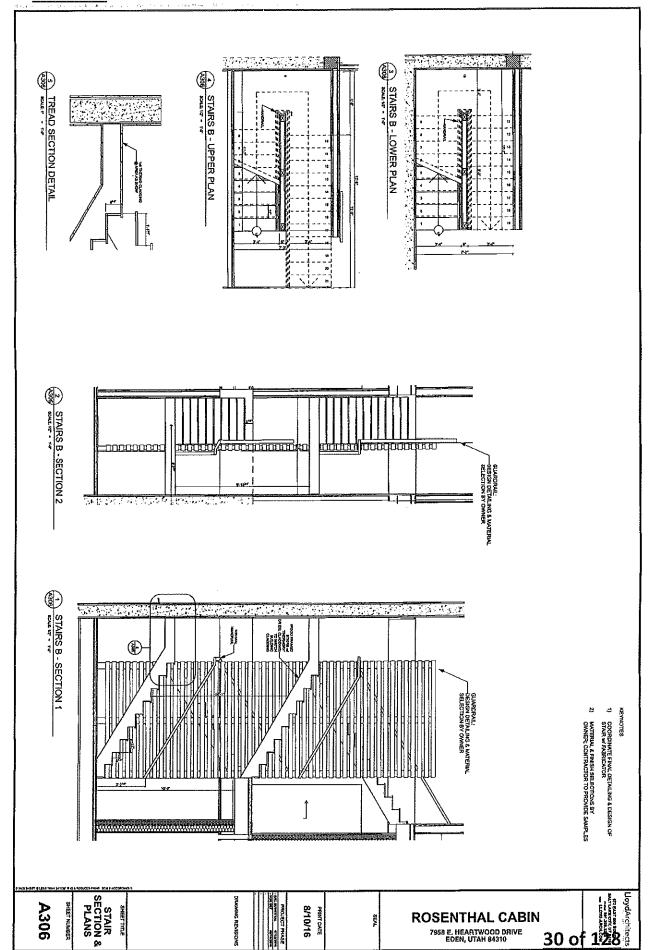












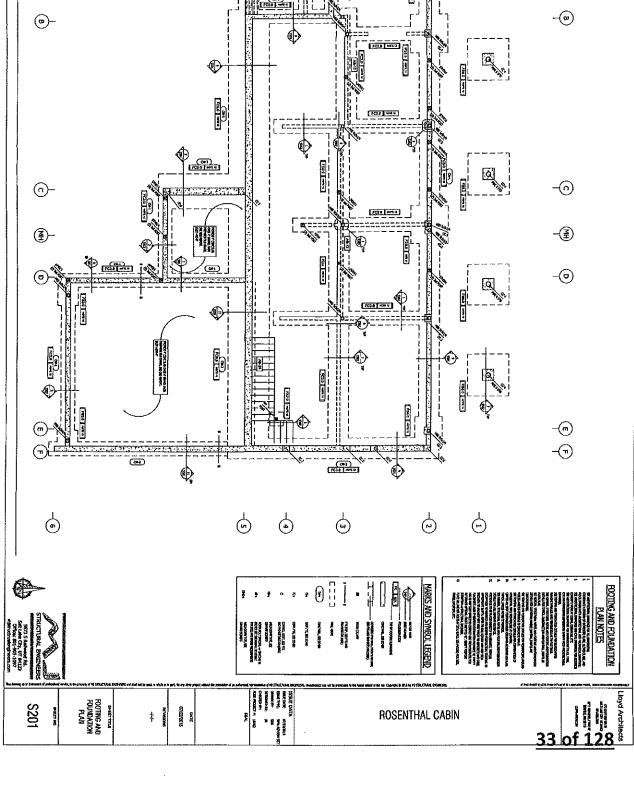
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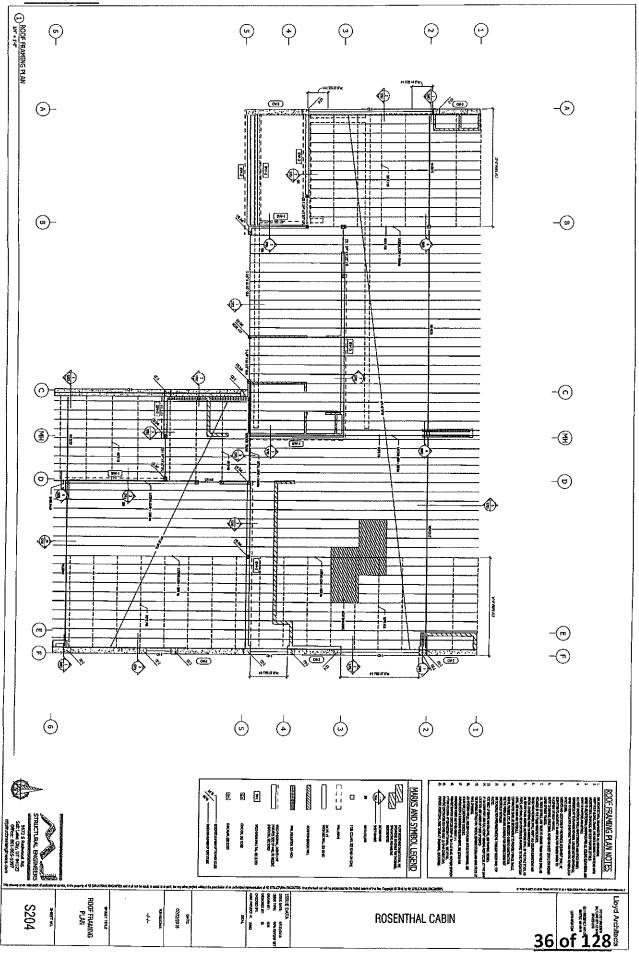
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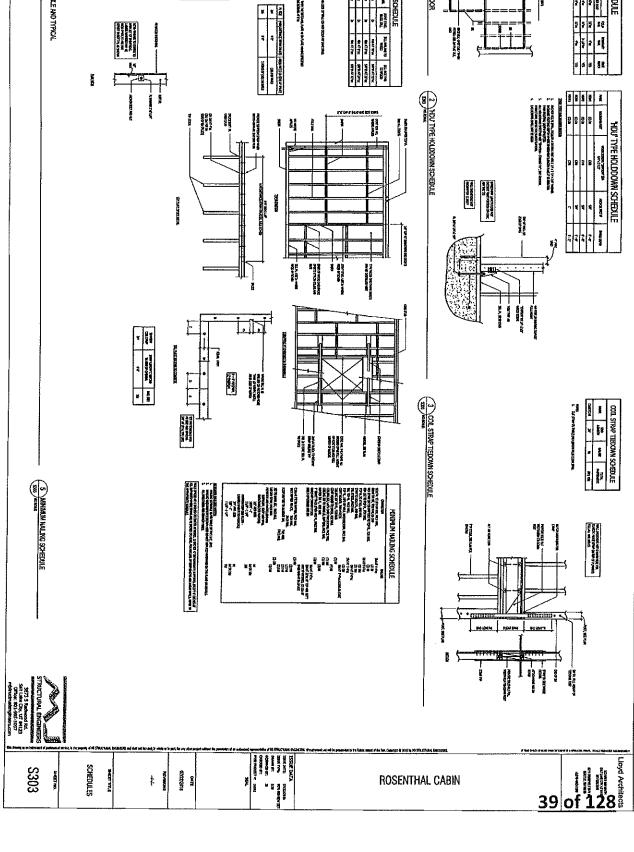
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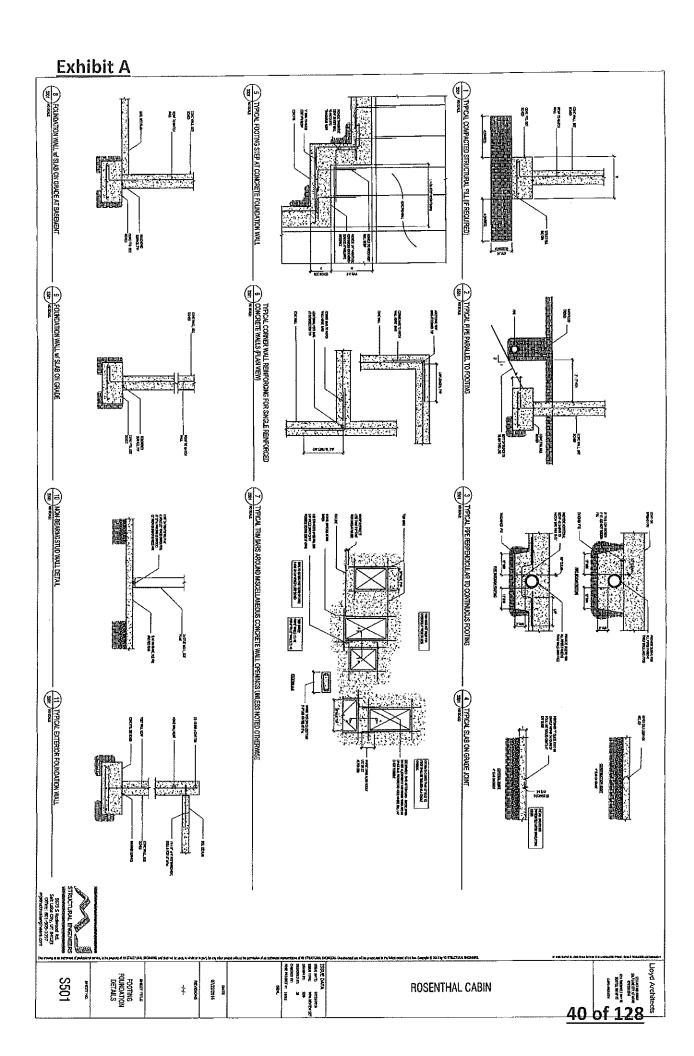
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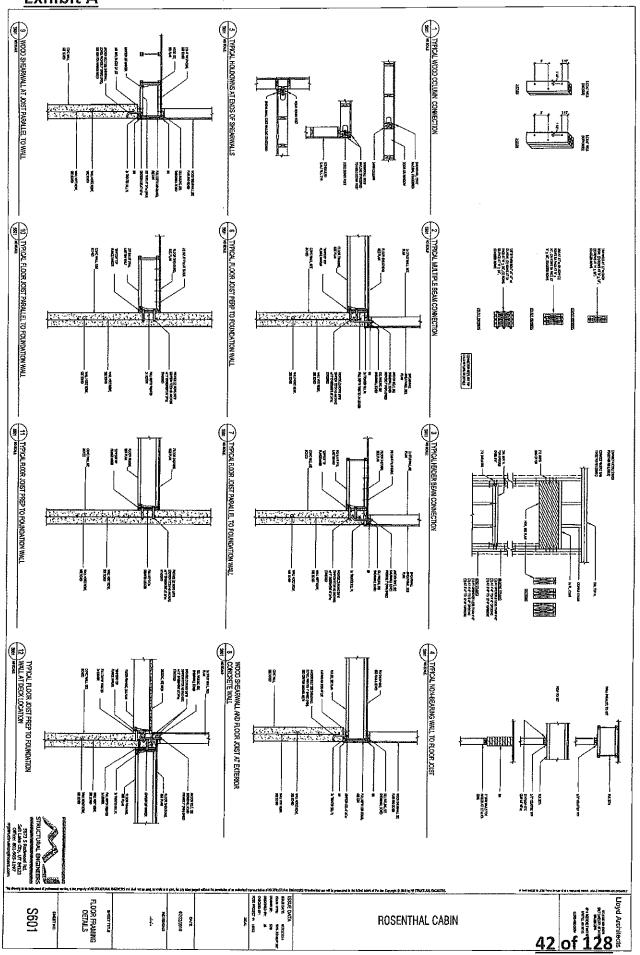
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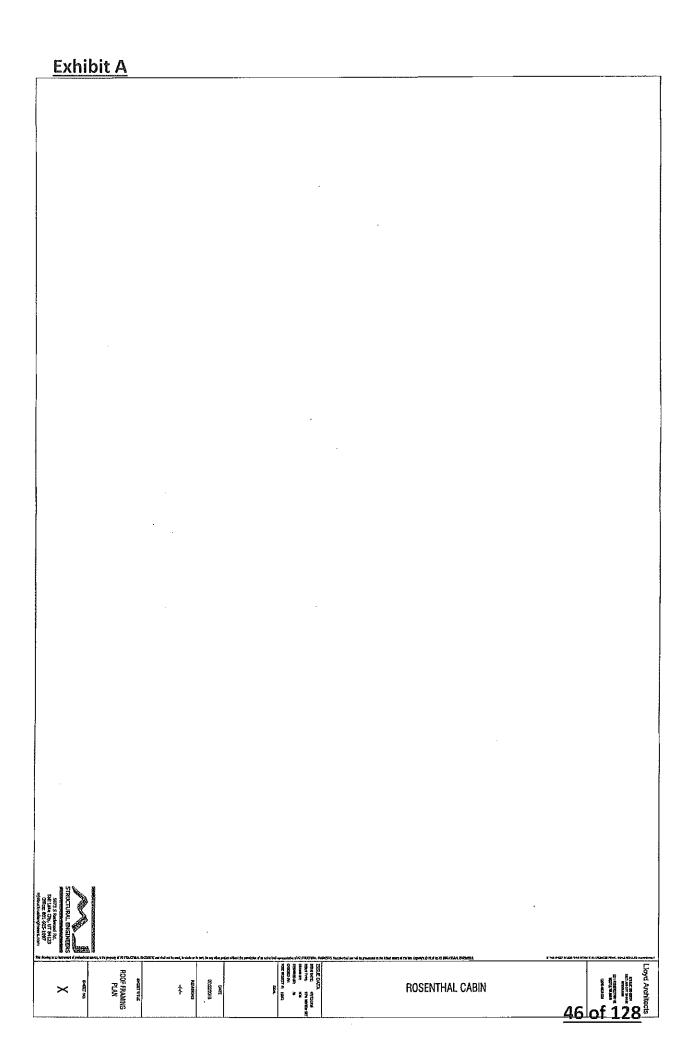


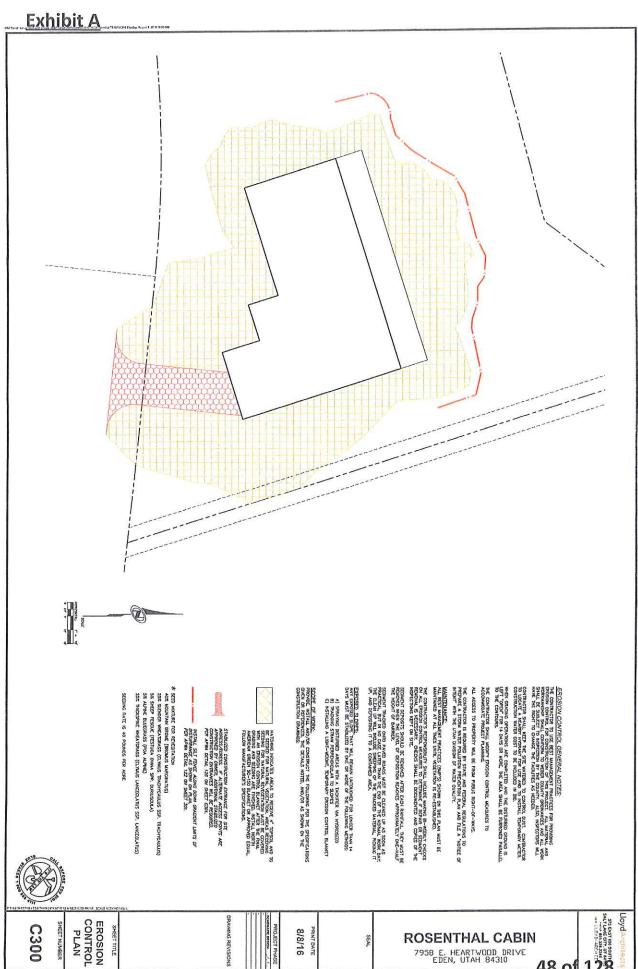




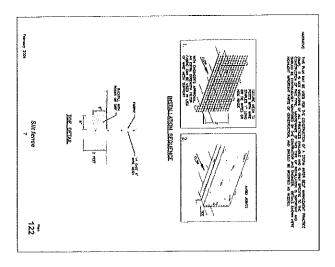


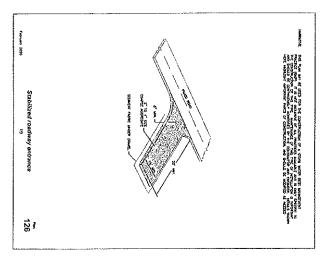






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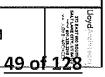


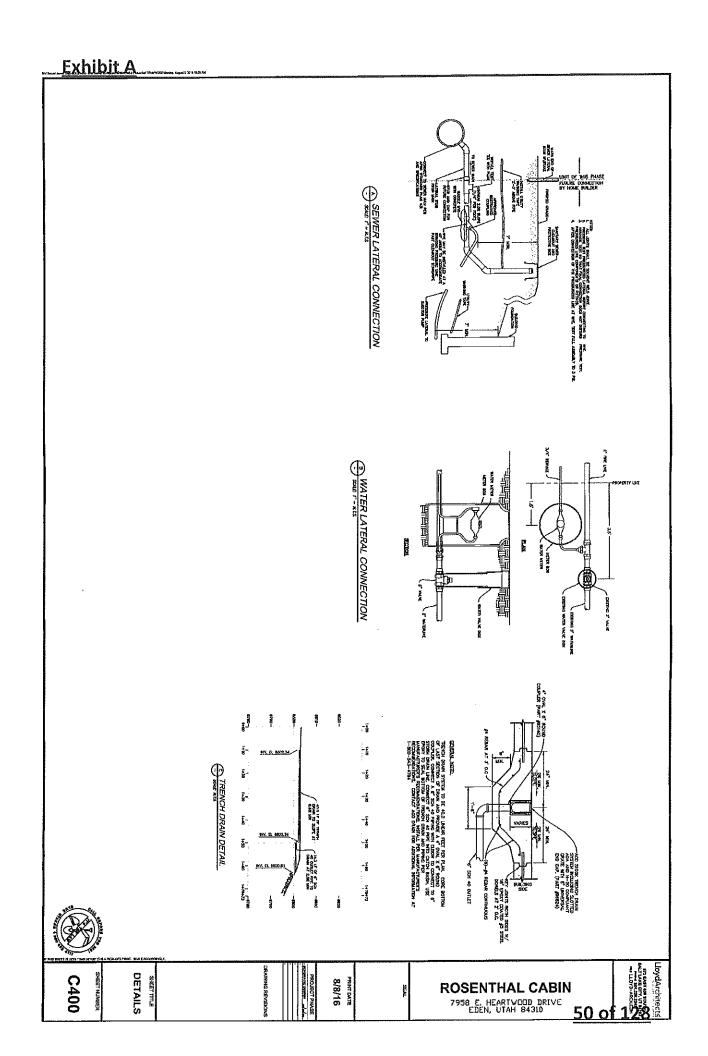


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7958 E. HEARTWOOD DRIVE EDEN, UTAH 84310







August 7, 2014

Mr. Grant H. Blakeslee Summit, LLC 3632 North Wolf Creek Drive Eden, Utah 84310

IGES Project No. 01628-006

RE: Geotechnical Investigation Report Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive Weber County, Utah

Mr. Blakeslee,

As requested, IGES has conducted a geotechnical investigation for the proposed residence to be constructed on Lot 34R of the Powder Mountain Resort located at 7958 East Heartwood Drive in Weber County, Utah. The approximate location of the property is illustrated on the Site Vicinity Map (Figure A-1 in Appendix A). The purposes of our investigation was to assess the nature and engineering properties of the subsurface soils at the proposed home site and to provide recommendations for the design and construction of foundations, grading, and drainage. The scope of work completed for this study included subsurface exploration, laboratory testing, engineering analyses and preparation of this letter.

