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 Fairways at Wolf Creek Resort PRUD Subdivision Phases 4 and 5.
Applicant: Fairways at Wolf Creek
Authorized Representative: Rick Everson
File Number: HSR 2016-07

Property Information

Approximate Address: 4200 Sunrise Drive
Zoning: FR-3
Existing Land Use: Vacant
Proposed Land Use: Multi-phased residential development
Parcel ID: 22-017-0017
Township, Range, Section: 7N 1E Sec 22

Adjacent Land Use

North: Vacant Residential **South:** Residential
East: Residential **West:** Vacant Residential

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 108 (Standards) Chapter 22 (Natural Hazards Areas)

Background

The subject property has been approved as part of the Fairways at Wolf Creek Resort PRUD located within the approved Wolf Creek Resort Master Development. The application is restricted to the Fairways at Wolf Creek Subdivision Phase 4 and 5 located within the Fairways at Wolf Creek PRUD. The subdivisions have been identified as being located within a potential geologic area; therefore, a geologic and geotechnical investigation have been included as part of the subdivision process to ensure the lots are safe for development.

Earthtec Engineering has performed the required geotechnical investigation and IGES has performed the required geologic hazards assessment, as required in LUC Title 108 Chapter 22, 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 subdivisions 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. The following submittals were required:

1. Subdivision Plat (see Exhibit A)
2. Geotechnical and Geologic Investigation Report (see Exhibit B)

Weber County Hillside Review Board comments

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

Weber County Engineering Division: The Engineering Division granted approval on January 27, 2017. The approval is subject to the applicant following all recommendations found in the applicable Geotechnical and Geological Investigation Reports including the following conditions:

1. High groundwater is a high risk. It is therefore required that the structures be built without a basement, or else the basement is be constructed with a foundation drain system as described in the geotechnical report.
2. Follow all other recommendations given in both the geological and geotechnical reports.

Weber Fire District: The Fire district has granted approval on April 18, 2017 subject to the following:

1. Fire Flow: All dwellings structures over 5000 sq. ft. which do not meet the fire flow requirements, shall be equipped with an NFPA 13D compliant fire sprinkler system or be provided with area separations compliant with the IBC/IRC. For more information regarding fire flow, please contact Fire Marshal Thueson at 801-782-3580.
2. Provide a temporary address marker at the building site during construction.
3. Roads shall have a maximum grade of 10% unless specifically approved as outlined by the International Fire Code.
4. Radius on all corners shall be a minimum of 28'-0".
5. Roads and bridges shall be designed, constructed and maintained to support an imposed load of 75,000 lbs.
6. All roads shall be designed, constructed, surfaced and maintained so as to provide an all-weather driving surface.
7. Fire access roads for this project shall be completed and approved prior to any combustible construction. Temporary roads shall meet the same requirements for height, width and imposed loads as permanent roads.
8. All required fire hydrants and water systems shall be installed, approved and fully functional prior to any combustible construction.

Weber County Building Division: The Building Division has granted approval on March 3, 2017. The Building Official does not have any concerns with this project.

Weber County Planning Division: 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 hazards assessment report dated May 19, 2016 provided by IGES (Project# 01855-007) and geotechnical investigation report dated March 8, 2016 provided by Earthtec (Project# 167003).

Planning Division Recommendations

Based on site inspections and review agency comments, the Planning Division Staff has determined that it is necessary to impose an additional condition as part of approving HSR 2016-07. The recommendation for approval is subject to adherence to all review agencies conditions and based on the following condition:

1. As a condition it is understood, by the applicant, the geo-technical engineer and engineering geologist that if any geologic hazards are revealed during the excavation and construction phase of the subdivision improvements or during the excavation for the dwelling, work 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 infrastructure and any future dwellings.
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 subdivision process and/or during the excavation and construction phase of the improvements and future dwellings, the requirements and conditions set forth by the Hillside Review Board.

Administrative Approval

Administrative approval of the Fairways at Wolf Creek Subdivision Phases 4 and 5 (HRS 2016-07) 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: ______________________

____
Rick Grover
Weber County Planning Director

Exhibits

A. Subdivision Plat
B. Geotechnical and Geologic Investigation Report

Map 1

Exhibit A

THE FAIRWAYS AT WOLF CREEK P.R.U.D., PHASE 4

A PORTION OF THE NORTHWEST QUARTER OF SECTION 22, TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OFUTAH
NOVEMBER 2016

VICINITY MAP
NOT TO SCALE

SURVEYOR'S CERTIFICATE

I, LYLE BISSEGGER, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR IN THE STATE OF UTAH, AND THAT I HOLD CERTIFICATE NO. 376082 IN ACCORDANCE WITH TITLE 58, CHAPTER 22, OF THE PROFESSIONAL ENGINEERS AND LAND SURVEYING LICENSING ACT. I ALSO CERTIFY THAT I HAVE COMPLETED A SURVEY F THE PROPERTY DESCRIBED HEREON IN ACCORDANCE WITH SECTION 17-23-17 AND THAT I HAVE VERIFIED ALL MEASUREMENTS SHOWN HEREON THIS PLAT OF TRAPPERS RIDE AT WOLF CREEK P.R.U.D. PHASE 8 IN WEBER COUNTY, UTAH AND THAT IT HAS BEEN CORRECTLY DRAWN TO THE DESIGNATED SCALE AND IS A TRUE AND CORRECT REPRESENTATION OF THE FOLLOWING DESCRIPTION OF LANDS INCLUDED IN SAID SUBDIVISION, BASED ON DATA COMPILED FROM RECORDS IN THE WEBER COUNTY RECORDERS OFFICE, AND ALL LOTS MEET THE REQUIREMENTS OF WEBER COUNTY LAND USE COD WCO 106-1-8(C)(1). MONUMENTS HAVE BEEN FOUND OR PLACED AS REPRESENTED ON THIS PLAT

SIGNATURE: ______________________________

REGISTRATION NO.: 376082

LEGAL DESCRIPTION

A PARCEL OF LAND SITUATED IN THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, EDEN, WEBER COUNTY, STATE OF UTAH, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARING:

THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE SOUTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE NORTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR N00°20'47"E.

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 22, THENCE N00°20'47"E ALONG THE WEST LINE OF SAID SECTION A DISTANCE OF 1648.70 FEET TO THE POINT OF BEGINNING:

THENCE N00°20'47"E ALONG THE WEST LINE OF SAID SECTION A DISTANCE OF 454.48 FEET TO A NON-TANGENT CURVE;

THENCE ALONG SAID CURVE TO THE RIGHT WHOSE CENTER BEARS S18°20'59"E, HAVING A RADIUS OF 1460.00 FEET, A CENTRAL ANGLE OF 20°26'23" AND A LENGTH OF 520.84 FEET;

THENCE S87°54'37"E, A DISTANCE OF 302.48 FEET TO A POINT ON THE WEST LINE OF THE FAIRWAYS AT WOLF CREEK PRUD PHASE 1, AMENDED ;

THENCE S03°20'53"W, A DISTANCE OF 166.90 FEET ALONG THE WEST LINE OF SAID FAIRWAYS AT WOLF CREEK TO A NON-TANGENT CURVE;

THENCE ALONG SAID CURVE TO THE LEFT WHOSE CENTER BEARS S03°20'56"W, HAVING A RADIUS OF 168.00 FEET, A CENTRAL ANGLE OF 71°59'54" AND A LENGTH OF 211.11 FEET;

THENCE S21°21'04"W, A DISTANCE OF 269.33 FEET;

THENCE S34°43'01"W, A DISTANCE OF 121.50 FEET;

THENCE S55°14'14"W, A DISTANCE OF 191.85 FEET;

THENCE N53°09'24"W, A DISTANCE OF 159.59 FEET;

THENCE N59°08'40"W, A DISTANCE OF 60.09 FEET;

THENCE N56°49'08"W, A DISTANCE OF 164.53 FEET TO THE POINT OF BEGINNING;

CONTAINING 411,555SQUARE FEET, OR 9.45 ACRES MORE OR LESS.

OWNERS DEDICATION

WE, THE UNDERSIGNED OWNERS OF THE HEREON DESCRIBED TRACT OF LAND, HEREBY SET APART AND SUBDIVIDE THE SAME INTO LOTS AND STREETS AS SHOWN ON THIS PLAT AND NAME SAID TRACT:

THE FAIRWAYS AT WOLF CREEK P.R.U.D., PHASE 4

AND DO HEREBY DEDICATE, GRANT AND CONVEY TO WEBER COUNTY, UTAH ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS STREETS THE SAME TO BE USED AS PUBLIC THOROUGHFARES FOREVER .