Project Understanding

Our understanding of the project is based primarily on our previous involvement with the Powder Mountain resort project, which included two geotechnical investigations for the greater 200-acre Powder Mountain Resort expansion project (IGES, 2012a and 2012b).

The Powder Mountain Resort expansion project is located southeast of SR-158 (Powder Mountain Road), south of previously developed portions of Powder Mountain Resort, in unincorporated Weber County, Utah. The project is accessed by Powder Ridge Road.

Lot 34R is a 3/4-acre single-family residential lot with a buildable envelope of approximately 0.21 acres. A single-family home will be constructed at the site, presumably a high-end vacation home. Construction plans were not available for our review; however, we assume the new home will be a one- or two-story wood-framed structure, with a basement, founded on conventional spread footings. The development is expected to include improvements common for residential developments such as underground utilities, curb and gutter, flatwork, landscaping, and possibly appurtenant structures.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

METHOD OF STUDY

Literature Review

IGES completed a geotechnical investigation for the Powder Mountain Resort expansion in 2012 (2012a, 2012b). Our previous work included twenty-two test pits and one soil boring excavated at various locations across the 200-acre development; as a part of this current study, the logs from relevant nearby test pits and other data from our reports were reviewed. In addition, Western Geologic (2012) completed a geologic hazard study for the greater 200-acre Powder Mountain expansion project – this report was reviewed to assess the potential impact of geologic hazards on the subject lot.

Field Investigation

Subsurface soils were investigated by excavating one test pit approximately 12 feet below the existing site grade. The approximate location of the test pit is illustrated on the *Geotechnical Map* (Figure A-2 in Appendix A). The soil types and conditions were visually logged at the time of the excavation in general accordance with the Unified Soil Classification System (USCS). Subsurface soil classifications and descriptions are included on the test pit log included as Figure A-3 in Appendix A. A key to USCS symbols and terminology is included as Figure A-4.

Laboratory Testing

Samples retrieved during the subsurface investigation were transported to the laboratory for evaluation of engineering properties. Specific laboratory tests include:

- Moisture Content and Unit Weight
- Soluble Sulfate, Soluble Chloride, pH and Resistivity

Results of the laboratory testing are discussed in this report and presented in Appendix B. Some test results, including moisture content; and unit weight, have been incorporated into the test pit log (Figure A-3).

In addition to laboratory testing on samples obtained from this lot, engineering analysis was also based on previously completed laboratory work on soil samples obtained near the site (IGES, 2012a & 2012b).

Engineering Analysis

Engineering analyses were performed using soil data obtained from laboratory testing and empirical correlations based on material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care. An allowable bearing pressure value was proportioned based on estimated shear strength of bearing soils.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

FINDINGS

Surface Conditions

At the time of the excavation, the lot was in a relatively natural state and was covered with a variety of vegetation including weeds and native grasses. Frequent boulders (>12 inches) were observed throughout the site. The site is relative flat, draining gently to the north, away from Heartwood Drive.

Earth Materials

The soil at the surface of the site consists of approximately 6 inches of poorly-developed topsoil consisting of mottled, medium-dense silty sand. The topsoil encountered was characterized by an abundance of organic matter (roots, etc.). The topsoil was underlain by medium dense clayey sand extending to a depth of approximately 9 feet below existing grade. Underlying this layer, we encountered coarse colluvium consisting of medium-dense clayey gravel. The colluvium was characterized by abundant coarse angular rock fragments, which extended to the bottom of the excavation (approximately 12 feet below the existing grade).

Detailed descriptions of earth materials encountered are presented on the test pit log, Figure A-3, in Appendix A.

Groundwater

Groundwater was not encountered in the test pit excavation. Based on our observations, groundwater is not anticipated to adversely impact the proposed construction. However, groundwater levels could rise at any time based on several factors including recent precipitation, on- or off-site runoff, irrigation, and time of year (e.g., spring run-off). Should the groundwater become a concern during the proposed construction, IGES should be contacted so that dewatering recommendations may be provided.

Geology and Geologic Hazards

Geology and geologic hazards have been previously addressed by Western Geologic in a separate submittal (Western Geologic, 2012). This work has also been referenced in our previous geotechnical reports for the project (IGES, 2012a and 2012b). The report by Western Geologic indicates that the lot is located outside of known geologically unstable areas.

During our subsurface investigation, potentially adverse geologic structures (e.g., evidence of faulting or landslides) were not evident to the maximum depth of exploration (12 feet). Geomorphic expressions of shallow, surficial landslides were not observed on, or near the lot. Based on currently available data and our observations, the potential for geologic hazards such as landslides, liquefaction, or surface fault rupture impacting the site is considered low.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Seismicity

Following the criteria outlined in the 2012 International Building Code (IBC, 2012), spectral response at the site was evaluated for the *Maximum Considered Earthquake* (MCE) which equates to a probabilistic seismic event having a two percent probability of exceedance in 50 years (2PE50). Spectral accelerations were determined based on the location of the site using the *U.S. Seismic "DesignMaps" Web Application* (USGS, 2012); this software incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012).

To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and Site Class are used. Site Class is a parameter that accounts for site amplification effects of soft soils and is based on the average shear wave velocity of the upper 100 feet; based on our field exploration and our understanding of the geology in this area, the subject site is appropriately classified as Site Class C (Very Dense Soil and Soft Rock). Based on IBC criteria, the short-period (F_a) coefficient is 1.070 and long-period (F_v) site coefficient is 1.526. Based on the design spectral response accelerations for a Building Risk Category of I, II or III, the site's Seismic Design Category is D. The short- and long-period Design Spectral Response Accelerations are presented in Table 1.0; a summary of the Design Maps analysis is presented in Appendix C. The peak ground acceleration (PGA) may be taken as 0.4*Sms.

Table 1.0
Short- and Long-Period Spectral Accelerations for MCE

Parameter	Short Period (0.2 sec)	Long Period (1.0 sec)
MCE Spectral Response Acceleration (g)	$S_S = 0.826$	$S_1 = 0.274$
MCE Spectral Response Acceleration Site Class C (g)	$S_{MS} = S_s F_a = 0.883$	$S_{M1} = S_1 F_v = 0.419$
Design Spectral Response Acceleration (g)	$S_{DS} = S_{MS} *^2/_3 = 0.589$	$S_{D1} = S_{M1} *^2/_3 = 0.279$

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the field observations, laboratory testing and previously completed geotechnical investigation (IGES, 2012a), the subsurface conditions are considered suitable for the proposed construction provided that the recommendations presented in this report are incorporated into the design and construction of the project.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

General Site Preparation and Grading

Prior to the placement of foundations, general site grading is recommended to provide proper support for exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

Below proposed structures, fills, and man-made improvements, all vegetation, topsoil, debris and undocumented fill soils (if any) should be removed. Any existing utilities should be re-routed or protected in place. The exposed native soils should then be proof-rolled with heavy rubber-tired equipment such as a scraper or loader. Any soft/loose areas identified during proof-rolling should be removed and replaced with structural fill. All excavation bottoms should be observed by an IGES representative during proof rolling or otherwise prior to placement of engineered fill to evaluate whether soft, loose, or otherwise deleterious earth materials have been removed and that recommendations presented in this report have been complied with.

Excavations

Soft, loose, or otherwise unsuitable soils beneath structural elements, hardscape or pavements may need to be over-excavated and replaced with structural fill. If over-excavation is required, the excavations should extend one foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. Structural fill should consist of granular materials and should be placed and compacted in accordance with the recommendations presented in this report.

Prior to placing engineered fill, all excavation bottoms should be scarified to at least 6 inches, moisture-conditioned as necessary at or slightly above optimum moisture content (OMC), and compacted to at least 90 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (Modified Proctor). Even though we did not encountered bedrock in the test pit for this lot, shallow bedrock was observed in most of the adjacent lots. Thus, it is possible shallow bedrock exists in some area of the lot. Scarification is not required where bedrock is exposed.

Excavation Stability

The contractor is responsible for site safety, including all temporary trenches excavated at the site and the design of any required temporary shoring. The contractor is responsible for providing the "competent person" required by Occupational Safety and Health (OSHA) standards to evaluate soil conditions. For planning purposes, Soil Type C is expected to predominate at the site (sands and gravels). Close coordination between the competent person and IGES should be maintained to facilitate construction while providing safe excavations.

Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. Where very moist soil conditions or groundwater is encountered,

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

or when the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. As an alternative to shoring or shielding, trench walls may be laid back at one and one half horizontal to one vertical (1½H:1V) (34 degrees) in accordance with OSHA Type C soils. Trench walls may need to be laid back at a steeper grade pending evaluation of soil conditions by the geotechnical engineer. Soil conditions should be evaluated in the field on a case-by-case basis. Large rocks exposed on excavation walls should be removed (scaled) to minimize rock fall hazards.

Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill should consist of granular native soils, which may be defined as soils with less than 25% fines, 10-60% sand, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension). Structural fill should also be free of vegetation and debris. Soils not meeting these criteria may be suitable for use as structural fill; however, such soils should be evaluated on a case by case basis and should be approved by IGES prior to use.

All structural fill should be placed in maximum 4-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 6-inch loose lifts if compacted by light-duty rollers, and maximum 8-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. Additional lift thickness may be allowed by IGES provided the Contractor can demonstrate sufficient compaction can be achieved with a given lift thickness with the equipment in use. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. Structural fill underlying all shallow footings and pavements should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. The moisture content should be at, or slightly above, the OMC for all structural fill. Any imported fill materials should be approved prior to importing. Also, prior to placing any fill, the excavations should be observed by IGES to confirm that unsuitable materials have been removed.

Specifications from governing authorities such as Weber County and/or special service districts having their own precedence for backfill and compaction should be followed where more stringent.

Utility Trench Backfill

Utility trenches should be backfilled with structural fill in accordance with the previous section. Utility trenches can be backfilled with the onsite soils free of debris, organic and oversized material. Prior to backfilling the trench, pipes should be bedded in and shaded with a uniform granular material that has a Sand Equivalent (SE) of 30 or greater. Pipe bedding may be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean ¾-inch gravel, which generally does not require densification. Native earth materials can be used as backfill over the pipe bedding zone. All utility trenches backfilled below pavement sections, curb and gutter, hardscape, should be backfilled with structural fill compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches should be backfilled and compacted to approximately 90 percent

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

of the MDD (ASTM D-1557). However, in all cases the pipe bedding and shading should meet the design criteria of the pipe manufacturer. Specifications from governing authorities having their own precedence for backfill and compaction should be followed where they are more stringent.

Oversize Material

Even though we did not encountered bedrock in the test pit for this lot, shallow bedrock was observed on some of the adjacent lots. Thus, it is possible shallow bedrock exists in some area of the lot. Frequent boulders (>12 inches) were also observed on the surface of the site. Based on our observations at the site and previously completed geotechnical investigation, there is a moderate potential for the presence of oversize materials (larger than 6 inches in greatest dimension). Large rocks, particularly boulders, may require special handling, such as segregation from structural fill, and disposal. Particularly large boulders may require special equipment for removal during excavation of the basement.

Foundations

Based on our field observations and considering the presence of relatively competent native earth materials, we recommend that the footings for proposed home be founded either entirely on competent native soils or entirely on structural fill. Native/fill transition zones are not allowed beneath a single structure footprint. If soft, loose, or otherwise deleterious earth materials are exposed in the footing excavations, then the footings should be deepened such that all footings bear on relatively uniform, competent native earth materials. Alternatively, the foundation excavation may be over-excavated a minimum of 2 feet below the bottom of proposed footings and replaced with structural fill, such that the footings bear entirely on a uniform fill blanket. We recommend that IGES inspect the bottom of the foundation excavation prior to the placement of steel or concrete to identify the competent native earth materials as well as any unsuitable soils or transition zones. Additional over-excavation may be required based on the actual subsurface conditions observed.

Shallow spread or continuous wall footings constructed entirely on competent, uniform native earth materials or on a minimum of 2 feet of structural fill may be proportioned utilizing a maximum net allowable bearing pressure of 2,200 pounds per square foot (psf) for dead load plus live load conditions. The net allowable bearing value presented above is for dead load plus live load conditions. The minimum recommended footing width is 20 inches for continuous wall footings and 30 inches for isolated spread footings.

All conventional foundations exposed to the full effects of frost should be established at a minimum depth of 42 inches below the lowest adjacent final grade. Interior footings, not subjected to the full effects of frost (i.e., a continuously heated structure), may be established at higher elevations, however, a minimum depth of embedment of 12 inches is recommended for confinement purposes.

Foundation drains should be installed around below-ground foundations (e.g., basement walls) to minimize the potential for flooding from shallow groundwater, which may be present at various times during the year, particularly spring run-off.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Settlement

Static settlement of properly designed and constructed conventional foundations, founded as described above, are anticipated to be on the order of 1 inch or less. Differential settlement is expected to be half of total settlement over a distance of 30 feet.

Competent native earth materials and/or properly compacted structural fill is expected to exhibit negligible seismically-induced settlement during a MCE seismic event.

Earth Pressure and Lateral Resistance

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance against concrete, a coefficient of friction of 0.45 for sandy native soils or structural fill should be used.

Ultimate lateral earth pressures from *granular* backfill acting against retaining walls, temporary shoring, or buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 2.0:

Table 2.0

Lateral Earth Pressure Coefficients

	Level	Backfill	2H:1V	Backfill
Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active (Ka)	0.33	35	0.53	56
At-rest (Ko)	0.50	55	0.80	85
Passive (Kp)	3.0	320		_

These coefficients and densities assume no buildup of hydrostatic pressures. The force of water should be added to the presented values if hydrostatic pressures are anticipated.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils should not be used as retaining wall backfill. Backfill should consist of native granular soil with an Expansion Index (EI) less than 20.

Walls and structures allowed to rotate slightly should use the active condition. If the element is to be constrained against rotation (i.e., a basement or buried tank wall), the atrest condition should be used. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Concrete Slab-on-Grade Construction

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying properly prepared subgrade. The gravel should consist of free-draining gravel or road base with a 3/4-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of 4"×4" W4.0×W4.0 welded wire mesh within the middle third of the slab. We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI). A Modulus of Subgrade Reaction of 260 psi/inch may be used for design.

A moisture barrier (vapor retarder) consisting of 10-mil thick Visqueen (or equivalent) plastic sheeting should be placed below slabs-on-grade where moisture-sensitive floor coverings or equipment is planned. Prior to placing this moisture barrier, any objects that could puncture it, such as protruding gravel or rocks, should be removed from the building pad. Alternatively, the subgrade may be covered with 2 inches of clean sand.

Moisture Protection

Moisture should not be allowed to infiltrate into the soils in the vicinity of the foundations. As such, design strategies to minimize ponding and infiltration near the home should be implemented. The new home may be subject to sheet flow during periods of heavy rain or snow melt; therefore, the Civil Engineer may also wish to consider construction of additional surface drainage to intercept surface runoff, or a curtain drain to intercept seasonal groundwater flow, if any.

We recommend that hand watering, desert landscaping or Xeriscape be considered within 5 feet of the foundations. We further recommend roof runoff devices be installed to direct all runoff a minimum of 10 feet away from structures. The home builder should be responsible for compacting the exterior backfill soils around the foundation. Additionally, the ground surface within 10 feet of the house should be constructed so as to slope a minimum of five percent away from the home. Pavement sections should be constructed to divert surface water off of the pavement into storm drains. Parking strips and roadway shoulder areas should be constructed to prevent infiltration of water into the areas surrounding pavement. Landscape plans must conform to Weber County development codes.

IGES recommends a perimeter foundation drain be constructed for the proposed residential structure in accordance with the International Residential Code (IRC).

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Soil Corrosion Potential

Laboratory testing of a representative soil sample obtained from the test pit indicated that the soil sample tested had a sulfate content of 8 ppm. Accordingly, the soils are classified as having a 'low' potential for deterioration of concrete due to the presence of soluble sulfate. As such, conventional Type I/II Portland cement may be used for all concrete in contact with site soils.

To evaluate the corrosion potential of ferrous metal in contact with onsite native soil a sample was tested for soil resistivity, soluble chloride and pH. The test indicated that the onsite soil tested has a minimum soil resistivity of 3,156 OHM-cm, soluble chloride content of 3.8 ppm and a pH of 8.2. Based on this result, the onsite native soil is considered to be *moderately corrosive* to ferrous metal. Consideration should be given to retaining the services of a qualified corrosion engineer to provide an assessment of any metal that may be associated with construction of ancillary water lines and reinforcing steel, valves etc.

Construction Considerations

Although shallow bedrock was not identified during our subsurface investigation, it is known that shallow bedrock may occur locally within this area. Although not anticipated, if shallow bedrock is encountered, this material may require special equipment and/or blasting for removal during excavation of the basement.

In addition, several large boulders were observed during our subsurface exploration; as such, excavation of the basement may generate an abundance of over-size material that may require special handling, processing, or disposal.

CLOSURE

The recommendations presented in this letter are based on limited field exploration, literature review, and a general understanding of the proposed construction. The subsurface data used in the preparation of this letter were obtained from the exploration(s) made for this investigation. It is possible that variations in the soil and groundwater conditions could exist beyond the point explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this letter, IGES should be immediately notified so that any necessary revisions to recommendations contained in this letter may be made. In addition, if the scope of the proposed construction changes from that described in this letter, IGES should also be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this letter in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Additional Services

The recommendations presented in this report are based on the assumption that an adequate program of tests and observations will be made during the construction. IGES staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Consultation as may be required during construction.
- Quality control testing of cast-in-place concrete.
- Review of plans and specifications to assess compliance with our recommendations.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please contact the undersigned at (801) 748-4044.

Respectfully submitted,

A-1/2

IGES, Inc.

Shun Li, P.E.I. Staff Engineer David A. Glass, P.E.

Reviewed by:

Senior Geotechnical Engineer

Attachments:

References

Appendix A

Figure A-1 – Site Vicinity Map

Figure A-2 – Geotechnical Map

Figure A-3 – Test Pit Log

Figure A-4 – Key to Soil Symbols and Terminology

Appendix B – Laboratory Results

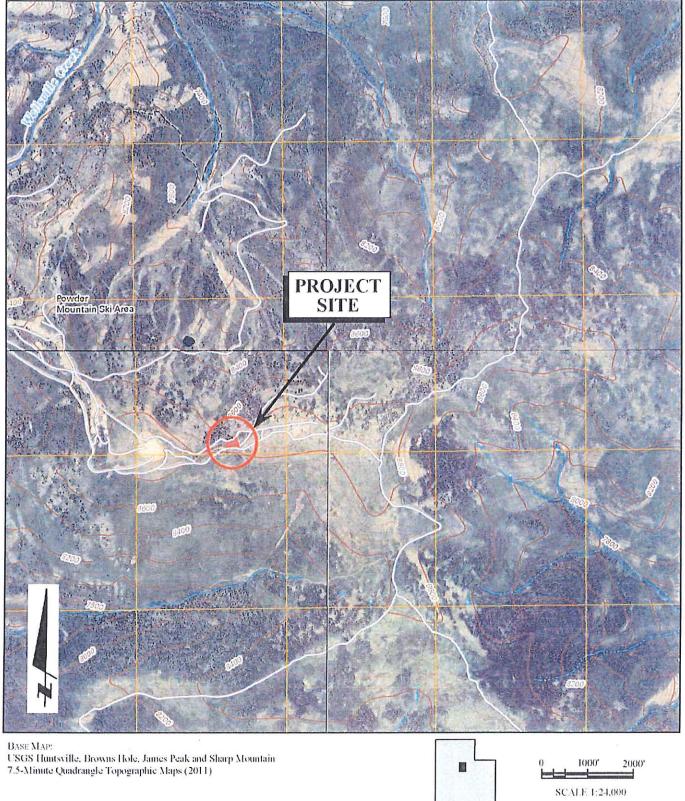
Appendix C – 2012 IBC MCE and Design Response Acceleration

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

References

- AMEC, 2001, Report Engineering Geologic Reconnaissance/Geotechnical Study Powder Mountain Resort.
- Federal Emergency Management Agency [FEMA], 1997, NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures, FEMA 302, Washington, D.C.
- Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1996, *National Seismic-hazard Maps: Documentation*, U.S. Geological Survey Open-File Report 96-532, June.
- IGES, Inc., 2012a, Design Geotechnical Investigation, Powder Mountain Resort, Weber County, Utah, Project No. 01628-003, dated November 9, 2012.
- IGES, Inc., 2012b, Preliminary Geotechnical Investigation, Powder Mountain Resort, Weber County, Utah, Project No. 01628-001, dated July 26, 2012.
- International Building Code [IBC], 2012, International Code Council, Inc.
- PSI, 2012, Geophysical ReMi Investigation, Powder Mountain Resort, Phase 1A, Weber County, Utah, PSI Project No. 0710375, dated September 18, 2012.
- U.S. Geological Survey, 2012, U.S. Seismic "Design Maps" Web Application, site: https://geohazards.usgs.gov/secure/designmaps/us/application.php.
- Western Geologic, 2012, Report: Geologic Hazards Reconnaissance, Proposed Area 1 Mixed-Use Development, Powder Mountain Resort, Weber County, Utah, dated August 28, 2012.

APPENDIX A





MAP LOCATION

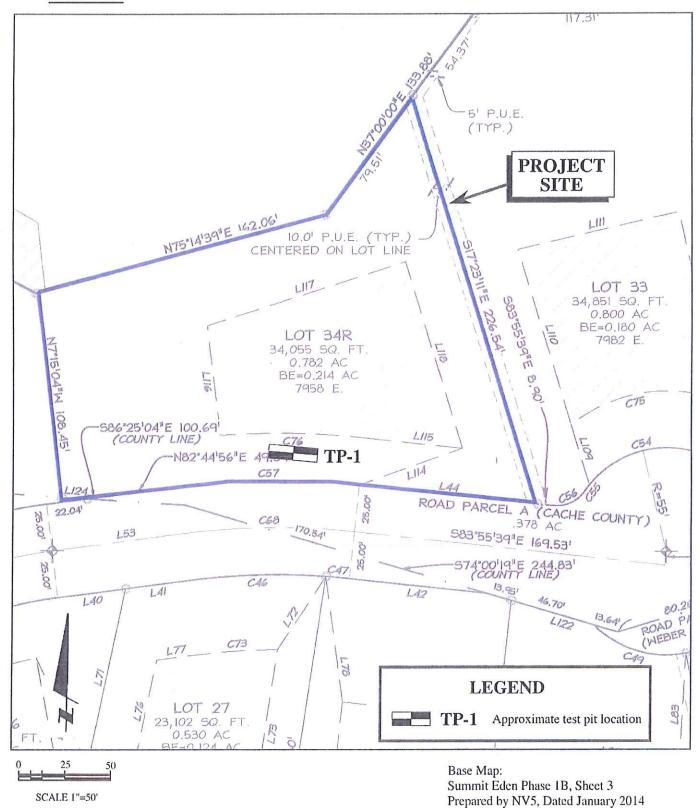


Geotechnical Investigation Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive SITE VICINITY MAP Weber County, Utah

Figure

A-1

64 of 128





Geotechnical Investigation
Lot 34R of Powder Mountain Resort
7958 East Heartwood Drive
Weber County, Utah
GEOT

GEOTECHNICAL MAP

Figure A-2 65 of 128

DATE	STAI	-		7/18/		Geotechnical Investigation Lot 34R of Powder Mountain Resort		Rep:				TEST P	IT NO: TP-	1
ш			1.0%	D: 7/18/		7958 East Heartwood Drive Weber County, Utah Project Number 01628-006	Rig Ty	/pe:	trackh	oe		Sheet 1 of 1		
ELEVATION	PTH	S3	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION LATITUDE 41.36961 LONGITUDE -111.75790 ELEVATION 8,808	Dry Density(pet)	Moisture Content %	Percent minus 200	imit	/ Index		sture Cor and erberg Lin	mits
ELEV	FEET	SAMPLES	WATER	GRAPHI	UNIFIEI	MATERIAL DESCRIPTION	Dry Den	Moisture	Percent 1	Liquid Limit	Plasticity Index	 	Content 405060	
1	0-				SM	Silty SAND - medium dense, moist, mottled, heavy roots in upper 18 inches						102030	403000	7080
8805	-				SC	Clayey SAND - loose, moist, brown, occasional roots								
-	5-	X					83.8	27.2						
8800														
	10-				GC	Clayey GRAVEL with sand - loose to medium dense, moist, reddish brown, coarse angular rock (colluvium) disaggregated into angular rock fragments up to 3 inches in diameter		14.9						
-						No groundwater encountered								
8795						Bottom of Test Pit @ 12 Feet		10.1						
87						SAMPLE TYPE [] - GRAB SAMPLE							FIG	T I
	G.	1		GI	E								A	

UNIFIED SOIL CLASSIFICATION SYSTEM

TYPICAL DESCRIPTIONS MAJOR DIVISIONS WELL-GRADED GRAVELS, GRAVEL-SAND GW MIXTURES WITH LITTLE OR NO FINES CLEAN GRAVELS WITH LITTLE OR NO FINES **GRAVELS** POORLY-GRADED GRAVELS, GRAVEL-SAND GP MIXTURES WITH LITTLE OR NO FINES is larger than the #4 sleve) SILTY GRAVELS, GRAVEL-SILT-SAND GM COARSE GRAINED GRAVELS MIXTURES WITH OVER 12% FINES CLAYEY GRAVELS, GRAVEL-SAND-CLAY SOILS GÇ MIXTURES of material WELL-GRADED SANDS, SAND-GRAVEL CLEAN SANDS WITH LITTLE is larger than the #200 sleve) SW MIXTURES WITH LITTLE OR NO FINES SANDS OR NO FINES POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES More than half of S'LTY SANDS, SAND-GRAVEL-SILT MIXTURES coarse fraction is smaller than the #4 sieve) SANDS WITH OVER 12% FINES CLAYEY SANDS SC SAND-GRAVEL-CLAY MIXTURES INORGANIC SILTS & VERY FINE SANDS. ML SILTY OR CLAYEY FINE SANDS. CLAYEY SILTS WITH SLIGHT PLASTICITY SILTS AND CLAYS NORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, (Liquid limit less than 50) SANDY CLAYS, SILTY CLAYS, LEAN CLAYS FINE ORGANIC SILTS & ORGANIC SILTY CLAYS GRAINED SOILS OL OF LOW PLASTICITY INORGANIC SILTS, MICACEOUS OR (More than half of material is smaller than MH DIATOMACEOUS FINE SAND OR SILT SILTS AND CLAYS the #200 sieve) CH FAT CLAYS (Liquid limit greater than 50) ORGANIC CLAYS & ORGANIC SILTS OH OF MEDIUM-TO-HIGH PLASTICITY PEAT, HUMUS, SWAMP SOILS HIGHLY ORGANIC SOILS WITH HIGH ORGANIC CONTENTS

MOISTURE CONTENT

DESCRIPTION	FIELD TEST	
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH	
MOIST	DAMP BUT NO VISIBLE WATER	
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE	

STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

LOG KEY SYMBOLS





TEST-PIT SAMPLE LOCATION



WATER LEVEL (level after completion)

 $\underline{\nabla}$

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKELY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
0	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only.
 Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL		TORVANE	POCKET PENETROMETER	FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNTRAINED SHEAR STRENGTH (Isf)	UNCONFINED COMPRESSIVE STRENGTH (Isl)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2-4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

GES

Key to Soil Symbols and Terminology

67 of 128

IGES, Inc. Project No.:01628-006

APPENDIX B

Water Content and Unit Weight of Soil



(In General Accordance with ASTM D7263 Method B and D2216)

Project: GTI - Powder Mountain Resort

No: 01628-006

Location: Weber County, Utah

Date: 7/29/2014

By: MP

<u>e</u> .	Boring No.	\$2,00,00	3,755,000	Ball Ball	00.430F
Sample Info.	Sample:	Lot34TP1			
Sa	Depth:	4.0'	EMBERG		2525
	Sample height, H (in)	5.446	120022		100 Maria 100
Unit Weight Info.	Sample diameter, D (in)	2.416			19.5530
ht I	Sample volume, V (ft ³)	0.0144	FOR BOYER	330000	101101
eig'	Mass rings + wet soil (g)	948.80	TE TO END	ON THE REAL PROPERTY.	
it W	Mass rings/tare (g)	250.66		diameter.	
Un	Moist soil, Ws (g)	698.14		\$25,500	Edukoza
	Moist unit wt., γ _m (pcf)	106.53	GALFREE		Delt-elli
r E	Wet soil + tare (g)	819.67	1月日本日本	Eglione and	Parity in the second
Water	Dry soil + tare (g)	670.76			0.000 (M) 5.004 0.000 (M) 5.004
> 0	Tare (g)	122.36	is the second		6,288
	Water Content, w (%)	27.2	是多种	SECTION 1	2540738
	Dry Unit Wt., γ _d (pcf)	83.8			

Entered by:	
Reviewed:	

Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and



Ions in Water by Chemically Suppressed Ion Chromatography (AASHTO T 288, T 289, ASTM D4327, and C 1580)

Project: GTI - Powder Mountain Resort

No: 01628-006

Location: Weber County, Utah

Date: 8/5/2014 By: ET

I	Boring No.						
IIIO.	Sample	1	Lot 34 TP1				
	Depth		9.5'				
	Wet soil + tare (g)		140.57				
	Dry soil + tare (g)			127.24			
	Tare (g)		37.80				
	Water content (%)		14.9				
	pН		8.16				
	oluble chloride* (ppm)		3.8				
	Soluble sulfate** (ppm)		8				
NAMES OF	Pin method		2				
-	Soil box		Miller Small				
	Son con		Approximate			I	
		· ·	Soil	Resistance		١	
			condition	Reading	Multiplier	ı	
			(%)	(Ω)	(cm)		
			As Is	8550	0.67		
			+3	6570	0.67		
			+6	4710	0.67		
			+9	4760	0.67		
						1	
				****************		İ	
						ļ	
						1	
						l	
	Minimum resistivity			315	6	1	
	(Ω-cm)			315	0		

^{*} Performed by AWAL using EPA 300.0

Entered by:	
Reviewed:	

^{**} Performed by AWAL using ASTM C1580

APPENDIX C



User-Specified Input

Building Code Reference Document 2012 International Building Code

(which utilizes USGS hazard data available in 2008)

Site Coordinates 41.36961°N, 111.7579°W

Site Soil Classification Site Class C - "Very Dense Soil and Soft Rock"

Risk Category I/II/III



USGS-Provided Output

$$S_s = 0.826 g$$

$$S_{MS} = 0.883 g$$

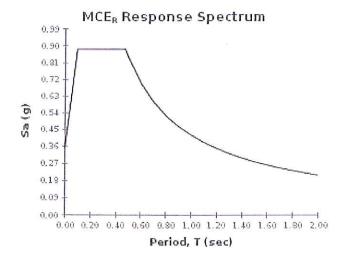
$$S_{MS} = 0.883 g$$
 $S_{DS} = 0.589 g$

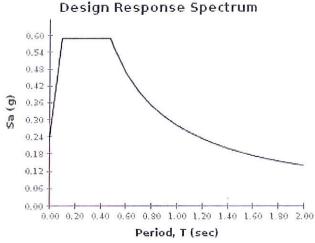
$$S_{*} = 0.274 \, \mathrm{g}$$

$$S_1 = 0.274 g$$
 $S_{M1} = 0.419 g$ $S_{D1} = 0.279 g$

$$S_{01} = 0.279 c$$

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

72 of 128

2012 International Building Code (41.36961°N, 111.7579°W)

Site Class C - "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S₅) and 1.3 (to obtain S₁). Maps in the 2012 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From Figure 1613.3.1(1) [1	From	Figure	1613.3.	1(1)	[1]
----------------------------	------	--------	---------	------	-----

$$S_s = 0.826 g$$

From Figure 1613.3.1(2) [2]

 $S_1 = 0.274 g$

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard - Table 20.3-1 SITE CLASS DEFINITIONS

Site Class	\overline{v}_s	\overline{N} or \overline{N}_{ch}	\bar{s}_{u}
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf

Any profile with more than 10 ft of soil having the

- characteristics:
 - Plasticity index PI > 20,
 - Moisture content $w \ge 40\%$, and
 - Undrained shear strength $s_u < 500 \text{ psf}$

F. Soils requiring site response analysis in accordance with Section 21.1

See Section 20.3.1

For SI: $1ft/s = 0.3048 \text{ m/s} 1lb/ft^2 = 0.0479 \text{ kN/m}^2$

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1) VALUES OF SITE COEFFICIENT F.

Site Class	Mapped Spectral Response Acceleration at Short Period					
	S _s ≤ 0.25	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	S _s ≥ 1.25	
А	0.8	0.8	0.8	0.8	8.0	
В	1.0	1.0	1.0	1.0	1.0	
С	1.2	1.2	1.1	1.0	1.0	
D	1.6	1.4	1.2	1.1	1.0	
E	2.5	1.7	1.2	0.9	0.9	
F		See Se	ction 11.4.7 of	ASCE 7		

Note: Use straight-line interpolation for intermediate values of S_s

For Site Class = C and $S_s = 0.826 g$, $F_a = 1.070$

TABLE 1613.3.3(2) VALUES OF SITE COEFFICIENT F.