AND HEREBY GRANT AND DEDICATE A PERPETUAL RIGHT AND EASEMENT OVER, UPON AND UNDER THE LANDS DESIGNATED ON THE PLAT AS PUBLIC UTILITY, STORM WATER DETENTION PONDS, DRAINAGE AND CANAL MAINTENANCE EASEMENTS, THE SAME TO BE USED FOR THE INSTALLATION, MAINTENANCE, AND OPERATION OF PUBLIC UTILITY SERVICE LINES, STORM DRAINAGE FACILITIES IRRIGATION CANALS OR FOR THE PERPETUAL PRESERVATION OF WATER DRAINAGE CHANNELS IN THEIR NATURAL STATE WHICHEVER IS APPLICABLE AS MAY AUTHORIZED BY WEBER COUNTY, UTAH, WITH NO BUILDINGS OR STRUCTURES BEING ERECTED WITHIN SUCH EASEMENTS AND DO HEREBY GRANT AND CONVEY TO THE PRUD UNIT OWNERS ASSOCIATION, ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS COMMON AREAS TO BE USED FOR RECREATIONAL AND OPEN SPACE PURPOSES FOR THE BENEFIT OF EACH UNIT OWNER ASSOCIATION MEMBER IN COMMON WITH ALL OTHERS IN THE SUBDIVISION AND GRANT AND DEDICATE TO WEBER COUNTY A PERPETUAL OPEN SPACE RIGHT AND EASEMENT ON AND OVER THE COMMON AREAS TO GUARANTEE TO WEBER COUNTY THAT THE COMMON AREAS REMAIN OPEN AND UNDEVELOPED EXCEPT FOR APPROVED RECREATIONAL, PARKING AND OPEN SPACE PURPOSES. THE FOREGOING SHALL NOT CONSTITUTE A DEDICATION OF THE COMMON AREA PARCELS FOR PUBLIC USE, SUCH PARCELS BEING RESTRICTED TO USE BY THE ASSOCIATION MEMBERS AND THEIR GUESTS AND OTHERS AS SET FORTH IN THE NEIGHBORHOOD DECLARATION AND THE MASTER DECLARATION. DECLARANT DOES ALSO HEREBY GRANT AND DEDICATE A PERPETUAL EASEMENT OVER, UPON, AND UNDER THE LANDS DESIGNATED AS COMMON AREA PARCELS HEREON AS A PUBLIC UTILITY EASEMENT, THE SAME TO BE USED FOR INSTALLATION, MAINTENANCE, AND OPERATION OF PUBLIC UTILITY SERVICE LINES, AS NECESSARY.

SIGNED THIS THE_____________ DAY OF_______________ , 20__

____
THE FAIRWAYS AT WOLF CREEK LLC
RUSS WATTS, MANAGING MEMBER

ACKNOWLEDGMENT

STATE OF UTAH)
) SS
COUNTY OF WEBER)

ON THIS DAY OF , 20__

ON THE ______ DAY OF_______________, 20__, PERSONALLY APPEARED BEFORE ME RUSS WATTS, WHO BEING BY ME DULY SWORN DID SAY THAT HE IS A MANAGING MEMBER OF THE FAIRWAYS AT WOLF CREEK, L.L.C. AND THAT SAID INSTRUMENT WAS SIGNED IN BEHALF OF SAID L.L.C. BY A RESOLUTION OF ITS MEMBERS AND RUSS WATTS ACKNOWLEDGED TO ME THAT SAID L.L.C. EXECUTED THE SAME.

____
NOTARY PUBLIC

PLAT NOTES

1. UNLESS OTHERWISE DIMENSIONED ON THIS PLAT, SETBACKS FOR THIS SUBDIVISION ARE AS FOLLOWS: FRONT= 20 FEET, REAR= 20 FEET, SIDE= 9 FEET, SIDE FACING STREET ON CORNER LOT= 20 FEET
2. THIS PLAT IS SUBJECT TO THAT CERTAIN AMENDED AND RESTATED DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS OF THE FAIRWAYS AT WOLF CREEK PRUD ("NEIGHBORHOOD DECLARATION") EXECUTED BY FAIRWAYS AT WOLF CREEK, LLC ("DECLARANT") AS WELL AS THAT CERTAIN MASTER DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS FOR WOLF CREEK RESORT ("MASTER DECLARATION") EXECUTED BY WOLF CREEK PROPERTIES, LC ("MASTER DEVELOPER"). BOTH NEIGHBORHOOD DECLARATION AND MASTER DECLARATION HAVE BEEN RECORDED IN THE OFFICE OF THE WEBER COUNTY RECORDER WHICH SHALL SET FORTH THE RESTRICTIONS AND GENERAL PLAN OF IMPROVEMENT FOR THE PROPERTY DESCRIBED IN THIS PLAT. CERTAIN TERMS NOT OTHERWISE DEFINED IN THIS PLAT SHALL HAVE THE MEANINGS SET FORTH IN THE NEIGHBORHOOD DECLARATION OR MASTER DECLARATION.
3. PURSUANT TO THE NEIGHBORHOOD DECLARATION, THE FAIRWAYS AT WOLF CREEK OWNERS ASSOCIATION, INC., A UTAH NONPROFIT CORPORATION ("COMMUNITY ASSOCIATION") IS RESPONSIBLE FOR MAINTAINING ALL COMMUNITY AREAS, IF ANY, AND SHALL HAVE A PERPETUAL NON-EXCLUSIVE EASEMENT OVER ALL PARCELS FOR SUCH MAINTENANCE PURPOSES AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
4. AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE ARCHITECTURAL CONTROL COMMITTEE ("COMMITTEE"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE COMMITTEE AS DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
5. AS FURTHER DESCRIBED IN THE MASTER DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE DESIGN REVIEW BOARD ("BOARD"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE BOARD AS DESCRIBED IN THE MASTER DECLARATION.
6. THE NEIGHBORHOOD DECLARATION SETS FORTH THE TERMS AND RESTRICTIONS FOR NIGHTLY RENTALS AND LEASING OF LOTS WITHIN THE PROJECT.

NARRATIVE

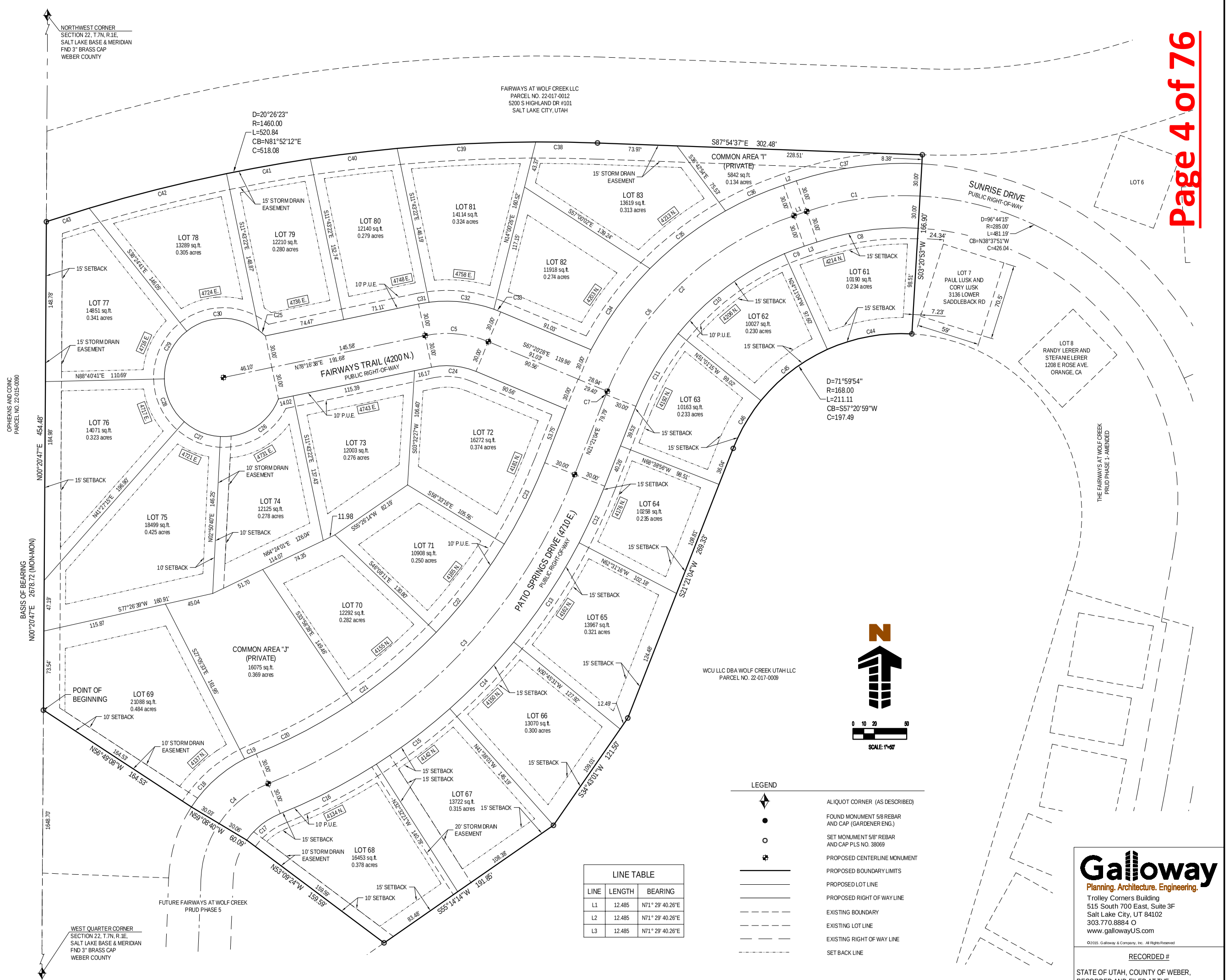
THIS SURVEY AND SUBSEQUENT SUBDIVISION PLAT WERE COMPLETED AT THE REQUEST OF THE "EDEN VILLAGE LLC" FRO THE PURPOSE OF SUBDIVIDING THEIR PROPERTY TO CREATE RESIDENTIAL LOTS.

BASIS OF BEARING:

THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE SOUTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE NORTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR N00°20'47"E.

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	BEARING	CHORD
C1	285.00	106.99	021°30'30"	N82°14'55"E	106.36
C2	285.00	249.42	050°08'36"	N46°25'22"E	241.54
C3	510.00	416.50	046°47'29"	N44°44'48"E	405.02
C4	100.00	59.80	034°15'47"	N51°00'39"E	58.91
C5	100.00	60.01	034°22'55"	S84°31'55"E	59.11
C6	285.00	246.14	049°28'58"	S46°45'11"W	238.56
C7	285.00	3.29	000°39'38"	S21°40'53"W	3.29
C8	254.52	95.55	021°30'30"	N82°13'42"E	94.99
C9	255.00	19.70	004°25'35"	N69°16'53"E	19.70
C10	255.00	124.85	028°03'07"	N53°02'32"E	123.60
C11	255.00	78.62	017°39'55"	N30°11'01"E	78.31
C12	540.00	57.75	006°07'40"	N24°24'54"E	57.73
C13	540.00	110.86	011°45'45"	N33°21'37"E	110.66
C14	540.00	86.01	009°07'32"	N43°48'15"E	85.92
C15	540.00	85.71	009°05'38"	N52°54'50"E	85.62
C16	540.00	100.67	010°40'54"	N62°48'06"E	100.53
C17	70.00	40.27	032°57'54"	N51°39'36"E	39.72
C18	130.00	67.45	029°43'35"	N48°02'39"E	66.69
C19	130.00	11.88	005°14'06"	N65°31'30"E	11.87
C20	480.00	101.53	012°07'11"	N62°04'57"E	101.34
C21	480.00	101.86	012°09'33"	N49°56'35"E	101.67
C22	480.00	104.03	012°25'05"	N37°39'17"E	103.83
C23	480.00	84.57	010°05'40"	N26°23'54"E	84.46
C24	70.00	42.01	034°22'55"	N84°31'55"W	41.38
C25	55.00	7.88	008°12'50"	S48°53'08"E	7.88
C26	55.00	68.65	071°30'41"	S57°05'19"W	64.28
C27	55.00	37.06	038°36'36"	N67°51'02"W	36.37
C28	55.00	45.33	047°13'25"	N24°56'02"W	44.06
C29	55.00	50.79	052°54'38"	N25°08'00"E	49.00
C30	55.00	72.40	075°25'08"	N89°17'53"E	67.28
C31	130.00	10.01	004°24'42"	N80°28'59"E	10.01
C32	130.00	61.23	026°59'14"	S83°49'03"E	60.67
C33	130.00	6.77	002°58'59"	S68°49'57"E	6.77
C34	315.00	93.52	017°00'36"	N36°02'27"E	93.17
C35	315.00	88.77	016°08'46"	N52°37'08"E	88.47
C36	315.00	59.39	010°48'09"	N66°05'36"E	59.30
C37	315.00	118.43	021°32'28"	N82°15'54"E	117.73
C38	1460.00	57.52	002°15'26"	N89°02'20"W	57.52
C39	1460.00	129.05	005°03'53"	S87°18'01"W	129.01
C40	1460.00	81.42	003°11'43"	S83°10'13"W	81.41
C41	1460.00	79.27	003°06'40"	S80°01'02"W	79.26
C42	1460.00	131.80	005°10'20"	S75°52'32"W	131.75
C43	1460.00	41.77	001°38'22"	S72°28'11"W	41.77
C44	168.00	80.73	027°32'00"	S79°34'56"W	79.96
C45	168.00	78.69	026°50'08"	S52°23'52"W	77.97
C46	168.00	51.69	017°37'45"	S30°09'55"W	51.49



LINE TABLE

LINE	LENGTH	BEARING
L1	12.485	N71° 29' 40.26"E
L2	12.485	N71° 29' 40.26"E
L3	12.485	N71° 29' 40.26"E

LEGEND

◆	ALIQUOT CORNER (AS DESCRIBED)
●	FOUND MONUMENT 5/8 REBAR AND CAP (GARDENER ENG.)
○	SET MONUMENT 5/8" REBAR AND CAP PLS NO. 38069
▣	PROPOSED CENTERLINE MONUMENT
━━━	PROPOSED BOUNDARY LIMITS
───	PROPOSED LOT LINE
───	PROPOSED RIGHT OF WAY LINE
— — —	EXISTING BOUNDARY
— — —	EXISTING LOT LINE
— — —	EXISTING RIGHT OF WAY LINE
-·-·-·-	SET BACK LINE

Galloway
Planning. Architecture. Engineering.
Trolley Corners Building
515 South 700 East, Suite 3F
Salt Lake City, UT 84102
303.770.8884 O
www.gallowayUS.com

THE FAIRWAYS AT WOLF CREEK P.R.U.D. PHASE 4

A PORTION OF THE NORTHWEST QUARTER OF SECTION 22,
TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OF UTAH

DEVELOPER
THE FAIRWAYS AT WOLF CREEK LLC
5200 S. HIGHLAND DRIVE STE 101
SALT LAKE CITY, UT 84117

WEBER COUNTY ATTORNEY

I HAVE EXAMINED THE FINANCIAL GUARANTEE AND OTHER DOCUMENTS ASSOCIATED WITH THIS SUBDIVISION PLAT AND IN MY OPINION THEY CONFORM WITH THE COUNTY ORDINANCE APPLICABLE THERETO AND NOW IN FORCE AND AFFECT.
SIGNED THIS ____________.DAY OF ____________. , 20________.

_____________________________________.
SIGNATURE

WEBER COUNTY SURVEYOR

I HEREBY CERTIFY THAT THE WEBER COUNTY SURVEYOR'S OFFICE HAS REVIEWED THIS PLAT FOR MATHEMATICAL CORRECTNESS, SECTION CORNER DATA AND FOR HARMONY WITH LINES AND MONUMENTS ON RECORD IN THE COUNTY OFFICES. THE APPROVAL OF THIS PLAT BY THE WEBER COUNTY SURVEYORS DOES NOT RELIEVE THE LICENSED LAND SURVEYOR WHO EXECUTED THIS PLAT FROM RESPONSIBILITIES AND/OR LIABILITIES ASSOCIATED THEREWITH. SIGNED THIS ________. DAY OF ___________.,
20 _______.

_____________________________________.
COUNTY SURVEYOR

WEBER COUNTY ENGINEER

I HEREBY CERTIFY THAT THE REQUIRED PUBLIC IMPROVEMENT STANDARDS AND DRAWINGS FOR THIS SUBDIVISION CONFORM WITH COUNTY STANDARDS AND THE AMOUNT OF THE FINANCIAL GUARANTEE IS SUFFICIENT FOR THE INSTALLATION OF THESE IMPROVEMENT.
SIGNED THIS ___________. DAY OF ___________. , 20 ______.