Site Class	Mapped Spectral Response Acceleration at 1-s Period					
	$S_1 \le 0.10$	$S_i = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_i \ge 0.50$	
Α	0.8	8.0	0.8	0.8	0.8	
В	1.0	1.0	1.0	1.0	1.0	
С	1.7	1.6	1.5	1.4	1.3	
D	2.4	2.0	1.8	1.6	1.5	
E	3.5	3.2	2.8	2.4	2.4	
F	See Section 11.4.7 of ASCE 7					

Note: Use straight-line interpolation for intermediate values of S₁

For Site Class = C and $S_1 = 0.274 g$, $F_v = 1.526$

Equation (16-37):

$$S_{MS} = F_a S_S = 1.070 \times 0.826 = 0.883 g$$

Equation (16-38):

$$S_{M1} = F_v S_1 = 1.526 \times 0.274 = 0.419 g$$

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):

$$S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.883 = 0.589 g$$

Equation (16-40):

$$S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.419 = 0.279 g$$

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1) SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE **ACCELERATION**

VALUE OF C	RISK CATEGORY				
VALUE OF S _{DS}	I or II	III	IV		
S _{ps} < 0.167g	А	Α	А		
$0.167g \le S_{DS} < 0.33g$	В	В	С		
$0.33g \le S_{ps} < 0.50g$	С	С	D		
0.50g ≤ S _{ps}	D	D	D		

For Risk Category = I and $S_{DS} = 0.589 g$, Seismic Design Category = D

TABLE 1613.3.5(2)

SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF C	RISK CATEGORY			
VALUE OF S _{D1}	I or II	III	IV	
S _{D1} < 0.067g	А	Α	Α	
$0.067g \le S_{D1} < 0.133g$	В	В	С	
0.133g ≤ S _{D1} < 0.20g	С	С	D	
0.20g ≤ S _{D1}	D	D	D	

For Risk Category = I and $S_{p1} = 0.279$ g, Seismic Design Category = D

Note: When S, is greater than or equal to 0.75g, the Seismic Design Category is E for buildings in Risk Categories I, II, and III, and F for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = D

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

- 1. Figure 1613.3.1(1): http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
- 2. Figure 1613.3.1(2): http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf



August 11, 2014

Mr. Grant H. Blakeslee Summit, LLC 3632 North Wolf Creek Drive Eden, Utah 84310

IGES Project No. 01628-006

RE: Geotechnical Investigation Report (Revised)
Lot 34R of Powder Mountain Resort
7958 East Heartwood Drive
Weber County, Utah

Mr. Blakeslee,

As requested, IGES has conducted a geotechnical investigation for the proposed residence to be constructed on Lot 34R of the Powder Mountain Resort located at 7958 East Heartwood Drive in Weber County, Utah. The approximate location of the property is illustrated on the *Site Vicinity Map* (Figure A-1 in Appendix A). The purposes of our investigation was to assess the nature and engineering properties of the subsurface soils at the proposed home site and to provide recommendations for the design and construction of foundations, grading, and drainage. The scope of work completed for this study included subsurface exploration, laboratory testing, engineering analyses and preparation of this letter. This report has been revised from the original report dated August 7, 2014 to further discuss the presence of bedrock at the site.

Project Understanding

Our understanding of the project is based primarily on our previous involvement with the Powder Mountain resort project, which included two geotechnical investigations for the greater 200-acre Powder Mountain Resort expansion project (IGES, 2012a and 2012b).

The Powder Mountain Resort expansion project is located southeast of SR-158 (Powder Mountain Road), south of previously developed portions of Powder Mountain Resort, in unincorporated Weber County, Utah. The project is accessed by Powder Ridge Road.

Lot 34R is a ¾-acre single-family residential lot with a buildable envelope of approximately 0.21 acres. A single-family home will be constructed at the site, presumably a high-end vacation home. Construction plans were not available for our review; however, we assume the new home will be a one- or two-story wood-framed structure, with a walk-out basement, founded on conventional spread footings. The development is expected to include improvements common for residential subdivisions such as underground utilities, curb and gutter, flatwork, landscaping, and possibly appurtenant structures.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

METHOD OF STUDY

Literature Review

IGES completed a geotechnical investigation for the Powder Mountain Resort expansion in 2012 (2012a, 2012b). Our previous work included twenty-two test pits and one soil boring excavated at various locations across the 200-acre development; as a part of this current study, the logs from relevant nearby test pits and other data from our reports were reviewed. In addition, Western Geologic (2012) completed a geologic hazard study for the greater 200-acre Powder Mountain expansion project – this report was reviewed to assess the potential impact of geologic hazards on the subject lot.

Field Investigation

Subsurface soils were investigated by excavating one test pit approximately 12 feet below the existing site grade. The approximate location of the test pit is illustrated on the Geotechnical Map (Figure A-2 in Appendix A). The soil types and conditions were visually logged at the time of the excavation in general accordance with the Unified Soil Classification System (USCS). Subsurface soil classifications and descriptions are included on the test pit log included as Figure A-3 in Appendix A. A key to USCS symbols and terminology is included as Figure A-4.

Laboratory Testing

Samples retrieved during the subsurface investigation were transported to the laboratory for evaluation of engineering properties. Specific laboratory tests include:

- Moisture Content and Unit Weight
- Soluble Sulfate, Soluble Chloride, pH and Resistivity

Results of the laboratory testing are discussed in this report and presented in Appendix B. Some test results, including moisture content; and unit weight, have been incorporated into the test pit log (Figure A-3).

In addition to laboratory testing on samples obtained from this lot, engineering analysis was also based on previously completed laboratory work on soil samples obtained near the site (IGES, 2012a & 2012b).

Engineering Analysis

Engineering analyses were performed using soil data obtained from laboratory testing and empirical correlations based on material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care. An allowable bearing pressure value was proportioned based on estimated shear strength of bearing soils.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

FINDINGS

Surface Conditions

At the time of the excavation, the lot was in a relatively natural state and was covered with a variety of vegetation including mature pine trees, native grasses and shrubs. The lot slopes relatively steeply toward north at a gradient of approximately 2.4H:1V, away from Heartwood Drive. On the southern boundary of the lot there is a 'ridge' jutting northeast into the building envelope, forming a topographic high point for the lot. This ridge is covered with a stand of mature pine trees. The ridge also represents an exposure of bedrock (dolomite). The remainder of the lot is essentially a sloped grassy field. Aside from the rocky outcrops on the ridge, several angular boulders could be observed at various locations on the surface.

Earth Materials

The earth materials exposed at the site consist of a rocky northeast-southwest-trending salient exposing dolomite bedrock, surrounded by a thick sequence of sandy colluvial cover (this is illustrated on Figure A-2). The soil at the surface of the site consists of approximately 6 inches of poorly-developed topsoil consisting of mottled silty sand characterized by an abundance of organic matter (roots, etc.). The topsoil was underlain by medium dense clayey sand extending to a depth of approximately 9 feet below existing grade. Underlying this layer, we encountered coarse colluvium consisting of medium-dense clayey gravel. The colluvium was characterized by abundant coarse angular rock fragments, which extended to the bottom of the excavation (approximately 12 feet below the existing grade). Due to the coarsness of the colluvium at 12 feet, it is postulated that bedrock could have been within a few feet of the bottom of the test pit; however, difficult excavating conditions limited the depth of the test pit.

Upon the topographic high point of the lot (illustrated on Figure A-2 in red, designated as geologic unit Gr), we observed bedrock outcrops consisting of highly weathered, closely fractured dark gray dolomite. The rock unit is fairly hard – samples could only be obtained with a firm blow from a rock hammer. It should be noted that the rock/colluvium contact it thought to dip steeply, since bedrock was not encountered in the test pit even though the test pit was excavated near the bedrock outcrop.

Detailed descriptions of earth materials encountered are presented on the test pit log, Figure A-3, in Appendix A.

Groundwater

Groundwater was not encountered in the test pit excavation. Based on our observations, groundwater is not anticipated to adversely impact the proposed construction. However, groundwater levels could rise at any time based on several factors including recent precipitation, on- or off-site runoff, irrigation, and time of year (e.g., spring run-off). Should the groundwater become a concern during the proposed construction, IGES should be contacted so that dewatering recommendations may be provided.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Geology and Geologic Hazards

Geology and geologic hazards have been previously addressed by Western Geologic in a separate submittal (Western Geologic, 2012). This work has also been referenced in our previous geotechnical reports for the project (IGES, 2012a and 2012b). The report by Western Geologic indicates that the lot is located outside of known geologically unstable areas. The Western Geologic report also includes a large-scale geologic map that shows the subject lot in an area mapped as "undifferentiated dolomite". Dolomite is a rock that has similar mechanical properties to limestone and is fairly hard, often forming cliffs and other near-vertical formations.

During our subsurface investigation, potentially adverse geologic structures (e.g., evidence of faulting or landslides) were not evident to the maximum depth of exploration (12 feet). Geomorphic expressions of shallow, surficial landslides were not observed on, or near the lot. Based on currently available data and our observations, the potential for geologic hazards such as landslides, liquefaction, or surface fault rupture impacting the site is considered low.

Seismicity

Following the criteria outlined in the 2012 International Building Code (IBC, 2012), spectral response at the site was evaluated for the *Maximum Considered Earthquake* (MCE) which equates to a probabilistic seismic event having a two percent probability of exceedance in 50 years (2PE50). Spectral accelerations were determined based on the location of the site using the *U.S. Seismic "DesignMaps" Web Application* (USGS, 2012); this software incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012).

To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and Site Class are used. Site Class is a parameter that accounts for site amplification effects of soft soils and is based on the average shear wave velocity of the upper 100 feet; based on our field exploration and our understanding of the geology in this area, the subject site is appropriately classified as Site Class B (Rock). Based on IBC criteria, the short-period (F_a) coefficient is 1.0 and long-period (F_v) site coefficient is 1.0. Based on the design spectral response accelerations for a Building Risk Category of I, II or III, the site's Seismic Design Category is D. The short- and long-period Design Spectral Response Accelerations are presented in Table 1.0; a summary of the Design Maps analysis is presented in Appendix C. The peak ground acceleration (PGA) may be taken as 0.4*Sms.

Table 1.0
Short- and Long-Period Spectral Accelerations for MCE

Parameter	Short Period (0.2 sec)	Long Period (1.0 sec)
MCE Spectral Response Acceleration (g)	$S_S = 0.826$	$S_1 = 0.274$
MCE Spectral Response Acceleration Site Class C (g)	$S_{MS} = S_s F_a = 0.826$	$S_{M1} = S_1 F_v = 0.274$
Design Spectral Response Acceleration (g)	$S_{DS} = S_{MS}*^2/_3 = 0.551$	$S_{D1} = S_{M1} *^2/_3 = 0.183$

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the field observations, laboratory testing and previously completed geotechnical investigation (IGES, 2012a), the subsurface conditions are considered suitable for the proposed construction provided that the recommendations presented in this report are incorporated into the design and construction of the project.

General Site Preparation and Grading

Prior to the placement of foundations, general site grading is recommended to provide proper support for exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

Below proposed structures, fills, and man-made improvements, all vegetation, topsoil, debris and undocumented fill soils (if any) should be removed. Any existing utilities should be re-routed or protected in place. The exposed native soils should then be proof-rolled with heavy rubber-tired equipment such as a scraper or loader. Any soft/loose areas identified during proof-rolling should be removed and replaced with structural fill. All excavation bottoms should be observed by an IGES representative during proof rolling or otherwise prior to placement of engineered fill to evaluate whether soft, loose, or otherwise deleterious earth materials have been removed and that recommendations presented in this report have been complied with.

Excavations

Soft, loose, or otherwise unsuitable soils beneath structural elements, hardscape or pavements may need to be over-excavated and replaced with structural fill. If over-excavation is required, the excavations should extend one foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. Structural fill should consist of granular materials and should be placed and compacted in accordance with the recommendations presented in this report.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Prior to placing engineered fill, all excavation bottoms should be scarified to at least 6 inches, moisture-conditioned as necessary at or slightly above optimum moisture content (OMC), and compacted to at least 90 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (Modified Proctor). Scarification is not required where bedrock is exposed.

Excavation Stability

The contractor is responsible for site safety, including all temporary trenches excavated at the site and the design of any required temporary shoring. The contractor is responsible for providing the "competent person" required by Occupational Safety and Health (OSHA) standards to evaluate soil conditions. For planning purposes, Soil Type C is expected to predominate at the site (sands and gravels). Close coordination between the competent person and IGES should be maintained to facilitate construction while providing safe excavations.

Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. Where very moist soil conditions or groundwater is encountered, or when the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. As an alternative to shoring or shielding, trench walls may be laid back at one and one half horizontal to one vertical (1½H:1V) (34 degrees) in accordance with OSHA Type C soils. Trench walls may need to be laid back at a steeper grade pending evaluation of soil conditions by the geotechnical engineer. Soil conditions should be evaluated in the field on a case-by-case basis. Large rocks exposed on excavation walls should be removed (scaled) to minimize rock fall hazards. Where dolomite bedrock is exposed, near-vertical walls (0.25H:1V) may be permitted provided adverse jointing or bedding patterns are absent and the excavation is assessed by the OSHA 'competent person' prior to occupancy.

Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill should consist of granular native soils, which may be defined as soils with less than 25% fines, 10-60% sand, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension). Structural fill should also be free of vegetation and debris. Soils not meeting these criteria may be suitable for use as structural fill; however, such soils should be evaluated on a case by case basis and should be approved by IGES prior to use.

All structural fill should be placed in maximum 4-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 6-inch loose lifts if compacted by light-duty rollers, and maximum 8-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. Additional lift thickness may be allowed by IGES provided the Contractor can demonstrate sufficient compaction can be achieved with a given lift thickness with the equipment in use. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. Structural fill underlying all shallow footings and pavements should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557.

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

The moisture content should be at, or slightly above, the OMC for all structural fill. Any imported fill materials should be approved prior to importing. Also, prior to placing any fill, the excavations should be observed by IGES to confirm that unsuitable materials have been removed.

Specifications from governing authorities such as Weber County and/or special service districts having their own precedence for backfill and compaction should be followed where more stringent.

Utility Trench Backfill

Utility trenches should be backfilled with structural fill in accordance with the previous section. Utility trenches can be backfilled with the onsite soils free of debris, organic and oversized material. Prior to backfilling the trench, pipes should be bedded in and shaded with a uniform granular material that has a Sand Equivalent (SE) of 30 or greater. Pipe bedding may be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean ¾-inch gravel, which generally does not require densification. Native earth materials can be used as backfill over the pipe bedding zone. All utility trenches backfilled below pavement sections, curb and gutter, hardscape, should be backfilled with structural fill compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches should be backfilled and compacted to approximately 90 percent of the MDD (ASTM D-1557). However, in all cases the pipe bedding and shading should meet the design criteria of the pipe manufacturer. Specifications from governing authorities having their own precedence for backfill and compaction should be followed where they are more stringent.

Foundations

Based on our field observations and considering the presence of bedrock exposures within the building envelope, we recommend that the footings for proposed home be founded *entirely* on bedrock. Bedrock/soil transition zones are not allowed. However, it is possible, and even likely, that deep colluvial deposits located on the north side of the building envelope may preclude the practical construction of all foundation on bedrock; as such, as an alternative to extending all foundations to bedrock, foundations constructed over colluvium may be underpinned with micropiles or a similar underpinning technology. This is conceptually illustrated on Figure D-1 in Appendix D.

Since the bedrock/colluvium contact cannot be known with certainty, and since the design of the new home is currently in the planning stages, the extent to which micropiles will be necessary (or perhaps not required) will not be evident until the basement is excavated. We recommend that IGES inspect the bottom of the foundation excavation prior to the placement of steel or concrete to identify any unsuitable soils or transition zones. If bedrock/soil transitions zones are identified, the Contractor may wish to pot-hole to assess the depth to bedrock and thus determine if deepening the foundations is practical, or if underpinning the foundations is the preferred option.

It should be noted that the bedrock at the site is expected to be very difficult to excavate (see *Construction Considerations* on page 11 of this report).

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

Shallow spread or continuous wall footings constructed entirely on competent bedrock may be proportioned utilizing a maximum net allowable bearing pressure of **5,000 pounds per square foot (psf)** for dead load plus live load conditions. The net allowable bearing value presented above is for dead load plus live load conditions. The minimum recommended footing width is 20 inches for continuous wall footings and 30 inches for isolated spread footings.

All conventional foundations exposed to the full effects of frost should be established at a minimum depth of 42 inches below the lowest adjacent final grade. Interior footings, not subjected to the full effects of frost (i.e., a continuously heated structure), may be established at higher elevations, however, a minimum depth of embedment of 12 inches is recommended for confinement purposes.

Foundation drains should be installed around below-ground foundations (e.g., basement walls) to minimize the potential for flooding from shallow groundwater, which may be present at various times during the year, particularly spring run-off.

Underpinning

Underpinning, if used, should be designed by IGES or an engineer experienced in deep foundation design. For planning purposes, underpinning may consist of micropiles conforming to the following criteria:

- Injection Bore micropile, R38N hollow bar, uncased.
- 6-inch grouted diameter.
- Socket a minimum of three feet into bedrock or 20 feet into colluvium, whichever is shorter.
- A single micropile, as described above, may be assumed to have an allowable axial capacity of 35 kips.
- Lateral resistance, if required by the Structural Engineer, will require a cased micropile and must be designed for specific project requirements.

Settlement

Static settlement of properly designed and constructed conventional foundations, founded as described above, are anticipated to be on the order of 1 inch or less. Differential settlement is expected to be half of total settlement over a distance of 30 feet.