_____________________________________.
SIGNATURE

WEBER COUNTY PLANNING COMMISSION APPROVAL

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WEBER COUNTY PLANNING COMMISSION ON THE DAY OF _______________., 20 ______.

_____________________________________.
CHAIRMAN-WEBER COUNTY PLANNING COMMISSION

WEBER COUNTY COMMISSION ACCEPTANCE

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT, THE DEDICATION OF THE STREETS AND OTHER PUBLIC WAYS AND FINANCIAL GUARANTEE OF PUBLIC IMPROVEMENTS ASSOCIATED WITH THIS SUBDIVISION THEREON ARE HEREBY APPROVED AND ACCEPTED BY THE COMMISSIONERS OF WEBER COUNTY, UTAH
THIS __________. DAY OF ____________________. , 20 ______.

_____________________________________.
CHAIRMAN, WEBER COUNTY COMMISSION

ATTEST: ________________________________.
TITLE: ________________________________.

WOLF CREEK WATER AND SEWER IMPROVEMENT DISTRICT

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WOLF CREEK WATER AND SEWER DISTRICT ON THE DAY OF _______________., 20 ______.

_____________________________________.
GENERAL MANAGER

RECORDED #

STATE OF UTAH, COUNTY OF WEBER,
RECORDED AND FILED AT THE

REQUEST OF: ______________________.
ENTRY NO: ______________________.
DATE: ____________. TIME: ____________.
BOOK: ____________. PAGE: ____________.
______________________________.
FEE %
______________________________.
WEBER COUNTY RECORDER

Exhibit A

THE FAIRWAYS AT WOLF CREEK P.R.U.D., PHASE 5

A PORTION OF THE NORTHWEST QUARTER OF SECTION 22, TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OFUTAH
NOVEMBER 2016

SURVEYOR'S CERTIFICATE

I, LYLE BISSEGGER, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR IN THE STATE OF UTAH, AND THAT I HOLD CERTIFICATE NO. 376082 IN ACCORDANCE WITH TITLE 58, CHAPTER 22, OF THE PROFESSIONAL ENGINEERS AND LAND SURVEYING LICENSING ACT. I ALSO CERTIFY THAT I HAVE COMPLETED A SURVEY F THE PROPERTY DESCRIBED HEREON IN ACCORDANCE WITH SECTION 17-23-17 AND THAT I HAVE VERIFIED ALL MEASUREMENTS SHOWN HEREON THIS PLAT OF TRAPPERS RIDE AT WOLF CREEK P.R.U.D. PHASE 8 IN WEBER COUNTY, UTAH AND THAT IT HAS BEEN CORRECTLY DRAWN TO THE DESIGNATED SCALE AND IS A TRUE AND CORRECT REPRESENTATION OF THE FOLLOWING DESCRIPTION OF LANDS INCLUDED IN SAID SUBDIVISION, BASED ON DATA COMPILED FROM RECORDS IN THE WEBER COUNTY RECORDERS OFFICE, AND ALL LOTS MEET THE REQUIREMENTS OF WEBER COUNTY LAND USE COD WCO 106-1-8(C)(1). MONUMENTS HAVE BEEN FOUND OR PLACED AS REPRESENTED ON THIS PLAT

SIGNATURE: ______________________________

REGISTRATION NO.: 376082

LEGAL DESCRIPTION

A PARCEL OF LAND SITUATED IN THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, EDEN, WEBER COUNTY, STATE OF UTAH, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BASIS OF BEARING:
THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE SOUTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE NORTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR N00°20'47"E.

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 22, THENCE N00°20'47"E ALONG THE WEST LINE OF SAID SECTION A DISTANCE OF 400.01 FEET TO THE POINT OF BEGINNING:
THENCE N00°20'47"E ALONG THE WEST LINE OF SAID SECTION A DISTANCE OF 1248.69 FEET;
THENCE S56°49'08"E, A DISTANCE OF 164.53 FEET;
THENCE S59°08'40"E, A DISTANCE OF 60.09 FEET;
THENCE S53°09'24"E, A DISTANCE OF 159.59 FEET;
THENCE S55°14'14"W, A DISTANCE OF 34.64 FEET;
THENCE S04°04'29W, A DISTANCE OF 785.51 FEET;
THENCE N86°01'15" W, A DISTANCE OF 98.86 FEET;
THENCE S18°46'41"W, A DISTANCE OF 78.02 FEET TO A POINT OF CURVATURE;
THENCE ALONG SAID CURVE TO THE LEFT WHOSE CENTER BEARS S71°13'19"E, HAVING A RADIUS OF 70.00 FEET, A CENTRAL ANGLE OF 37°57'45" AND A LENGTH OF 46.38 FEET;
THENCE S19°11'06"E, A DISTANCE OF 19.91 FEET TO A POINT OF CURVATURE;
THENCE ALONG SAID CURVE TO THE RIGHT WHOSE CENTER BEARS S70°48'54"W, HAVING A RADIUS OF 230.00 FEET, A CENTRAL ANGLE OF 14°38'43" AND A LENGTH OF 58.79 FEET;
THENCE S04°36'50"E, A DISTANCE OF 28.67 FEET;
THENCE S85°23'10"W, A DISTANCE OF 5.49 FEET TO A POINT ON THE NORTH LINE OF FAIRWAY OAKS AT WOLF CREEK PRUD PHASE 1, 1ST AMENDMENT;
THENCE S78°24'08"W, A DISTANCE OF 60.00 FEET ALONG THE NORTH LINE OF SAID FAIRWAY OAKS AT WOLF CREEK;
THENCE N89°14'39"W, A DISTANCE OF 73.37 FEET ALONG THE NORTH LINE OF SAID FAIRWAY OAKS AT WOLF CREEK TO THE POINT OF BEGINNING,

CONTAINING 276,979 SQUARE FEET, OR 6.36 ACRES MORE OR LESS.

OWNERS DEDICATION

WE, THE UNDERSIGNED OWNERS OF THE HEREON DESCRIBED TRACT OF LAND, HEREBY SET APART AND SUBDIVIDE THE SAME INTO LOTS AND STREETS AS SHOWN ON THIS PLAT AND NAME SAID TRACT:

THE FAIRWAYS AT WOLF CREEK P.R.U.D., PHASE 5

AND DO HEREBY DEDICATE, GRANT AND CONVEY TO WEBER COUNTY, UTAH ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS STREETS THE SAME TO BE USED AS PUBLIC THOROUGHFARES FOREVER .

AND HEREBY GRANT AND DEDICATE A PERPETUAL RIGHT AND EASEMENT OVER, UPON AND UNDER THE LANDS DESIGNATED ON THE PLAT AS PUBLIC UTILITY, STORM WATER DETENTION PONDS, DRAINAGE AND CANAL MAINTENANCE EASEMENTS, THE SAME TO BE USED FOR THE INSTALLATION, MAINTENANCE, AND OPERATION OF PUBLIC UTILITY SERVICE LINES, STORM DRAINAGE FACILITIES IRRIGATION CANALS OR FOR THE PERPETUAL PRESERVATION OF WATER DRAINAGE CHANNELS IN THEIR NATURAL STATE WHICHEVER IS APPLICABLE AS MAY AUTHORIZED BY WEBER COUNTY, UTAH, WITH NO BUILDINGS OR STRUCTURES BEING ERECTED WITHIN SUCH EASEMENTS AND DO HEREBY GRANT AND CONVEY TO THE PRUD UNIT OWNERS ASSOCIATION, ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS COMMON AREAS TO BE USED FOR RECREATIONAL AND OPEN SPACE PURPOSES FOR THE BENEFIT OF EACH UNIT OWNER ASSOCIATION MEMBER IN COMMON WITH ALL OTHERS IN THE SUBDIVISION AND GRANT AND DEDICATE TO WEBER COUNTY A PERPETUAL OPEN SPACE RIGHT AND EASEMENT ON AND OVER THE COMMON AREAS TO GUARANTEE TO WEBER COUNTY THAT THE COMMON AREAS REMAIN OPEN AND UNDEVELOPED EXCEPT FOR APPROVED RECREATIONAL, PARKING AND OPEN SPACE PURPOSES.

SIGNED THIS THE______________ DAY OF________________ , 20__

____
THE FAIRWAYS AT WOLF CREEK LLC
RUSS WATTS, MANAGING MEMBER

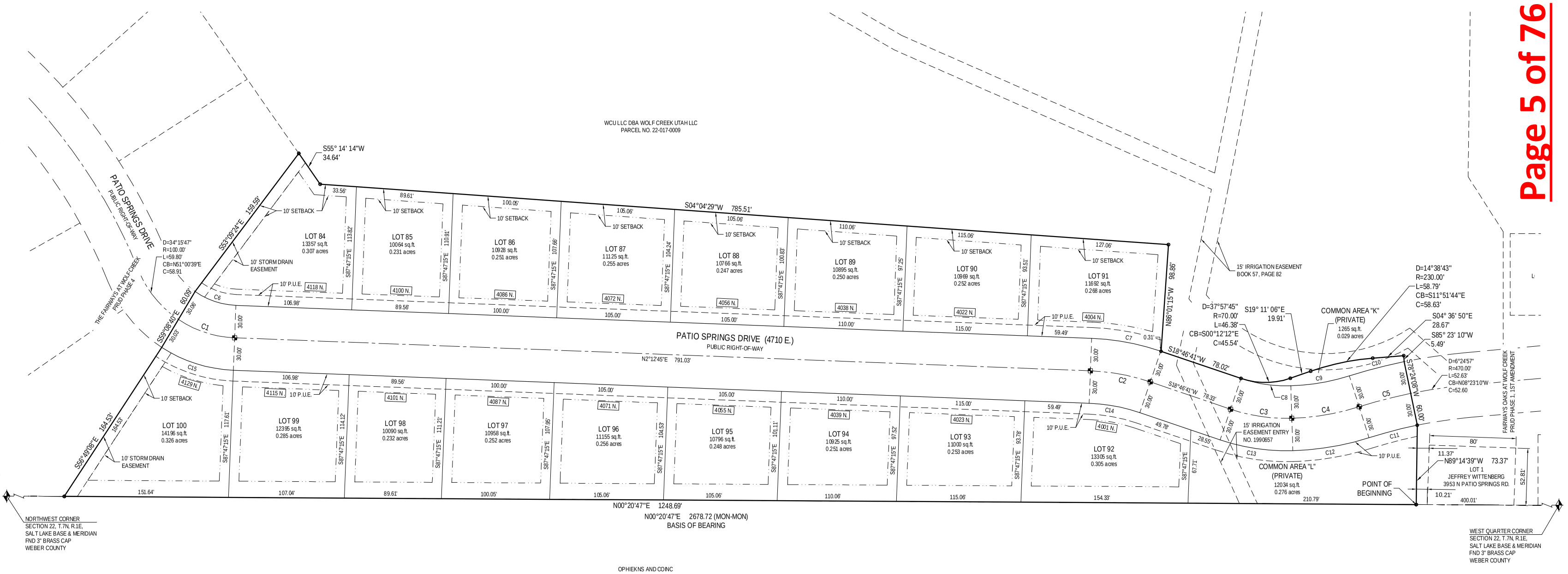
ACKNOWLEDGMENT

STATE OF UTAH)
) SS
COUNTY OF WEBER)

ON THIS DAY OF , 20__

ON THE______ DAY OF________________ , 2016, PERSONALLY APPEARED BEFORE ME RUSS WATTS, WHO BEING BY ME DULY SWORN DID SAY THAT HE IS A MANAGING MEMBER OF THE FAIRWAYS AT WOLF CREEK, L.L.C. AND THAT SAID INSTRUMENT WAS SIGNED IN BEHALF OF SAID L.L.C. BY A RESOLUTION OF ITS MEMBERS AND RUSS WATTS ACKNOWLEDGED TO ME THAT SAID L.L.C. EXECUTED THE SAME.

____
NOTARY PUBLIC

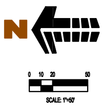


PLAT NOTES

1. UNLESS OTHERWISE DIMENSIONED ON THIS PLAT, SETBACKS FOR THIS SUBDIVISION ARE AS FOLLOWS: FRONT= 15 FEET, REAR= 15 FEET, SIDE= 9 FEET, SIDE FACING STREET ON CORNER LOT= 20 FEET
2. THIS PLAT IS SUBJECT TO THAT CERTAIN AMENDED AND RESTATED DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS OF THE FAIRWAYS AT WOLF CREEK PRUD ("NEIGHBORHOOD DECLARATION") EXECUTED BY FAIRWAYS AT WOLF CREEK, LLC ("DECLARANT") AS WELL AS THAT CERTAIN MASTER DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS FOR WOLF CREEK RESORT ("MASTER DECLARATION") EXECUTED BY WOLF CREEK PROPERTIES, LC ("MASTER DEVELOPER"). BOTH NEIGHBORHOOD DECLARATION AND MASTER DECLARATION HAVE BEEN RECORDED IN THE OFFICE OF THE WEBER COUNTY RECORDER WHICH SHALL SET FORTH THE RESTRICTIONS AND GENERAL PLAN OF IMPROVEMENT FOR THE PROPERTY DESCRIBED IN THIS PLAT. CERTAIN TERMS NOT OTHERWISE DEFINED IN THIS PLAT SHALL HAVE THE MEANINGS SET FORTH IN THE NEIGHBORHOOD DECLARATION OR MASTER DECLARATION.
3. PURSUANT TO THE NEIGHBORHOOD DECLARATION, THE FAIRWAYS AT WOLF CREEK OWNERS ASSOCIATION, INC., A UTAH NONPROFIT CORPORATION ("COMMUNITY ASSOCIATION") IS RESPONSIBLE FOR MAINTAINING ALL COMMUNITY AREAS, IF ANY, AND SHALL HAVE A PERPETUAL NON-EXCLUSIVE EASEMENT OVER ALL PARCELS FOR SUCH MAINTENANCE PURPOSES AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
4. AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE ARCHITECTURAL CONTROL COMMITTEE ("COMMITTEE"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE COMMITTEE AS DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
5. AS FURTHER DESCRIBED IN THE MASTER DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE DESIGN REVIEW BOARD ("BOARD"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE BOARD AS DESCRIBED IN THE MASTER DECLARATION.
6. THE NEIGHBORHOOD DECLARATION SETS FORTH THE TERMS AND RESTRICTIONS FOR NIGHTLY RENTALS AND LEASING OF LOTS WITHIN THE PROJECT.

LEGEND

◈	ALIQUOT CORNER (AS DESCRIBED)
●	FOUND MONUMENT 5/8 REBAR AND CAP (GARDENER ENG.)
○	SET MONUMENT 5/8" REBAR AND CAP PLS NO. 38069
▣	PROPOSED CENTERLINE MONUMENT
━━━	PROPOSED BOUNDARY LIMITS
───	PROPOSED LOT LINE
───	PROPOSED RIGHT OF WAY LINE
– – – – –	EXISTING BOUNDARY
– – – – –	EXISTING LOT LINE
—— —— ——	EXISTING RIGHT OF WAY LINE
—— · · —— · · ——	SET BACK LINE



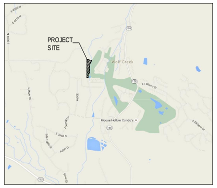
NARRATIVE

THIS SURVEY AND SUBSEQUENT SUBDIVISION PLAT WERE COMPLETED AT THE REQUEST OF THE "EDEN VILLAGE LLC" FRO THE PURPOSE OF SUBDIVIDING THEIR PROPERTY TO CREATE RESIDENTIAL LOTS.

BASIS OF BEARING:
THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 22, T.7N., R.1E. OF THE SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE SOUTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE NORTH BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR N00°20'47"E.

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	BEARING	CHORD
C1	100.00	55.27	031°40'01"	S18°02'45"W	54.57
C2	195.00	56.38	016°33'56"	N10°29'43"E	56.18
C3	160.00	57.53	020°36'06"	S08°28'38"W	57.22
C4	230.00	63.31	015°46'17"	S09°42'34"E	63.11
C5	470.00	49.23	006°00'03"	N14°35'41"W	49.20
C6	70.00	40.27	032°57'54"	S18°41'42"W	39.72
C7	225.00	65.05	016°33'56"	N10°29'43"E	64.83
C8	130.00	46.74	020°36'06"	S08°28'38"W	46.49
C9	200.00	55.05	015°46'17"	S09°42'34"E	54.88
C10	500.00	52.37	006°00'03"	N14°35'41"W	52.34
C11	440.00	46.09	006°00'05"	N14°35'40"W	46.07
C12	260.00	71.57	015°46'17"	S09°42'34"E	71.34
C13	190.00	68.32	020°36'06"	S08°28'38"W	67.95
C14	165.00	47.71	016°33'56"	N10°29'43"E	47.54
C15	130.00	70.27	030°58'07"	S17°41'48"W	69.41



VICINITY MAP
NOT TO SCALE

THE FAIRWAYS AT WOLF CREEK P.R.U.D., PHASE 5

A PORTION OF THE NORTHWEST QUARTER OF SECTION 22,
TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OF UTAH

DEVELOPER
THE FAIRWAYS AT WOLF CREEK LLC
5200 S. HIGHLAND DRIVE STE 101
SALT LAKE CITY, UT 84117

WEBER COUNTY ATTORNEY

I HAVE EXAMINED THE FINANCIAL GUARANTEE AND OTHER DOCUMENTS ASSOCIATED WITH THIS SUBDIVISION PLAT AND IN MY OPINION THEY CONFORM WITH THE COUNTY ORDINANCE APPLICABLE THERETO AND NOW IN FORCE AND AFFECT.
SIGNED THIS ____________. DAY OF ____________., 20________.