Competent native earth materials and/or properly compacted structural fill is expected to exhibit negligible seismically-induced settlement during a MCE seismic event.

Earth Pressure and Lateral Resistance

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance against Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

concrete, a coefficient of friction of 0.45 for sandy native soils or structural fill should be used.

Ultimate lateral earth pressures from *granular* backfill acting against retaining walls, temporary shoring, or buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 2.0. These lateral pressures should be assumed even if the backfill is placed in a relatively narrow gap between a vertical bedrock cut and the foundation wall.

Table 2.0
Lateral Earth Pressure Coefficients

	Level Backfill		2H:1V Backfill		
Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)	
Active (Ka)	0.33	35	0.53	56	
At-rest (Ko)	0.50	55	0.80	85	
Passive (Kp)	3.0	320			

These coefficients and densities assume no buildup of hydrostatic pressures. The force of water should be added to the presented values if hydrostatic pressures are anticipated.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils should not be used as retaining wall backfill. Backfill should consist of native granular soil with an Expansion Index (EI) less than 20.

Walls and structures allowed to rotate slightly should use the active condition. If the element is to be constrained against rotation (i.e., a basement or buried tank wall), the atrest condition should be used. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

Concrete Slab-on-Grade Construction

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying properly prepared subgrade. The gravel should consist of free-draining gravel or road base with a 3/4-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer; however, as

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

a minimum, slab reinforcement should consist of 4"×4" W4.0×W4.0 welded wire mesh within the middle third of the slab. We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI). A Modulus of Subgrade Reaction of 400 psi/inch may be used for design.

A moisture barrier (vapor retarder) consisting of 10-mil thick Visqueen (or equivalent) plastic sheeting should be placed below slabs-on-grade where moisture-sensitive floor coverings or equipment is planned. Prior to placing this moisture barrier, any objects that could puncture it, such as protruding gravel or rocks, should be removed from the building pad. Alternatively, the subgrade may be covered with 2 inches of clean sand.

Moisture Protection

Moisture should not be allowed to infiltrate into the soils in the vicinity of the foundations. As such, design strategies to minimize ponding and infiltration near the home should be implemented. The new home may be subject to sheet flow during periods of heavy rain or snow melt; therefore, the Civil Engineer may also wish to consider construction of additional surface drainage to intercept surface runoff, or a curtain drain to intercept seasonal groundwater flow, if any.

We recommend that hand watering, desert landscaping or Xeriscape be considered within 5 feet of the foundations. We further recommend roof runoff devices be installed to direct all runoff a minimum of 10 feet away from structures. The home builder should be responsible for compacting the exterior backfill soils around the foundation. Additionally, the ground surface within 10 feet of the house should be constructed so as to slope a minimum of five percent away from the home. Pavement sections should be constructed to divert surface water off of the pavement into storm drains. Parking strips and roadway shoulder areas should be constructed to prevent infiltration of water into the areas surrounding pavement. Landscape plans must conform to Weber County development codes.

IGES recommends a perimeter foundation drain be constructed for the proposed residential structure in accordance with the International Residential Code (IRC).

Soil Corrosion Potential

Laboratory testing of a representative soil sample obtained from the test pit indicated that the soil sample tested had a sulfate content of 8 ppm. Accordingly, the soils are classified as having a 'low' potential for deterioration of concrete due to the presence of soluble sulfate. As such, conventional Type I/II Portland cement may be used for all concrete in contact with site soils.

To evaluate the corrosion potential of ferrous metal in contact with onsite native soil a sample was tested for soil resistivity, soluble chloride and pH. The test indicated that the onsite soil tested has a minimum soil resistivity of 3,156 OHM-cm, soluble chloride content of 3.8 ppm and a pH of 8.2. Based on this result, the onsite native soil is considered to be

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

moderately corrosive to ferrous metal. Consideration should be given to retaining the services of a qualified corrosion engineer to provide an assessment of any metal that may be associated with construction of ancillary water lines and reinforcing steel, valves etc.

Construction Considerations

- Excavation Difficulty: bedrock consisting of relatively hard dolomite is exposed at the surface within the building envelope. Based on conversations with contractors currently working in the vicinity, this rock is expected to be relatively difficult to remove. Special heavy-duty excavation equipment will likely be required, such as a hammer hoe.
- Over-Size Material: A bedrock outcrop was observed within the building footprint of this lot. In addition, large boulders up to 12 inches were observed on the surface; larger boulders may be present within the colluvial soil. As such, development of the lot is expected to generate a substantial amount of over-size material (rocks larger than 6 inches in greatest dimension). Large rocks, particularly boulders, may require special handling, such as segregation from structural fill, and disposal. Bedrock is expected to require specialized equipment for removal during excavation of the basement.

CLOSURE

The recommendations presented in this letter are based on limited field exploration, literature review, and a general understanding of the proposed construction. The subsurface data used in the preparation of this letter were obtained from the exploration(s) made for this investigation. It is possible that variations in the soil and groundwater conditions could exist beyond the point explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this letter, IGES should be immediately notified so that any necessary revisions to recommendations contained in this letter may be made. In addition, if the scope of the proposed construction changes from that described in this letter, IGES should also be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this letter in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

Additional Services

The recommendations presented in this report are based on the assumption that an adequate program of tests and observations will be made during the construction. IGES staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive, Weber County, Utah

- Observations and testing during site preparation, earthwork and structural fill placement.
- Consultation as may be required during construction.
- Quality control testing of cast-in-place concrete.
- Review of plans and specifications to assess compliance with our recommendations.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please contact the undersigned at (801) 748-4044.

Respectfully submitted, IGES, Inc.

Reviewed by:

3-1/2

Shun Li, P.E.I. Staff Engineer David A. Glass, P.E.

Senior Geotechnical Engineer

No. 6370734

Attachments:

References

Appendix A

Figure A-1 – Site Vicinity Map

Figure A-2 – Geotechnical Map

Figure A-3 – Test Pit Log

Figure A-4 – Key to Soil Symbols and Terminology

Appendix B – Laboratory Results

Appendix C – 2012 IBC MCE and Design Response Acceleration

Appendix B – Laboratory Results

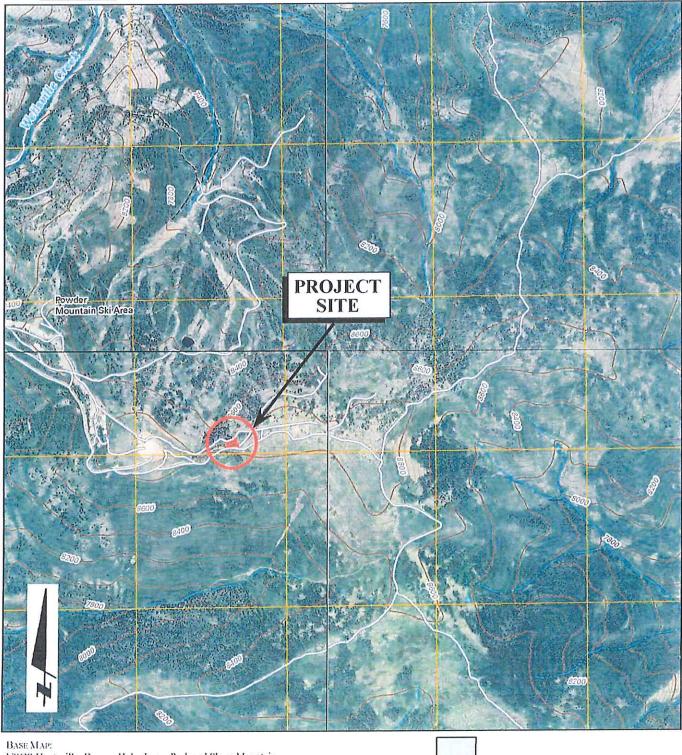
Figure D-1 – Conceptual Cross-Section – Foundation Underpinning

Figure D-2 – Conceptual Cross-Section – Source Plan-View

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- IGES, Inc., 2012a, Design Geotechnical Investigation, Powder Mountain Resort, Weber County, Utah, Project No. 01628-003, dated November 9, 2012.
- IGES, Inc., 2012b, Preliminary Geotechnical Investigation, Powder Mountain Resort, Weber County, Utah, Project No. 01628-001, dated July 26, 2012.
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- Western Geologic, 2012, Report: Geologic Hazards Reconnaissance, Proposed Area 1 Mixed-Use Development, Powder Mountain Resort, Weber County, Utah, dated August 28, 2012.

APPENDIX A



USGS Huntsville, Browns Hole, James Peak and Sharp Mountain 7.5-Minute Quadrangle Topographic Maps (2011)





MAP LOCATION

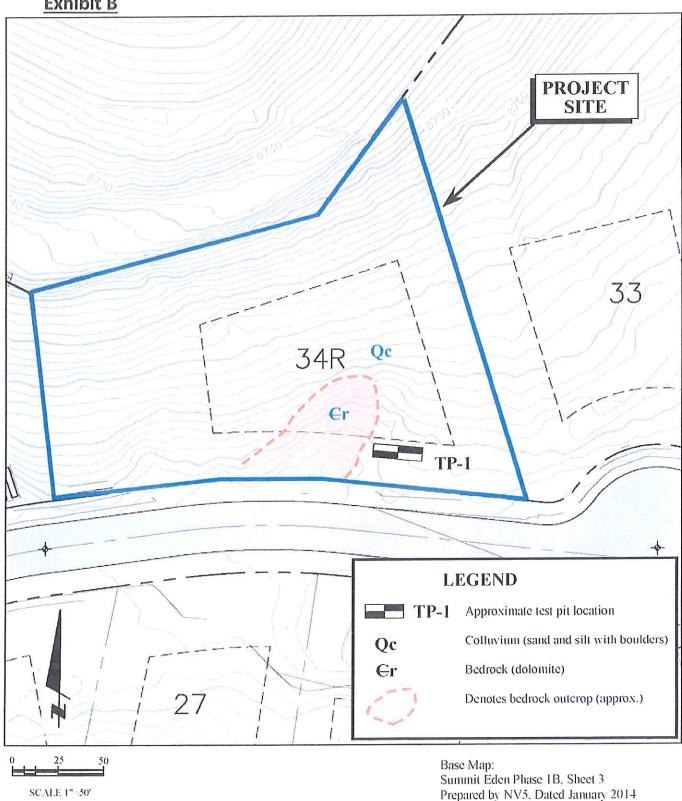


Geotechnical Investigation Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive Weber County, Utah

SITE VICINITY MAP

Figure

A-1





Geotechnical Investigation Lot 34R of Powder Mountain Resort 7958 East Heartwood Drive GEOTECHNICAL MAP Weber County, Utah

Figure

A-2

Exhibit B TEST PIT NO: Geotechnical Investigation STARTED: DATE IGES Rep: SL Lot 34R of Powder Mountain Resort TP-1COMPLETED: 7/18/14 7958 East Heartwood Drive trackhoe Rig Type: Sheet 1 of 1 BACKFILLED: 7/18/14 Weber County, Utah Project Number 01628-006 DEPTH LOCATION Moisture Content Moisture Content % GRAPHICAL LOG UNIFIED SOIL CLASSIFICATION and LONGITUDE -111.75790 ELEVATION 8,808 Percent minus 200 LATITUDE 41.36961 Dry Density(pcf) WATER LEVEL Atterberg Limits Plasticity Index ELEVATION Liquid Limit Plastic Moisture Liquid Limit Content Limit SAMPLES FEET MATERIAL DESCRIPTION 102030405060708090 0 Silty SAND - medium dense, moist, mottled, heavy roots in upper 18 inches SM Clayey SAND - loose, moist, brown, occasional roots SC 8805 83.8 27.2 5 Clayey GRAVEL with sand - loose to medium dense, moist, reddish GC brown, coarse angular rock (colluvium) disaggregated into angular rock fragments up to 3 inches in diameter 14.9 10 No groundwater encountered Bottom of Test Pit @ 12 Feet NOTES:

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OF TEST PITS (A) -(4 LINE HEADER W ELEV) 01628-006 LOT 34R,GPJ IGES,GDT 8/6/14

371	VII	LL	1	11	1	
m	CI	AD	c	181	IDI	t

3" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL

▼- MEASURED FIGURE

UNIFIED SOIL CLASSIFICATION SYSTEM

MA IOR DIVISIONS DESCRIPTIONS WELL-GRADED GRAVELS, GRAVEL-SAND GW MIXTURES WITH LITTLE OR NO FINES CLEAN GRAVELS GRAVELS WITH LITTLE OR NO FINES POORLY-GRADED GRAVELS, GRAVEL-SAND More than half of coarse fraction MIXTURES WITH LITTLE OR NO FINES is larger than SILTY GRAVELS GRAVEL-SILT-SAND GM the #4 sieve) GRAVELS COARSE GRAINED SOILS WITH OVER CLAYEY GRAVELS, GRAVEL-SAND-CLAY 12% FINES GC (More than half of material is larger than WELL-GRADED SANDS, SAND-GRAVEL CLEAN SANDS MIXTURES WITH LITTLE OR NO FINES WITH LITTLE OR NO FINES the #200 sleve) SANDS POORLY-GRADED SANDS, SAND-GRAVEL SP MIXTURES WITH LITTLE OR NO FINES More than half of coarse fraction is smaller than SM SANDS WITH the #4 sieve) **OVER 12% FINES** CLAYEY SANDS SC SAND-GRAVEL-CLAY MIXTURES ORGANIC SILTS & VERY FINE SANDS. ML CLAYEY SILTS WITH SLIGHT PLASTICITY SILTS AND CLAYS INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS (Liquid limit less than 50) FINE GRAINED ORGANIC SILTS & ORGANIC SILTY CLAYS OL OF LOW PLASTICITY INORGANIC SILTS, MICACEOUS OR (More than half MH DIATOMACEOUS FINE SAND OR SILT of material is smaller than SILTS AND CLAYS INORGANIC CLAYS OF HIGH PLASTICITY, the #200 sleve) CH FAT CLAYS (Liquid limit greater than 50) ORGANIC CLAYS & ORGANIC SILTS OH OF MEDIUM-TO-HIGH PLASTICITY PEAT, HUMUS, SWAMP SOILS HIGHLY ORGANIC SOILS PT WITH HIGH ORGANIC CONTENTS

MOISTURE CONTENT

ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
ABBENCE OF MOISTORE, DOST 1, DRT TO THE TOUCH
DAMP BUT NO VISIBLE WATER
VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE
۰

STRATIFICATION

1	DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
	SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
	LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

LOG KEY SYMBOLS





TEST-PIT SAMPLE LOCATION



WATER LEVEL (level after completion)

 $\underline{\nabla}$

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKELY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
s	SOLUBILITY	R	RESISTIVITY
0	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only.
 Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL		TORVANE	POCKET PENETROMETER	FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNTRAINED SHEAR STRENGTH (Isf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

IGES°

Key to Soil Symbols and Terminology

Figure A-4

IGES, Inc. Project No.:01628-94 of 128

APPENDIX B

Exhibit Bontent and Unit Weight of Soil (In General Accordance with ASTM D7263 Method B and D2216)



Project: GTI - Powder Mountain Resort

No: 01628-006

Location: Weber County, Utah

Date: 7/29/2014

By: MP

<u>v</u> .	Boring No.		4-435		
Sample Info.		Lot34TP1		(JESTINE)	
Sa	Depth:	4.0'			
	Sample height, H (in)	5,446			
nfo.	Sample diameter, D (in)	2.416		原型對身	
Unit Weight Info.	Sample volume, V (ft ³)	0.0144		5265	Control of the contro
/eig	Mass rings + wet soil (g)	948.80			
it W	Mass rings/tare (g)	250.66			TUNUS .
ក	Moist soil, Ws (g)		_ 32.2752.14		
	Moist unit wt., γ _m (pcf)	106.53			
int	Wet soil + tare (g)	819.67			
Water Content	Dry soil + tare (g)	670.76	100	The Date	
> 0	Tare (g)	122.36			
	Water Content, w (%)	27.2		E-F-F-	
	Dry Unit Wt., γ _d (pcf)	83.8			

Entered	by:	
Review	ed:	

Exhibit Baboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and



Ions in Water by Chemically Suppressed Ion Chromatography (4.4SUTO T 288, T 289, ASTM D4327, and C1580)

Project: GTI - Powder Mountain Resort

No: 01628-006

Location: Weber County, Utah

Date: 8/5/2014 By: ET

ı	
L	Boring No.
	Sample
_	Depth
	Wet soil + tare (g)
_	Dry soil + tare (g)
_	Tare (g)
_	Water content (%)
L	pН
	Soluble chloride* (ppm)
L	Soluble sulfate** (ppm)
t	Pin method
	Soil box
THE REAL PROPERTY.	
	NAT.
	Minimum resistivity (Ω-cm)

						mn.	200 0
Ŧ	Performed	by	A	WAL	using	EPA	300.0

Entered by:	
Reviewed:	

^{**} Performed by AWAL using ASTM

APPENDIX C

Design Maps Summary Report

User-Specified Input

Report Title Lot 34R

Tue August 12, 2014 00:42:37 UTC

Building Code Reference Document 2012 International Building Code

(which utilizes USGS hazard data available in 2008)

Site Coordinates 41.3696°N, 111.7579°W

Site Soil Classification Site Class B - "Rock"

Risk Category I/II/III



USGS-Provided Output

$$S = 0.826 g$$

$$S_{...} = 0.826$$

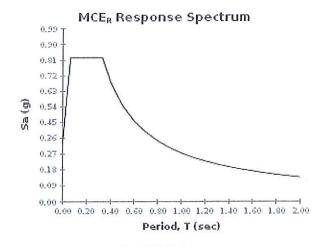
$$S_s = 0.826 g$$
 $S_{MS} = 0.826 g$ $S_{DS} = 0.551 g$
 $S_1 = 0.274 g$ $S_{M1} = 0.274 g$ $S_{D1} = 0.183 g$

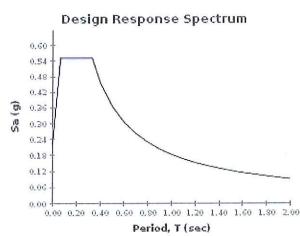
$$S = 0.274 g$$

$$S = 0.274$$

$$S_{1} = 0.183$$

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

Exhibit B USGS Design Maps Detailed Report

2012 International Building Code (41.3696°N, 111.7579°W)

Site Class B - "Rock", Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2012 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From	Figure	1613.3.1(1)	[1]

$$S_s = 0.826 g$$

From Figure 1613.3.1(2) [2]

$$S_{1} = 0.274 g$$

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class B, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1 SITE CLASS DEFINITIONS

Site Class	v _s	\overline{N} or \overline{N}_{ch}	s u
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf

Any profile with more than 10 ft of soil having the characteristics:

- Plasticity index PI > 20,
- Moisture content $w \ge 40\%$, and
- Undrained shear strength $s_{\parallel} < 500 \text{ psf}$

F. Soils requiring site response analysis in accordance with Section 21.1

See Section 20.3.1

For SI: $1ft/s = 0.3048 \text{ m/s} 1 \text{lb/ft}^2 = 0.0479 \text{ kN/m}^2$

response acceleration parameters

TABLE 1613.3.3(1) VALUES OF SITE COEFFICIENT F

Site Class	Mapped Spectral Response Acceleration at Short Period							
	S _s ≤ 0.25	S _s = 0.50	$S_s = 0.75$	S _s = 1.00	S _s ≥ 1.25			
Α	0.8	8,0	0.8	0.8	0.8			
В	1.0	1.0	1.0	1.0	1.0			
С	1.2	1.2	1.1	1.0	1.0			
D	1.6	1.4	1.2	1.1	1.0			
E	2.5	1.7	1.2	0.9	0.9			
F	See Section 11.4.7 of ASCE 7							

Note: Use straight-line interpolation for intermediate values of $S_{\rm s}$

For Site Class = B and $S_s = 0.826 g$, $F_a = 1.000$

TABLE 1613.3.3(2) VALUES OF SITE COEFFICIENT F

Site Class	Mapped Spectral Response Acceleration at 1-s Period					
	S ₁ ≤ 0.10	S ₁ = 0.20	$S_{i} = 0.30$	$S_{i} = 0.40$	$S_i \ge 0.50$	
Α	0.8	0.8	0.8	0.8	0.8	
В	1.0	1.0	1.0	1.0	1.0	
С	1.7	1.6	1.5	1.4	1.3	
D	2.4	2.0	1.8	1.6	1.5	
E	3.5	3.2	2.8	2.4	2.4	
F	See Section 11.4.7 of ASCE 7					

Note: Use straight-line interpolation for intermediate values of S,

For Site Class = B and $S_1 = 0.274 g$, $F_v = 1.000$

Equation (16-37):

$$S_{MS} = F_a S_S = 1.000 \times 0.826 = 0.826 g$$

Equation (16-38):

$$S_{M1} = F_v S_1 = 1.000 \times 0.274 = 0.274 g$$

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):

$$S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.826 = 0.551 g$$

Equation (16-40):

$$S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.274 = 0.183 g$$

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)

SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

WALLE OF C	RISK CATEGORY			
VALUE OF S _{DS}	I or II	III	IV	
S _{ps} < 0.167g	Α	Α	Α	
0.167g ≤ S _{DS} < 0.33g	В	В	С	
0.33g ≤ S _{DS} < 0.50g	С	С	D	
0.50g ≤ S _{DS}	D	D	D	

For Risk Category = I and $S_{DS} = 0.551$ g, Seismic Design Category = D

TABLE 1613.3.5(2)

SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

WALLE OF C	RISK CATEGORY			
VALUE OF S _{D1}	I or II	III	IV	
S _{D1} < 0.067g	А	Α	Α	
0.067g ≤ S _{D1} < 0.133g	В	В	С	
0.133g ≤ S _{D1} < 0.20g	С	С	D	
0.20g ≤ S _{D1}	D	D	D	

For Risk Category = I and $S_{D1} = 0.183$ g, Seismic Design Category = C

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category \equiv "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = D

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

- 1. Figure 1613.3.1(1): http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
- 2. Figure 1613.3.1(2): http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf



February 11, 2016

Summit Powder Mountain c/o Ms. Andrea Milner 3632 North Wolf Creek Drive Eden, Utah 84310

IGES Project No. 01628-006

Subject:

Exhibit B

Addendum to Geotechnical Report – Geology & Slope Stability

Lot 34R of Powder Mountain Resort

7958 East Heartwood Drive

Weber County, Utah

Ms. Milner:

As requested, IGES has prepared the following addendum to the referenced geotechnical report to further address geologic issues, such as the presence (or absence) of geologic hazards and slope stability. This addendum is intended to address issues that have recently come to light during the review process for adjacent properties; specifically, geologic review comments by the Weber County geologist. The purpose of this addendum is to adequately address geology consistent with recent questions brought up by the Weber County geologist, and to comply with the Weber County Hillside Development Review Procedures.

Description of Geologic Units

A geologic investigation that included geologic mapping of Lot 13 and the surrounding area was conducted by IGES between August 26 and 27, 2015 (IGES, 2015a). This investigation covered the Lot 34R property area within its area of investigation, and included field mapping, aerial photograph review, and the review of other available geologic data (Western Geologic, 2012; Sorenson and Crittenden, Jr., 1979) pertaining to the area of interest. A brief description of the geologic units found adjacent to and across the Lot 34R property is presented in the following paragraphs.

A prominent bedrock outcrop of the Dolomite Member of the Cambrian St. Charles Limestone near the southwestern corner of Lot 27 (located just south of Lot 34R) provided an understanding of the bedrock stratigraphy. At lot 27, approximately 45 feet of bedrock is continuously exposed, and displays four distinct lithologic units:

1. Unit 1: The uppermost unit is a dark gray, sparry¹ dolomite found to contain abundant round, curved, whitish-yellow shell fragments in massive blocks. The exposed thickness of this unit at this location is approximately 3 feet.

¹ A term loosely applied to ay transparent or translucent light-colored crystalline mineral, usually readily cleavable and somewhat lustrous (AGI, 1984).

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- 2. Unit 2: Immediately underlying Unit 1 is a dark gray to light gray sparry dolomite containing faint laminations in thickly bedded blocks. Within the unit are distinct dark gray beds that contain abundant rounded *Girvanella*² nodules up to 1 centimeter in diameter. Bedding becomes more prominent with depth in this unit, which is approximately 10 to 12 feet thick.
- 3. Unit 3: Immediately underlying Unit 2 is a dark gray, sparry dolomite that is transitional between the overlying two units, in that it contains some laminations and curved shelly material. The unit is thickly to moderately bedded, and is distinct from the overlying units in that it contains abundant thin yellow stringers of calcium carbonate. The unit is seen to be approximately 20 to 25 feet thick.
- 4. Unit 4: The basal unit in the exposed outcrop is a light gray to pinkish gray, finely sparry dolomite with a highly variegated, mottled coloration in irregular, elongated lobes. Distinct to this unit is the presence of small vugs up to 2 inches in diameter, commonly filled with recrystallized dolomite. The exposed thickness of this unit at this location is approximately 5 feet.

Bedding at this outcrop (Lot 27) was found to strike at N24°W and dip at 25°NE, which was largely characteristic of the bedding found on Lot 34R and the Ridge Nest property to the west, which, as a whole, consist largely of bedrock outcrops. Across Lot 34R and adjacent properties to the west and south, the bedrock was found to have blocky jointing, with the two major joint sets being orthogonal to one another. The joint set parallel to the bedding has the same strike and dip orientation as the bedding, while the other major joint set perpendicular to the first has a strike of approximately N24°W and a dip of approximately 65°SW.

Bedrock was found to be largely moderately fractured (distance between fractures ~0.5-1.0 feet) to little fractured (distance between fractures ~1.0-4.0 feet), with localized areas of intense fracturing (distance between fractures ~0.05-0.1 feet). Joint spacing was largely found to be a product of the lithology. The finer-grained dolomite lithologies were more thinly bedded, and therefore had a smaller distance (approximately 1 to 4 inches) between bedding plane joints. These lithologies also tended to fracture into rectangular blocks generally between 4 and 18 inches in length and width, and contained both bedding-confined and through-going fractures. Coarser-grained dolomite lithologies were more thickly bedded to massive, with bedding plane joints separated by between 6 inches to as much as several feet. These lithologies tended to fracture into rectangular blocks with highly variable dimensions, ranging in width and length from between a couple inches to several feet, though larger blocks (with dimensions of several feet x several feet x several feet) were most common. Most fracturing associated with the coarser-grained dolomite lithologies consisted of large through-going fractures.

Nearly all of the joints encountered in the field investigation were open, had slightly rough to rough surfaces, and did not contain a secondary mineralization, except rare calcite infilling in places. No slickensides were observed on any joint surface. Joint apertures varied from between

² Girvanella is a *microbial biscuit* (hemispherical or disk-shaped calcareous mass) characterized by a complex of microscopic filaments (AGI, 2005).

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a few millimeters to a couple inches in width. Joints with smaller apertures tended to be devoid of any sort of fill, while the larger aperture joints were often filled with soil.

The dolomite bedrock described above covers all of the Lot 34R property, with the exception of the southeastern corner of the property. This area, where TP-1 was excavated, contains a veneer of undifferentiated Quaternary colluvial and slopewash deposits up to as much as 12 feet thick. This unit is comprised of a combination of angular dolomite and rounded quartzite clasts, with the dolomite clasts commonly found to be moderately weathered and oxidized.

The preceding bedrock characteristics were discussed between the engineering geologist and the geotechnical engineer and were taken into consideration in development of the subsurface model, geologic cross section, and subsequent slope stability analysis.

Faulting

Based upon a review of the available geologic data for the Lot 34R property and surrounding area, no evidence of faulting was observed. According to the USGS Quaternary Fault and Fold Database of the United States (USGS and UGS, 2006), the closest fault to the area of investigation is approximately 2.5 miles to the southwest. IGES reviewed three stereo pairs of aerial photographs that cover the Ridge Nests property and adjacent areas. The aerial photographs reviewed for this exercise are listed in Table 1. The aerial photographs were examined stereoscopically for the presence of photo-lineaments which might be indicative of faulting, as well as other additional geomorphic features. No photo-lineaments were observed either crossing or projecting toward the subject property. Additionally, no fault-related geomorphic features indicative of past surface faulting at or near the property, including fault scarps, vegetation lineaments, gullies, vegetation/soil contrasts, aligned springs or seeps, sag ponds, aligned or disrupted drainages, faceted spurs, grabens, or displaced landforms were observed in either the aerial photographs reviewed or the site reconnaissance.

Table 1
Stereoscopic Aerial Photographs Reviewed

SOURCE*	DATE	FLIGHT	PHOTOGRAPHS	SCALE
1947 AAJ	August 10, 1946	AAJ_1B	88-90	1:20,000
1953 AAI	September 14, 1952	AAI_4K	34-36	1:20,000
1963 ELK	June 25, 1963	ELK_3	57-59	1:15,840

^{*}https://geodata.geology.utah.gov/imagery/

Slope Stability Analysis

The global stability of the slope was modeled using gSTABL7 slope stability software. Bishop's Method and Janbu's Simplified method was used to model the slope, as appropriate. For our analysis, we have assessed Section A-A', illustrated on Figure 1 (Geologic Map) and the Geologic Cross-Section, Figure 2, attached. Calculations for stability were developed by searching for the minimum factor-of-safety for both a circular-type failure and a block-type (translational) failure. For the circular analysis model, arcuate failure surfaces and homogenous

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earth materials were assumed. For the block analysis, anisotropic strength parameters in the bedrock was assumed, based on the apparent dip of bedding and jointing as measured at bedrock outcrops just west and north of Lot 34R (apparent dip of approximately 4 degrees, the slope stability software has been allowed to search between 0 and 15 degrees). A minimum static factor-of-safety of 1.5 and seismic factor-of-safety of 1.0 (global stability) was considered acceptable for this project considering the available information and design assumptions.

The earth materials present on Lot 34R generally consist of relatively competent, moderately weathered dolomite and coarse colluvium. The software package RocLab (V. 1.033), which is based on the Hoek-Brown failure Criterion (1997) was utilized to estimate equivalent strength parameters for dolomite (friction angle and cohesion) to be used in conventional limit-equilibrium slope stability software. Input parameters utilized to estimate reasonable strength parameters were as follows:

- Uniaxial Compressive Strength: 1,500 ksf
- GSI: 45 (geologic strength index)
- Mi Value: 9 (intact rock parameter)
- D: 0.7 (disturbance factor)

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• MR: 425 (Modulus Ratio, used to estimate the intact rock deformation modulus, Ei)

Based on these input parameters, RocLab indicates an equivalent cohesion of 44.844 ksf and a friction angle of 20.1 degrees for the dolomite. For our analysis, IGES has conservatively reduced the estimated equivalent cohesion by approximately 20% to 35 ksf. For our anisotropic analysis, strength along bedding and/or jointing has been estimated to have a friction angle of 42 degrees and a cohesion of zero (IGES, 2015b). The output file for RocLab is attached.

The surficial unit described on the geologic map as Qc-sw is undifferentiated colluvium and slope wash. This material is generally very coarse and bouldery; constituents generally have a moderate degree of angularity. Accordingly, we have assigned a friction angle of 42 degrees and a cohesion of zero for the colluvium north of Lot 34R.

For the seismic (pseudo-static) assessment of the slopes, the seismic coefficient k_h is modeled as equal to 50% of the peak ground acceleration (PGA) resulting from a MCE seismic event (2PE50). From our referenced geotechnical report, the PGA resulting from a 2PE50 seismic event is taken as 0.33g. Therefore, for seismic analysis we have adopted a seismic coefficient of 0.165g.

The exact configuration of the new home's foundations is currently unknown; however, based on experience with similar projects, IGES has estimated an approximate and reasonable foundation configuration to assess the impact of a new home to the slope. Various surcharge loads have been included in the analysis to model a) possible fill sections, and b) foundation loading of 1500 psf.

Based on our analysis, the global stability of the north-facing natural slope meets the minimum factors-of-safety of 1.5 and 1.0 for static and seismic conditions, respectively. The results of the global stability analyses are attached.

Pawder Mauntain Resear Webs: Count Units Leaf 34R

Conclusions

Based on the geologic evidence presented on the attached *Geologic Map* (Figure 1), the associated *Geologic Cross-Section* (Figure 2), and the slope stability assessment presented herein, the following conclusions are made:

- 1. The stability of the slope is not adversely impacted by the geologic, stratigraphic, or hydrologic conditions observed.
- 2. There are no evident potential on-site or off-site geologic hazards that can adversely affect the subject property, and the site is considered suitable for development from a geologic hazards standpoint.
- 3. The site is considered suitable for development from a geotechnical perspective, provided the recommendations presented in the referenced 2014 geotechnical report are incorporated into the design and construction of the project.

Also, once construction plans are established, IGES should review the plans and assess compatibility with our recommendations and conclusions. The impact of the proposed foundation and grading to slope stability should also be assessed.

Powder Manifull Resolve Weber County, Vials Lat 548

Closure

We appreciate the opportunity to provide you with our services. If you have any questions please contact the undersigned at your convenience (801) 748-4044.

Respectfully Submitted, IGES, Inc.

Peter E. Doumit, P.G., C.P.G.

Senior Geologist

David A. Glass, P.E.