______________________________.
SIGNATURE

WEBER COUNTY SURVEYOR

I HEREBY CERTIFY THAT THE WEBER COUNTY SURVEYOR'S OFFICE HAS REVIEWED THIS PLAT FOR MATHEMATICAL CORRECTNESS, SECTION CORNER DATA AND FOR HARMONY WITH LINES AND MONUMENTS ON RECORD IN THE COUNTY OFFICES. THE APPROVAL OF THIS PLAT BY THE WEBER COUNTY SURVEYORS DOES NOT RELIEVE THE LICENSED LAND SURVEYOR WHO EXECUTED THIS PLAT FROM RESPONSIBILITIES AND/OR LIABILITIES ASSOCIATED THEREWITH. SIGNED THIS ________. DAY OF ____________, 20 ________.

______________________________.
COUNTY SURVEYOR

WEBER COUNTY ENGINEER

I HEREBY CERTIFY THAT THE REQUIRED PUBLIC IMPROVEMENT STANDARDS AND DRAWINGS FOR THIS SUBDIVISION CONFORM WITH COUNTY STANDARDS AND THE AMOUNT OF THE FINANCIAL GUARANTEE IS SUFFICIENT FOR THE INSTALLATION OF THESE IMPROVEMENT.
SIGNED THIS ____________. DAY OF ____________. , 20 ______.

______________________________.
SIGNATURE

WEBER COUNTY PLANNING COMMISSION APPROVAL

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WEBER COUNTY PLANNING COMMISSION ON THE DAY OF ________________., 20 ______.

______________________________.
CHAIRMAN-WEBER COUNTY PLANNING COMMISSION

WEBER COUNTY COMMISSION ACCEPTANCE

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT, THE DEDICATION OF THE STREETS AND OTHER PUBLIC WAYS AND FINANCIAL GUARANTEE OF PUBLIC IMPROVEMENTS ASSOCIATED WITH THIS SUBDIVISION THEREON ARE HEREBY APPROVED AND ACCEPTED BY THE COMMISSIONERS OF WEBER COUNTY, UTAH
THIS __________. DAY OF ____________________. , 20 ______.

______________________________.
CHAIRMAN, WEBER COUNTY COMMISSION

ATTEST: ______________________________.
TITLE: ______________________________.

WOLF CREEK WATER AND SEWER IMPROVEMENT DISTRICT

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WOLF CREEK WATER AND SEWER DISTRICT ON THE DAY OF ________________., 20 ______.

______________________________.
GENERAL MANAGER

Galloway
Planning. Architecture. Engineering.
Trolley Corners Building
515 South 700 East, Suite 3F
Salt Lake City, UT 84102
303.770.8884 O
www.gallowayUS.com

RECORDED #

STATE OF UTAH, COUNTY OF WEBER,
RECORDED AND FILED AT THE

REQUEST OF: ______________________________.
ENTRY NO: ______________________________.
DATE: ______________. TIME: ______________.
BOOK: ______________. PAGE: ______________.

______________________________.
FEE %

______________________________.
WEBER COUNTY RECORDER

Exhibit B

1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

3662 West 2100 South
Salt Lake City, Utah - 84120
Phone (801) 787-9138

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

GEOTECHNICAL STUDY
Fairways at Wolf Creek Subdivision Phases 4 & 5
4700 East 4000 North
Eden, Utah

Project No. 167003

March 8, 2016

Prepared For:

Watts Enterprises
Attention: Mr. Rick Everson
5200 South Highland Drive, Suite 101
Salt Lake City, UT 84117

Prepared By:

EARTHTEC ENGINEERING
Lindon Office

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APPENDIX A

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1.0 EXECUTIVE SUMMARY

This report presents the results of Earthtec Engineering's completed geotechnical study for the Fairways at Wolf Creek Subdivision Phases 4 & 5 in Eden, Utah. This executive summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- The subject property is approximately 14 acres and is proposed to be developed to 41 residential lots. The residential structures will consist of conventionally framed, one- to two-story buildings. We anticipate foundation loads for the proposed structures will not exceed 4,000 pounds per linear foot for bearing wall, 25,000 pounds for column loads, and 100 pounds per square foot for floor slabs

- Our field exploration included the excavation of six (6) test pits to depth of 10 to 14 feet below the existing ground surface. Groundwater was encountered at depths of approximately 6 to 9½ feet below the existing ground surface.

- The subsurface soils encountered generally consisted of topsoil overlying near-surface medium stiff to stiff clay, and dense to very dense sand and gravel. All topsoil should be removed beneath the entire building footprints, exterior flatwork, and pavements prior to construction.

- The native soils have a slight potential for collapse (settlement) and a moderate to high potential for compressibility under increased moisture contents and anticipated load conditions.

- Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on a minimum of 24 inches of firm, undisturbed, uniform granular soils (i.e. completely on sand or gravel soils, etc.), or entirely on a minimum 24 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils.

- Minimum roadway section consists of 3 inch asphalt, 10 inches road-base. Areas that are soft or deflect under construction traffic should be removed and replaced with granular material or structural fill.

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site is suitable for the proposed development, provided the recommendations presented in this report are followed and implemented during design and construction.

Failure to consult with Earthtec Engineering (Earthtec) regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that Earthtec observes the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec performs materials testing and special inspections for this project to

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provide continuity during construction.

2.0 INTRODUCTION

The project is located at approximately 4700 East 4000 North in Eden, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Site Plan Showing Location of Test Pits*, at the end of this report. The purposes of this study are to:

- Evaluate the subsurface soil conditions at the site,
- Assess the engineering characteristics of the subsurface soils, and
- Provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, and asphalt paved residential streets.

The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, geotechnical engineering analysis, and the preparation of this report.

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project as described to us by Mr. Rick Everson with Watts Enterprises, and consists of developing the approximately 14-arce existing parcel into 41 lot residential subdivision. The residential structures will consist of conventionally framed, one- to two-story buildings We have based our recommendations in this report on the assumption that or anticipated foundation loads for the proposed structures will not exceed 4,000 pounds per linear foot for bearing wall, 25,000 pounds for column loads, and 100 pounds per square foot for floor slabs. If structural loads will be greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

In addition to the construction described above, we anticipate that

- Utilities will be installed to service the proposed buildings,
- Exterior concrete flatwork will be placed in the form of curb, gutter, and sidewalks, and
- Asphalt paved residential streets will be constructed.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was an undeveloped lot covered in approximately 1 to 2 feet of snow. The vegetation observed at the test pit locations consisted of

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grass, small bushes, and weeds. The site is located on northeast side of Ogden Valley and the site generally slopes to the southwest, a small hill is located at approximately Lot 23. The site also has a small ravine or drainage on the east site of the property. The ground surface appears to slope more than 15 percent grade, we anticipate up to 4 of cut and fill may be required for site grading and road construction. The lot was bounded on the north and west by vacant property on the east and south by a golf course and residential lots.

4.2 Geologic Setting

The subject property is located in the foothill on northeast side of Ogden Valley. The proposed subdivision is between 5220 and 5320 feet above sea level. These foothills start form the southwestern margin of the Ogden Valley, a northwest to southeast trending valley located between the Wasatch Mountains to the west and the southern end of the Bear River Range to the east. The Ogden Valley is part of the Wasatch Hinterlands Section of the Middle Rocky Mountain Physiographic Province. Stokes describes the Wasatch Hinterlands as a belt of mixed, moderately rugged topography located on the east side of the Wasatch Range that has varied topography, with hilly areas dominating valley areas. The Ogden Valley is currently occupied by Pineview Reservoir, a manmade lake formed by damming the Ogden River and several of its tributaries, as well as the towns of Huntsville, Eden, and Liberty.