Senior Geotechnical Engineer

Attachments:

References

Figure 1 – Geologic Map

Figure 2 - Geologic Cross-Section A-A'

No. 6370734

Slope Stability Analysis

Reviewed by:

C. Charles Payton, P.G.

Engineering Geologist

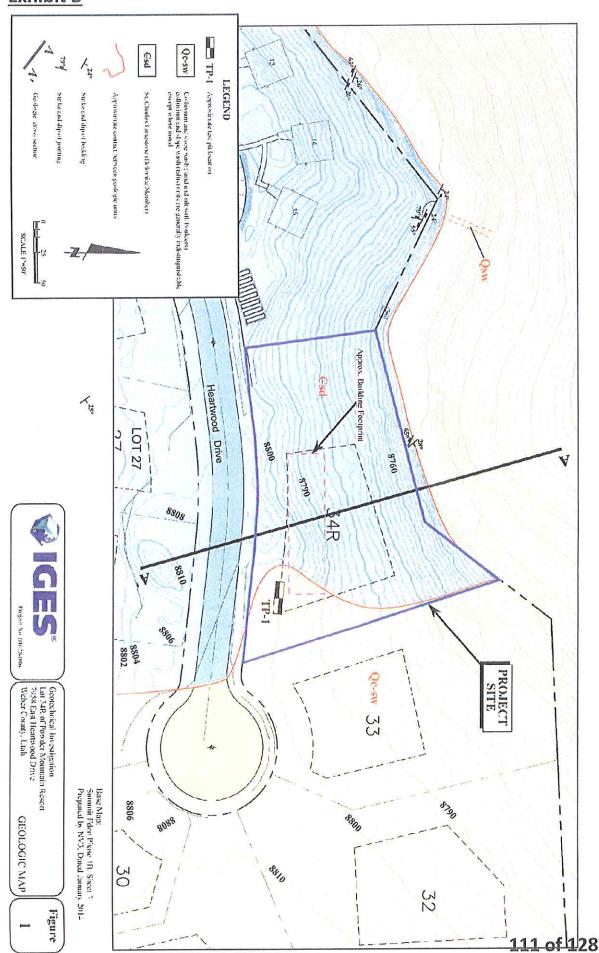
No. 5248599 C. CHARLES PAYTON

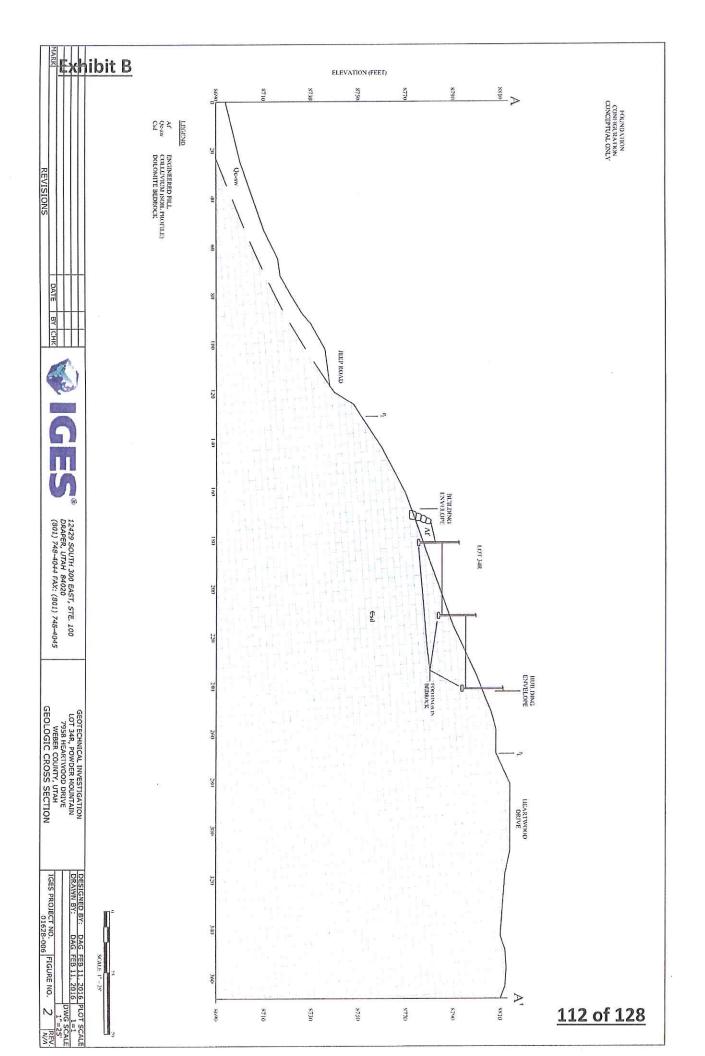
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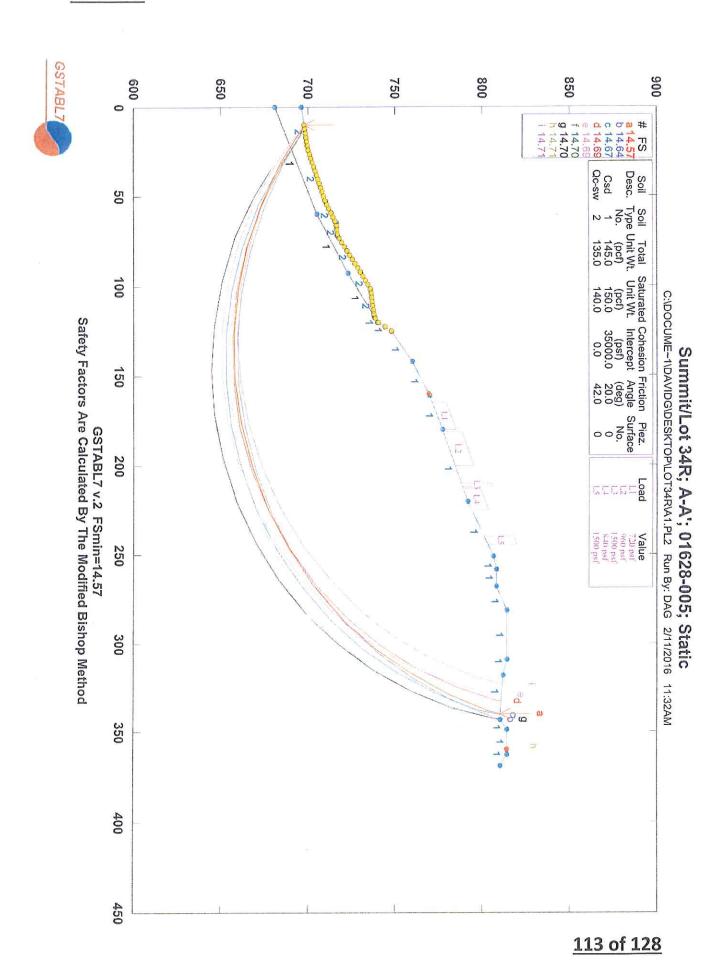
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References

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Boundary

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X-Right (ft)

Soil Type Selow Bnd

BOUNDARY COORDINATES

23 Top 26 Total

Boundaries Boundaries

GSTABL7 ***

GSTABL7 by Garry H. Gregory, P.E. **

December 2001 ** ** Original Version 1.0, January 1996; Current Version 2.002,

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(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/File, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options. Modified Bishop, Simplified Janbu, or GLE Method of Slices. SLOPE STABILITY ANALYSIS SYSTEM

苏尔林芬莱苏尔芬英国乔莱尔英安英尔英尔斯特特格洛尔芬芬芬洛洛芬希特芬洛格尔洛尔芬格特洛洛尔安米尔特米洛洛布安洛格莫洛洛斯用格布斯洛斯马洛洛斯普洛斯用格奇洛耳斯洛格尔洛斯

ISOTROPIC SOIL PARAMETERS

μ

User Specified Y-Origin =

600.00(ft

2 Type(s) of Soil

Input Data Filename: Output Filename:

C:al. C:al.OUT English

DAG

Analysis Run Date: Time of Run:

Unit System:

Plotted Output Filename:

C:al.PLT

PROBLEM DESCRIPTION: Summit/Lot 34R; A-A'; 01628-005; Static

Soil Total Saturated Cohesion Type Unit Mt. Unit Mt. Intercept No. (pcf) (pcf) (psf)

145.0 135.0 150.0 35000.0 Cohesion Friction Intercept Angle (deg) Pore Pressure Piez. Pressure Constant Surface 0.00 Param.

(psf) 0.0

ö.

BOUNDARY LOAD(S)

5 Load(s) Specified

Load No. いるらひし 165.00 181.00 210.00 213.00 240.00 X-Left (ft) X-Right (ft) 180.00 200.00 212.00 225.00 244.00 Intensity 720.0 960.0 1500.0 840.0 1500.0 (psf) Deflection 00000 00000

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical ranson Technique For Generating 2500 Trial Surfaces Have Been Generated. Critical Failure Surface Searching Method, Using A Random echnique For Generating Circular Surfaces, Has Been Specified. 7 112 113 114 115 117 151.70 176.46 200.66 223.96 246.04 266.62 285.40 302.14 316.60 328.60 337.95 658.38 661.81 668.09 677.15 688.86 719.56 719.56 718.13 758.13 758.53 780.46 803.64

50 Surface(s) Initiate(s) From Along The Ground Surface Between and Each Of 50 Points Equally Spaced X = 10.00(ft) X = 125.00(ft)

Each Surface Terminates Between and X = 160.00(ft) X = 360.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is $\chi = 0.00(\text{ft})$

25.00(ft) Line Segments Define Each Trial Failure Surface

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -40.0 And -20.0 deg.

The Trial

Following Is Displayed The Most Critical Of Failure Surfaces Evaluated.

Safety Factors Are Calculated By The Modified Bishop Method

Total Number of Trial Surfaces Evaluated B 2500

Statistical Data On All Valid FS Values: FS Max = 58.513 FS Min = 14.573 FS Ave = Standard Deviation = 4.572 Coefficient of Variation 20.333 p

22.49

Failure Surface Specified By 18 Coordinate Points

Point No. X-Surf (ft) 10.00 31.16 53.72 77.38 101.82 126.70 697.67 684.34 673.57 665.50 660.24 657.85 Y-Surf

> Individual data 9 the 44 slices

Weight (1bs) Water Force Top (lbs) Water Force Bot (1bs) Force Tan Hor Earthquake Force Surcharge /er Load

8133.7
2417.1
114526.1
84015.9
3726.1
35411.4
31606.3
148209.4
40488.5
1290933.2
9792.3
2006.5
12606.5
146611.4
62166.5
22374.9
146611.4
64260.3
58559.0
116578.0
318154.6
1157957.4

Center At X = 134.64 ; Y = 871.83 ; and Radius =

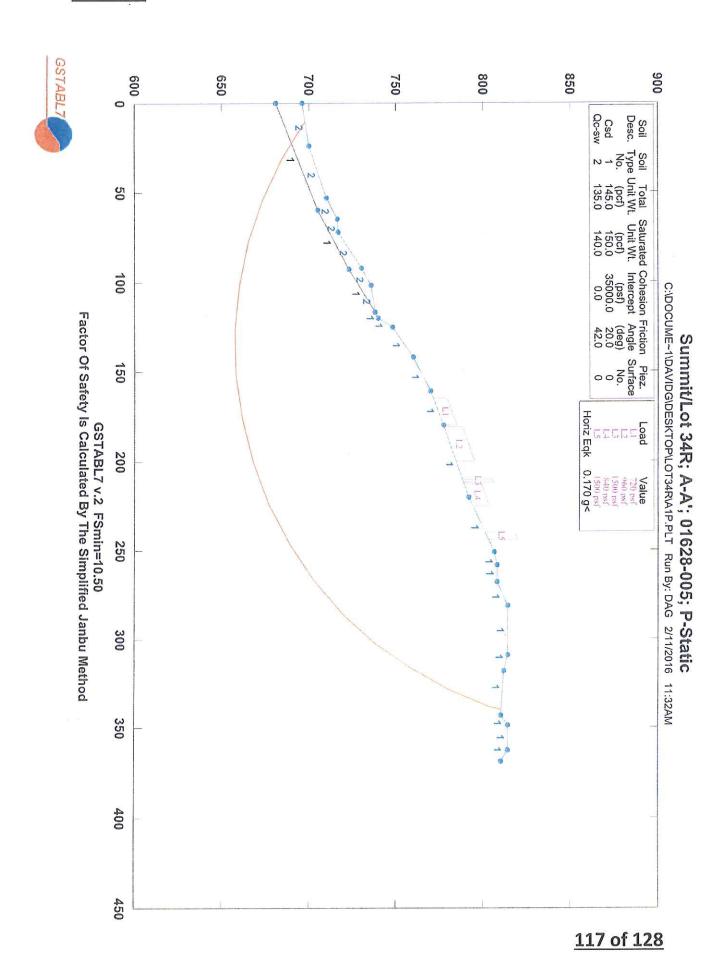
214.17

Circle

Factor of Safety *** 14.573 ***

	1.8	9.4	10.6	1.4	7.6	6.9	16.7	4.4	13.0	1.4		7.0	5.0	2.0	4.0	15.0	1.0	4.0	7.0	1.0
+ +	887.0	25409.1	62689.0	10602.0	66138.6	70645.8	206650.8	61542.3	190412.8	20871.8	134881.5	113984.7	82132.1	34088.2	66824.9	252215.8	17638.6	66842.3	118178.9	16890.7
	0.0	0.0	0.0	0.0	0.0	0.0	0-0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

 ** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

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Surfaces, Pseudo-Static Earthquake, and Applied Force Options. Including Pier/Pile, Reinforcement, Soil Nail, Tieback, Wonlinear Undrained Shear Strength, Curved Phi Envelope, Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water Modified Bishop, Simplified Janbu, or GLE Method of Slices. (Includes Spencer & Morgenstern-Price Type Analysis) SLOPE STABILITY ANALYSIS SYSTEM

终还留得建筑场出现经济特技不够的的特殊者在保险中的各种的环境和环境的中央的一种大学的一种的一种和一种不知的人,是是一种的一种,是一种的一种,是一种的一种,是一种的一种,

Output Filename: Plotted Output Filename: Unit System: Input Data Filename: Time of Run: Analysis Run Date: C:alp. C:alp.OUT English C:alp.PLT 2/11/2016 11:32AM

PROBLEM DESCRIPTION: Summit/Lot 34R; A-A'; 01628-005; P-Stati

BOUNDARY COORDINATES

23 Top Boundaries 26 Total Boundaries

Boundary

No.

(ft)

X-Right (ft)

Y-Right (ft)

Soil Type Below Bnd

0.00 24.00 53.00 65.00 72.00 92.00 102.00 117.00 696.00 700.00 710.00 716.00 717.00 730.00 738.00 740.00 24.00 53.00 65.00 72.00 92.00 102.00 117.00 120.00 700.00 710.00 716.00 717.00 730.00 736.00 738.00 740.00 748.00 H H N N N N N N N

ISOTROPIC SOIL PARAMETERS

User Specified Y-Origin =

600.00 (ft

2 Type(s) of Soil

Soil Total Saturated Cohesion
Type Unit Wt. Unit Wt. Intercept
No. (pcf) (pcf) (psf) 145.0 135.0 150.0 35000.0 Cohesion Friction Intercept Angle (deg) Pore Pressure Piez. Pressure Constant Surface 0.00 Param.

(psf)

No.

0.0

BOUNDARY LOAD (S)

5 Load(s) Specified

No. 4 4 3 4 4 5 165.00 181.00 210.00 213.00 240.00 X-Left (ft) X-Right (ft) 180.00 200.00 212.00 225.00 244.00 Intensity 720.0 960.0 1500.0 840.0 1500.0 (psf) Deflection 0.000

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

222221165431112110 2222211865431110 125.00 142.00 180.00 220.00 251.00 258.00 258.00 258.00 309.00 318.00 349.00 349.00 363.00 748.00 760.00 770.00 777.00 806.00 808.00 808.00 814.00 814.00 814.00 814.00 814.00 814.00 142.00
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Vertical Earthquake Loading Coefficient	jned	6nropor a
)efficient		COURTHURSE

A Vertical Earthquake Loading Coefficient Of0.000 Has Been Assigned

Cavitation Pressure = 0.0(psf)

Janbu's Empirical Coef. is being used for the case of $\,\,$ c $\,$ $\,$ phi both $\,>\,$ 0

ы

Trial Failure Surface Specified By 18 Coordinate Points

2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	Soint No.	
151.70 176.46 200.66 223.96 246.04 266.62 285.40 302.14 316.60 328.60 337.95 339.76	-Sur (ft) 10.0 31.1 31.1 53.7 77.3 01.8	
658.38 668.09 677.15 688.86 773.06 773.15 778.55 778.13 778.53 778.53	(ft) 97.6 97.6 84.3 73.5 65.5 65.5	

Janbu's Empirical Coefficient (fo) = 1.082

 * * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 10.498

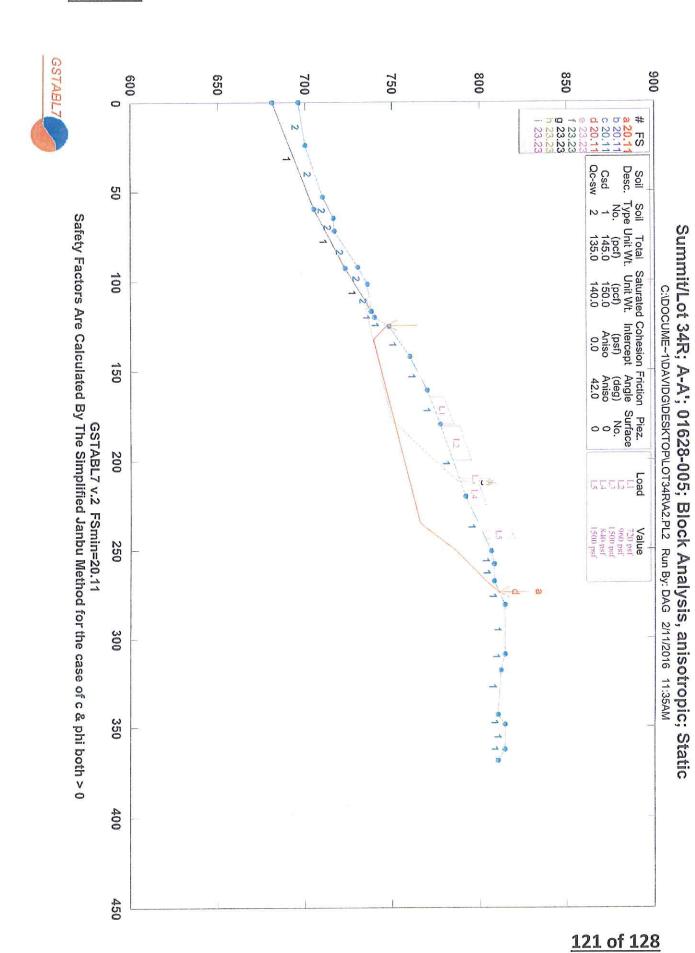
Slice Wi	
Width 1	*
Weight (1bs)	**Table
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Water Force Bot (1bs)	ividual
Tie Force Norm (1bs)	***Table 1 - Individual Data on the
Tie Force Tan (1bs)	the 48
Earthquake Force Surcharge Hor Ver Load (lbs) (lbs) (lbs)	48 Slices***
uake ce Su Ver (1bs)	*
rcharge Load (1bs)	
юн *	Slice
-32.20 -32.20	Alpha
(ft) 16.15 23.15	X-Coord.
(ft) 14.54 2.01	Base
(psf) 743.84 42912.03	Available Shear Strangth
(psf) -257.28 -553.53	Mobilized