The Ogden Valley was prehistorically occupied by an arm of Lake Bonneville, a Pleistocene age, fresh water lake that covered most of northwestern Utah and parts of northeastern Nevada. Sediment deposited by the lake are still present within portions of the valley and at places within the foothills surrounding the valley below the elevation of the high stand of the lake which was between approximately 5,170 and 5,200 feet above sea level. The Great Salt Lake of northwestern Utah is a remnant of ancient Lake Bonneville.

The geology at the location of the subject lot and surrounding area has been mapped by Sorenson and Crittenden 1979[1]. The geology at the location of the subject site (Trappers Ridge & Fairways Subdivisions) as shown on the referenced map is described as boulder, colluvium and slopewash deposits, chiefly along eastern margin of Ogden Valley; in part lag from Tertiary units (Map Unit Qcs, Holocene).

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on January 28, 2016 and February 3, 2016 by the excavation of six (6) test pits to depth of 10 to 14 feet below the existing ground surface using a a track-mounted excavator. The approximate locations of the test pits are shown on Figure No. 2, *Site Plan*

---

[1] Geologic Map of the Huntsville Quadrangle, Weber and Cash Counties, Utah, by Martin L. Sorensen and Max D. Crittenden, Jr, 1979, USGS GQ-1503

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Showing Location of Test Pits. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 8, *Test Pit Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 9, *Legend*.

Disturbed bag samples and relatively undisturbed block samples were collected at various depths in each test pit. The soil samples collected were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Lindon, Utah laboratory where they will be retained for 30 days following the date of this report and then discarded, unless a written request for additional holding time is received prior to the 30 day limit.

5.2 Percolation Testing

Percolation tests were conducted in Test Pit 3 (TP-3), Test Pit 5 (TP-5), and Test Pit 6 (TP-6). The tests were performed at the specified depth by digging a small hole with a shovel, filling the hole with water, by filling the auger with water and measuring the water loss with time. The tests were performed several times and the final measured rate is shown in the table below.

Table 1: Percolation Test Results

Test Pit No.	Depth (ft.)	Percolation Rate (min/in)	Soil Type
TP-3	5	77	GC
TP-3	7½	26	CL
TP-5	5	58	SC
TP-5	8	62	SC
TP-6	5	25	SC
TP-6	7	19	SC

6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture content, dry density tests, liquid and plastic limits determinations, mechanical (partial) gradation analyses, one-dimensional consolidation tests, and direct shear tests. The table below summarizes the laboratory test results, which are also included on the attached *Test Pit Logs* at the respective sample depths, on Figure Nos. 10 to 12, *Consolidation-Swell Test*, and on Figure Nos. 13 and 14, *Direct Shear Test*.

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Table 2: Laboratory Test Results

Test Pit No.	Depth (ft.)	Natural Moisture (%)	Natural Dry Density (pcf)	Atterberg Limits		Grain Size Distribution (%)			Soil Type
				Liquid Limit	Plasticity Index	Gravel (+ #4)	Sand	Silt/Clay (- #200)	
TP-1	2	13	-	50	21	54	24	22	GM
TP-3	8	15	107	41	19	31	18	51	CL
TP-4	6	5	110	49	25	78	12	10	GP-GC
TP-5	10	14	-	-	-	20	50	30	SC
TP-5	12	20	-	-	-	32	38	30	SC
TP-6	4	24	96	53	32	23	55	22	SC

NP* = Non-Plastic

As part of the consolidation test procedure, water was added to the samples to assess moisture sensitivity when the samples were loaded to an equivalent pressure of approximately 1,000 psf. The native soils have a slight potential for collapse (settlement) and a moderate to high potential for compressibility under increased moisture contents and anticipated load conditions.

A direct shear test was performed on the native soils in TP-4 at a depth of 6 feet below existing site grades, the results indicated an apparent cohesion of 280 psf and an internal friction angle of 37 degrees. A direct shear test was performed on the native soils in TP-5 at a depth of 12 feet below existing site grades, the results indicated an apparent cohesion of 370 psf and an internal friction angle of 31 degrees.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered topsoil which is estimated to extend about 1½ to 2 feet in depth at the test pit locations. Below the fill we encountered layers of clay, sand, and gravel extending to depth of 10 to 14 feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 8, *Test Pit Log* at the end of this report. Based on our experience and observations during field exploration, the clay soils visually ranged from medium stiff to stiff in consistency and the sand and gravel soils visually had a relative density varying from of medium dense to very dense.

7.2 Groundwater Conditions

Groundwater was encountered at depths of approximately 6 to 9½ feet below the existing ground surface. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. The contractor should be prepared to dewater excavations as needed.

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8.0 SITE GRADING

8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered topsoil on the surface of the site. The fill (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered. Over-excavations below footings and slabs also may be needed, as discussed in Section 10.0.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. Because there is more than 30 feet of relief from east to west, we anticipate that up to 4 feet of fill may be placed in some areas of the site during grading. If more than 4 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so that we may provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) prior to construction to allow settlement to occur.

8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[2] requirements for Type B soils

8.3 Fill Material Composition

The native soils vary from test pit to test pit some of the soils appear to be suitable for use as placed and compacted structural fill provided the material meets the requirements for structural fill and any existing debris and particles larger than 6 inches in diameter are removed proir to use. Excavated soils, including clay, may be stockpiled for use as fill in landscape areas.

Structural fill is defined as fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. We recommend that a professional engineer or geologist verify that the structural fill to be used on this project meets the requirements, stated below. We recommend that structural fill consist of imported sandy/gravelly soils meeting the following requirements in the table below:

---

[2] OSHA Health And Safety Standards, Final Rule, CFR 29, part 1926.

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Table 3: Structural Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
4 inches	100
3/4 inches	70 – 100
No. 4	40 – 80
No. 40	15 – 50
No. 200	0 – 25
Liquid Limit	35 maximum
Plasticity Index	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, more strict quality control measures than normally used may be required, such as using thinner lifts and increased or full time observation of fill placement.

We recommend that utility trenches below any structural load be backfilled using structural fill. Note that most local governments and utility companies require Type A-1-a or A-1-b (AASHTO classification) soils (which overall is stricter than our recommendations for structural fill) be used as backfill above utilities in certain areas. In other areas or situations, utility trenches may be backfilled with the native soil, but the contractor should be aware that native clay soils and the variety of soils observed in the explorations may be time consuming to compact due to potential difficulties in controlling the moisture content needed to obtain optimum compaction. All backfill soil should have a maximum particle size of 4 inches, a maximum Liquid Limit of 35 and a maximum Plasticity Index of 15.

If required (i.e. fill in submerged areas), we recommend that free draining granular material (clean sand and/or gravel) meet the following requirements in the table below:

Table 4: Free-Draining Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
3 inches	100
No. 10	0 – 25
No. 40	0 – 15
No. 200	0 – 5
Plasticity Index	Non-plastic

Three inch minus washed rock (sometimes called river rock or drain rock) and pea gravel materials usually meet these requirements and may be used as free draining fill. If free draining fill will be placed adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions should include either placing a filter fabric between the free draining fill and the adjacent soil material, or using a well-graded, clean filtering material approved by the geotechnical engineer.

Exhibit B

8.4 Fill Placement and Compaction

Fill should be placed on level, horizontal surfaces. Where fill will be placed on existing slopes steeper than 5H:1V, the existing ground should be benched prior to placing fill. We recommend bench heights of 1 to 4 feet, with the lowest bench being a minimum 3 feet below adjacent grade and at least 10 feet wide.

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness prior to compaction of 4 inches for hand operated equipment, 6 inches for most "trench compactors" and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

- In landscape and other areas not below structurally loaded areas: 90%
- Less than 5 feet of fill below structurally loaded areas: 95%
- Between 5 and 10 feet of fill below structurally loaded areas: 98%

Generally, placing and compacting fill at moisture contents within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content deviates from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement and we recommend early testing to demonstrate that placement and compaction methods are achieving the required compaction. The contractor is responsible to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.5 Stabilization Recommendations

Near surface layers of clay soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment, partially loaded equipment, tracked equipment, by working in dry times of the year, and/or by providing a working surface for equipment.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material. In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up, or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches.

Exhibit B

For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

Using a geosynthetic fabric, such as Mirafi 600X or equivalent, may also reduce the amount of material required and avoid mixing of the granular material and the subgrade. If a fabric is used, following removal of disturbed soils and water, the fabric should be placed over the bottom and up the sides of the excavation a minimum of 24 inches. The fabric should be placed in accordance with the manufacturer's recommendations, including proper overlaps. The granular material should then be placed over the fabric in compacted lifts. Again, we suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor.