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A1P

Exhibit B

) (lbs)	= 2074292.50	Driving Forces	Sum of the Dr	S
	Pile, Reinforcing, sf)	<pre>(including Tieback, Pier/Pile, applicable) = 49454.76(psf)</pre>		Average Available Shear Strength Soil Nail, and Applied Forces if	verage Avail oil Nail, an	SA
	Reinforcing (lbs)	Resisting Forces (including Pier/Pile, Tieback, and Applied Forces if applicable) = **********	es (including rces if appli	sisting Forc d Applied Fo	Sum of the Re Soil Nail, an	& &
	495.02	118363.88	6.86	œ	74.71	48
	2691.10	88590.83	24.99	333.27	68.03	47
	5672.85	72786.53	22.08	323.30	61.31	46
	7277.94	73980.15	2.92	ω.	61.31	45
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	9098-20	43882.61	7.51	216.50	21.25	30
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	8805.46	43567.57	10.02	205.33	21.25	27
	7030.00	42138.72	0.68	200.33	14.55	26
	7202.70	42435.13	19.63	190.50	14.55	25
	6891-94	42014.96	1.03	180.50	14.55	4 4
	7057.11	41397.59	11.57	170.73	7.89	2 2
	4909.57	41040.07	4.04	163.00	7.89	21
	4809.29	40920.07	9.39	156.35	7.89	20
	2890.30	40482.55	9.70	146.85	1.21	1,0
	2677.22	40077.04	15.30	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.21	19 ~
	80.016	40101 T8	3.02	127.50	- 5.49 - 6.49	1 F
	857.62	39553.54	3.01	118.50	-5.49	, <u>,</u>
	824.34	39387.63	15.07	109.50	-5.49	14
	802.59	39279.25	0.18	101.91	5-49	<u>μ</u> :
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	-350 06	30350 43	30.00	74.69	18.83	
	~1115.19	40102.65	7.40	68.50	-18.83	00
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	-912.54	39615,59	Ø. 60 Ø. 60	55.00 00.00	-18.83	ത (
average Nobilized Shear Stress - 1090.31(psr)	-1443.93	41571.14	0.8.0	73. 36. 20.00	-25.52	JT&
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GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.002,
December 2001 **

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142.00 161.00 180.00 220.00 251.00 258.00 258.00 258.00 318.00 318.00 343.00 343.00 93.00

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142.00 180.00 220.00 251.00 258.00 268.00 281.00 309.00 318.00 349.00 349.00 369.00 369.00

760.00 777.00 777.00 777.00 808.00 808.00 814.00 814.00 814.00 810.00 810.00 703.00

Including Pier/Pile, Reinforcement, Soil Nail, Tieback, Nonlinear Undrained Shear Strength, Curved Phi Envelope, Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water Surfaces, Pseudo-Static Earthquake, and Applied Force Options. Modified Bishop, Simplified Janbu, or GLE Method of Slices (Includes Spencer & Morgenstern-Price Type Analysis) SLOPE STABILITY ANALYSIS SYSTEM

Output Filename: Analysis Run Date: Time of Run: Unit System: Run By: Input Data Filename: C:a2. C:a2.OUT English DAG

Plotted Output Filename: C:a2.PLT

PROBLEM DESCRIPTION: Summit/Lot 34R; A-A'; 01628-005; Block A nalysis, anisotropic; Static

BOUNDARY COORDINATES

23 Top 26 Total Boundaries Boundaries

Boundary ö. 425450143014301430 0.00 24.00 53.00 65.00 72.00 92.00 102.00 117.00 696.00 700.00 710.00 717.00 717.00 730.00 736.00 738.00 740.00 X-Right (ft) 24.00 53.00 65.00 72.00 92.00 102.00 117.00 120.00 125.00 700.00 710.00 716.00 717.00 717.00 730.00 736.00 740.00 748.00 (11) Soil Type Below Bnd

ISOTROPIC SOIL PARAMETERS

_

User Specified Y-Origin =

2 Type(s) of Soil

Soil Total Saturated Cohesion Type Unit Wt. Unit Wt. Intercept No. (pcf) (pcf) 145.0 135.0 150.0 140.0 (pcf) 35000.0 Cohesion Friction (deg) Pressure Constant Surface 0.00 Param. Pressure 0.0 (psf) 00 S.

ANISOTROPIC STRENGTH PARAMETERS l soil type(s)

Soil Type 1 Is Anisatropic

Number Of Direction Ranges Specified =

Direction Range Ö. Counterclockwise Direction Limit (deg) 0.0 15.0 90.0 Intercept (psf) 35000.00 0.00 35000.00 Cohesion Friction Angle (deg) 20.00 42.00 20.00

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and

C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and

C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)

5 Load(s) Sr

r.	5 Load(s) Specified	led			
Load	X-Left	X-Right	Intensity	Deflection	
Zo.	(ft)	(ft)	(Jsq)	(deg)	
ב	165.00	180.00	720.0	0.0	
N	181.00	200.00	960.0	0.0	
ω	210.00	212 00	1500.0	0.0	
4	213.00	225.00	840.0	0.0	
ហ	240.00	244.00	1500.0	0.0	
NOTE 1	Intensity Is Force Acting	Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.	Uniformly Di lly Projected	stributed Surface.	
Janbus	Empirical Coe	Janbus Empirical Coef is being used for the case of	d for the cas	e of c & phi both > 0	
A Criti	cal Failure S	A Critical Failure Surface Searching Method, Using A Random	ng Method, Us	ing A Random	

Technique For Generating Sliding Block Surfaces, Has Been Specified.

2500 Trial Surfaces Have Been Generated.

ы
Boxes
Specified
For
Generation
O H
Central
Block
Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

N Þ	Box
40.00	X-Left
165.00	(ft)
675.00	Y-Left
750.00	(ft)
160.00	X-Rìght
265.00	(ft)
750.00	Y-Right
790.00	(ft)
25.00	Height
25.00	(ft)

Following Is Displayed The Most Critical Of The Trial Failure Surfaces Evaluated.

 * * Safety Factors Are Calculated By The Simplified Janbu Method * *

Startistical Data On All Valid FS Values:
FS Max = 480.270 FS Min = 20.109 FS Ave = 45.025
Standard Deviation = 35.793 Coefficient of Variation =

Failure Surface Specified By 6 Coordinate Points

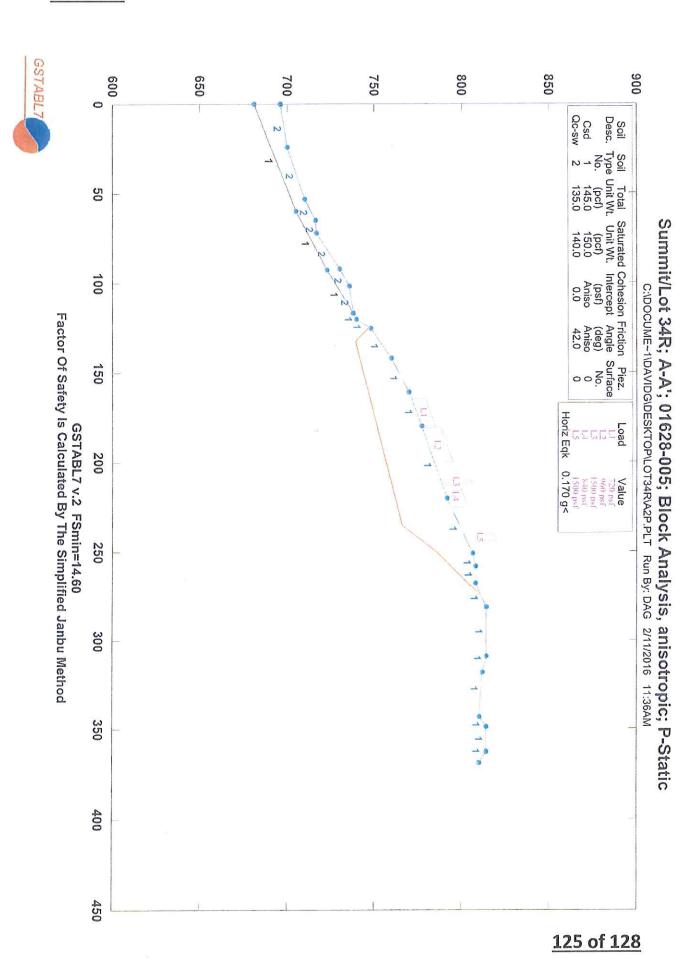
σ	វូច	.1.	ω	N	بر	Point No.
73.7		50.6	35.3	32.6	24.4	X-Surf (ft)
10	803.76	8	93	띪	47	Y-Surf (ft)

*** 20.109 ***

Individual data on the 22 slices

20	19	18	17	16	15	1/2	13	12	11	10	ø	œ	7	σ	U	4	į	N	ь	No.	Slice	•	
10.0	7.0	0.3	6.7	٥.	4.6	10.4	5.0	7.0	1.0	2.0	10.0	19.0	1.0	15.0	۵.	19.0	9 .u	7.7	0.5	(ft)	Width		
13775.7	17441.8	982.9	21966.6	15792.9	20784.4	47810.9	22042.7	29991.1	4220.2	8392.3	40998.3	73474.1	3706.5	53778.7	13767.2	57962.4	22270.3	8793.7	50.1	(Lbs)	Weight		
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(lbs)	dol	Force	Water
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(lbs)	Bot	Force	Water
0.	0.	0.	٥.	٥.	0.	0.	0.	٥.	0.	0-	0.	0.	٥.	٥.	0.	0.	0.	0.	0.	(sdl)	Norm	Force	Tie
								0.											0.	(lbs)	Tan	Force	Tie
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(lbs)	Hor	Force	Earthquake
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(Lbs)	Ver	ce Sur	uake
0.0	0.0	0	0	6000.0	0	0.0	4200	5880	0	3000	0.0	18240.0	0.0	10800.0	0.0	0.0	0.0	0.0	0.0	(lbs)	Load	charge	

Total Number of Trial Surfaces Evaluated = 2500



GSTABL7 ***

GSTABL7 by Garry H. Gregory, P.E. **

December 2001 ** ** Original Version 1.0, January 1996; Current Version 2.002,

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142.00 161.00 180.00 220.00 251.00 258.00 268.00 268.00 349.00 349.00 349.00 349.00 349.00

748.00 770.00 777.00 777.00 806.00 808.00 808.00 814.00 814.00 814.00 814.00 814.00

142.00
180.00
220.00
221.00
258.00
268.00
309.00
318.00
349.00
349.00
369.00
369.00

7760.00 777.00 777.00 792.00 806.00 808.00 814.00 8112.00 8114.00 8114.00 8114.00 8114.00 8114.00

SLOPE STABILITY ANALYSIS SYSTEM Modified Bishop, Simplified Janbu, or GLE Method of Slices. (Includes Spencer & Morgenstern-Price Type Analysis) Including pier/Pile, Reinforcement, Soil Nail, Tieback, Nonlinear Undrained Shear Strength, Curved Phi Envelope, Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water Surfaces, Pseudo-Static Barthquake, and Applied Force Options.

Plotted Output Filename: Unit System: Output Filename: Run By: Time of Run: Input Data Filename: Analysis Run Date: C:a2p. C:a2p.OUT English C:a2p.PLT 2/11/2016 11:36AM DAG

PROBLEM DESCRIPTION: Summit/Lot 34R; A-A'; 01628-005; Block A nalysis, anisotropic; P-Static

BOUNDARY COORDINATES

23 Top Boundaries 26 Total Boundaries

Boundary ö 4484648 0.00 24.00 53.00 65.00 72.00 92.00 102.00 117.00 696.00 700.00 710.00 716.00 717.00 730.00 736.00 738.00 740.00 24.00 53.00 65.00 72.00 92.00 102.00 117.00 120.00 700.00 710.00 716.00 717.00 717.00 730.00 736.00 740.00 748.00 Soil Type Below Bnd 440000000

ISOTROPIC SOIL PARAMETERS

User Specified Y-Origin =

600_00 (ft)

Type(s) of Soil

Soil Total Saturated Cohesion Type Unit Wt. Unit Wt. Intercept No. (pcf) (pcf) 150.0 35000.0 Cohesion Friction Intercept Angle 20.0 Pressure Constant Surface 0.00 Param. (psf) 0.0 So.

ANISOTROPIC STRENGTH PARAMETERS 1 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified =

чαω	Range No.
0.0 15.0 90.0	Counterclockwise Direction Limit (deg)
35000.00 0.00 35000.00	Cohesion Intercept (psf)
20.00 42.00 20.00	Friction Angle (deg)

ANISOTROPIC SOIL NOTES:

An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
 An input value of 0.02 for Phi will set both Phi and

-57.28 -669.93 1100.09 1280.80 1445.05 1689.24 1556.23 1868.91 1721.42 2145.09 1771.99

Mobilized Shear Stress (psf)

					·
1 2 3 4 5 5 5 Tanbu's Emp	Trial Failure Point No.	A Vertical Of0.000 Has Cavitation	NOTE - I F A Horizo Of0.170	Load No.	C equal (3) An input C equal C equal Soundary LOAD(S)
124.48 1132.69 235.36 250.66 268.15 273.79 273.79 Of Safety	ilure Surface X-Surf (ft)	A Vertical Earthquake Loading Coefficient Of0.000 Has Been Assigned Cavitation Pressure = 0.0(psf)	NOTE - Intensity Is Specified As A Uniforml Force Acting On A Horizontally Proje A Horizontal Earthquake Loading Coefficient	X-Left (ft) 165.00 181.00 210.00 213.00 240.00	C equal to zero, with no water weight in the tension An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crity LOAD(S)
747.17 738.99 766.12 785.89 803.76 810.67 Is Calculated	Specified Y-Surf	Loading Coefficingned 0.0(psf) f. is being used	pecified As n A Horizont n E Horizont	X-Right (£t) 180.00 200.00 212.00 225.00 244.00	
By #	By 6 Coordinate Points	the	Specified As A Uniformly Distributed On A Horizontally Projected Surface. water Loading Coefficient signed	Intensity (psf) 720.0 960.0 1500.0 840.0	ater weight in Phi will set weight in th
1.062 The Simplified Janbu Method *	ce Points	case of c & phi both	stributed	Deflection (deg) 0.0 0.0 0.0 0.0 0.0	equal to zero, with no water weight in the tension crack. Input value of 0.03 for Phi will set both Phi and equal to zero, with water weight in the tension crack. OAD(S) JOAD(S)
* 110 88 77 8 12 12 12 12 12 12 12 12 12 12 12 12 12	22 S1ice No.	15. 16. 17. 18. 19. 20. 20. 21.	12.00 m = 6	S1ice Noice	
144.89 144.80 144.80 144.80 144.80 144.80 144.80	_ **		15.0 1.0 19.0 10.0 1.0 7.0	হ	Fac
	* *		53781.7 3706.8 73480.0 41002.3 8393.2 4220.7 29994.4		Factor Of Safety
124.74 128.85 137.35 151.50 163.00 163.00 172.50 1172.50 190.50 205.00 211.00 211.00 211.50	2 - B	0000000	00000000	Wate Forc Top (lbs	1 - 1 ety #
0.73 10.85 9.63 19.65 4.14 15.51 1.03 19.65 10.34 7.24	Str Len	00000000	00000000	Water Force Bot (lbs) 0.0 0.0 0.0	or The Preco
	0.0 Data on the Availa Shear Str (psf)	0.0000000	000000000		Preceding Specified Surface
50710.71 51262.16 51262.16 2795.61 3154.11 3945.40 33945.40 33945.73 4423.67 3757.35 5220.21 3867.72 4696.34	0.0 22 22 lable trengt			Tie Force Tan (lbs) (0.0 0.0 0.0 0.0	ied Sur
		3530.4 2685.4 3735.7 166.4 2965.5 2342.2	9142.9 630.2 12491.6 6970.4 1426.8 717.5 5099.1 3747.7	Earthqua Force Hor ((lbs) (3785.2 9853.8 2340.5	urface = 1

0.0 1496.4 0.0 1496.4 0.0 3785.8 0.0 9853.8 0.0 9853.9 0.0 6970.4 0.0 14291.6 0.0 6970.4 0.0 717.5 0.0 3737.7 0.0 3530.4 0.0 2685.4 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2 0.0 2342.2

0.0 0.0 0.0 0.0 0.0 18240.0 3000.0 3000.0 4200.0 0.0 0.0 0.0 0.0

14.598

Hor Earthquake Force

Ver (lbs)

yer Load (lbs) (lbs)

to	של מז	(0.10	22	21	20	19	18	17	16	15	14	13
Sum of the	verage Ava soil Nail,	Sum of the Soil Nail,	50.79	45.62	45.62	45.62	45.62	52.26	52.26	52.26	14.80	14.80
the Driving Forces =	Average Available Shear Strength (including Tie Soil Nail, and Applied Forces if applicable) =	Resisting Forces and Applied Forc	270.97	268.08	263.00	254.50	250.83	247.33	242.00	237.68	230.18	222.50
302453.66 (lbs)	ength (inclu es if applic	(including es if applic	8.92	0.21	14.30	10.01	0.49	10.88	6.54	7.58	10.72	5.17
(lbs)	Average Available Shear Strength (including Tieback, Pier/Pile, Soil Nail, and Applied Forces if applicable) = 23526.56(psf)	Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 4157308.00 (lbs)	53895.55	49115.23	49494.21	50059.62	50256.29	57303.10	58541.56	57980.70	4231.54	4810.09
	Pile, Reinforcing, sf)	Reinforcing (lbs)	275.64	525.92	1148.48	2077.31	2400.38	2952.70	4720.28	4005.19	1938.67	2065.67

**** END OF GSTABL7 OUTPUT ****

Total length of the failure surface =

176.71 (ft)

Average Mobilized Shear Stress =

1711.61 (psf)