9.0 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The residential structures should be designed in accordance with the International Residential Code (IRC). The IRC designates this area as a seismic design class D_0.

The site is located at approximately 41.334 degrees latitude and -111.833 degrees longitude from the approximate center of the site. The IRC site value for this property is 0.643g. The design spectral response acceleration parameters are given below.

Table 5: Design Acceleration for Short Period

S_S	F_a	Site Value (S_{DS})
		2/3 S_S*F_a
0.944	1.023	0.643g

S_S = Mapped spectral acceleration for short periods
F_a = Site coefficient from Table 1613.5.3(1)
$S_{DS} = ⅔S_{MS} = ⅔\,(F_a \cdot S_s)$ = 5% damped design spectral response acceleration for short periods

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Structurally the Ogden Valley is a down-faulted block bound on the northeast by the northwest to southeast oriented Northeastern Margin Fault and on the southwest by the northwest to southeast oriented Southwestern Margin Fault, as described by Hecker. The northwest to southeast oriented North Fork Fault also runs below the central portion of the Ogden Valley. None of these faults are mapped by Hecker to

Exhibit B

be active (showing evidence of movement during Holocene (past 10,000 years) time).

9.3 Liquefaction Potential

According to current liquefaction maps[3] for Weber County, liquefaction potential at the site is not determined. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be near saturation for liquefaction to occur.

Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils were composed of stiff clays and dense to very dense sands and gravels. The soils encountered at this project do not appear liquefiable, but the liquefaction susceptibility of underlying soils (deeper than our explorations) is not known and would require deeper explorations to quantify.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered during our field exploration, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions and assumptions related to foundations are significantly different, Earthtec should be notified so that we can re-evaluate our design parameters and estimates (higher loads may cause more settlement), and to provide additional recommendations if necessary.

Conventional strip and spread footings may be used to support the proposed structures after appropriate removals as outlined in Section 8.1. Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, organic soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction they should be removed or recompacted.

10.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on a minimum of 24 inches of firm, undisturbed, uniform granular soils (i.e. completely on sand or gravel soils, etc.), or entirely on a minimum 24 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils. For foundation design we recommend the

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[3] Utah Geological Survey, Liquefaction-Potential Map For A Part Of Weber County, Utah, Public Information Series 28, August 1994.

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following:

- Footings founded on native soils may be designed using a maximum allowable bearing capacity of 1,500 pounds per square foot. Footings founded on a minimum 24 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2012 International Building Code.
- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.
- Exterior footings should be placed below frost depth which is determined by local building codes. In general 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.
- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.
- The bottom of footing excavations should be compacted with at least 4 passes of an approved non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.
- Footing excavations should be observed by the geotechnical engineer prior to beginning footing construction to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.
- Due to groundwater encountered at the site, lowest floor slab depths should be limited to 3 feet below existing site grades. This is intended to provide a minimum of 3 feet of separation between the observed groundwater condition and the bottom of the floor slab.
- Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

10.3 Estimated Settlements

If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate that total settlements should not exceed one inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during a seismic event due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, and/or if foundation soils are allowed to become wetted.

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10.4 Lateral Earth Pressures

Below grade walls act as soil retaining structures and should be designed to resist pressures induced by the backfill soils. The lateral pressures imposed on a retaining structure are dependent on the rigidity of the structure and its ability to resist rotation. Most retaining walls that can rotate or move slightly will develop an active lateral earth pressure condition. Structures that are not allowed to rotate or move laterally, such as subgrade basement walls, will develop an at-rest lateral earth pressure condition. Lateral pressures applied to structures may be computed by multiplying the vertical depth of backfill material by the appropriate equivalent fluid density. Any surcharge loads in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. For static conditions the resultant forces is applied at about one-third the wall height (measured from bottom of wall). For seismic conditions, the resultant forces are applied at about two-third times the height of the wall both measured from the bottom of the wall. The lateral pressures presented in the table below are based on drained, horizontally placed structural fill (as outlined in this report) as backfill material using a 31° friction angle and a dry unit weight of 115 pcf.

Table 6: Lateral Earth Pressures (Static and Dynamic)

Condition	Case	Lateral Pressure Coefficient	Equivalent Fluid Pressure (pcf)
Active	Static	0.32	37
	Seismic	0.42	49
At-Rest	Static	0.48	56
	Seismic	0.66	76
Passive	Static	3.12	359
	Seismic	4.52	520

*Seismic values combine the static and dynamic values

These pressure values do not include any surcharge, and are based on a relatively level ground surface at the top of the wall and drained conditions behind the wall. It is important that water is not allowed to build up (hydrostatic pressures) behind retaining structures. Retaining walls should incorporate drainage behind the walls as appropriate, and surface water should be directed away from the top and bottom of the walls.

Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.40 for native sands and 0.55 for native gravels or structural fill meeting the recommendations presented herein. For concrete or masonry walls shall be selected and constructed in accordance to the provision of Section R404 of the 2012 International Residential Code or sections referenced therein. Retaining wall lateral resistance design should further reference Section R404.4 for reference of Safety Factors.

The pressure and coefficient values presented above are ultimate; therefore an appropriate factor of safety may need to be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project structural engineer.

11.0 FLOOR SLABS AND FLATWORK

Due to shallow groundwater encountered at the site, lowest floor slab depths should be limited to 3 feet below existing site grades. This is intended to provide a minimum of 3 feet of separation between the observed groundwater condition and the bottom of the floor slab.

Concrete floor slabs and exterior flatwork may be supported on uniform native soils or a minimum of 12 inches of properly placed and compacted structural fill after appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum 4 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For exterior flatwork, we recommend placing a minimum 4 inches of road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of sub-grade reaction of 110 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches, as per Section R506.1 of the 2012 International Residential Code.

To help control normal shrinkage and stress cracking, we recommend that floor slabs have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints, frequent crack control joints, and non-rigid attachment of the slabs to foundation and bearing walls. Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 DRAINAGE

12.1 Surface Drainage

As part of good construction practice, precautions should be taken during and after construction to reduce the potential for water to collect near foundation walls. Accordingly, we recommend the following:

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the

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excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.

- Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.
- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 5 feet, from foundation walls. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Section R405.1 of the 2012 International Residential Code states, “Drains shall be provided around all concrete and masonry foundations that retain earth and enclose habitable or usable spaces located below grade.” Section R310.2.2 of the 2012 International Residential Code states, “Window wells shall be designed for proper drainage by connecting to the building’s foundation drainage system.” An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils, which include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. The soils observed in the explorations at the depth of foundation consisted primarily of soils which are not Group 1 soils. The recommendations presented below should be followed during design and construction of the foundation drains:

- A perforated 4-inch minimum diameter pipe should be enveloped in at least 12 inches of free-draining gravel and placed adjacent to the perimeter footings. The perforations should be oriented such that they are not located on the bottom side of the pipe, as much as possible. The free-draining gravel should consist of primarily ¾- to 2-inch size gravel having less than 5 percent passing the No. 4 sieve, and should be wrapped with a separation fabric such as Mirafi 140N or equivalent.
- The highest point of the perforated pipe bottom should be equal to the bottom elevation of the footings. The pipe should be uniformly graded to drain to an appropriate outlet (storm drain, land drain, other gravity outlet, etc.) or to one or more sumps where water can be removed by pumping.

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- A perforated 4-inch minimum diameter pipe should be installed in all window wells and connected to the foundation drain.
- To facilitate drainage beneath basement floor slabs we recommend that the minimum thickness of free-draining fill beneath the slabs be increased to at least 10 inches (approximately equal to the bottom of footing elevations). A separation fabric such as Mirafi 140N or equivalent should be placed beneath the free-draining gravel. Connections should be made to allow any water beneath the slabs to reach the perimeter foundation drain.
- The drain system should be periodically inspected and clean-outs should be installed for the foundation drain to allow occasional cleaning/purging, as needed. Proper drain operation depends on proper construction and maintenance.

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt paved residential streets will be constructed as part of the project. The native soils encountered beneath the topsoil during our field exploration were predominantly composed of clays. We estimate that a California Bearing Ratio (CBR) value of 3 is appropriate for these soils. If the concrete flatwork and pavement areas are constructed undocumented fill material and/or topsoil, increased maintenance costs over time should be anticipated.

We anticipate that the traffic volume will be about 400 vehicles a day or less for the residential streets, consisting of mostly cars and pickup trucks, with a daily delivery truck and a weekly garbage truck. Based on these traffic parameters, the estimated CBR given above, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (1998), we recommend the minimum asphalt pavement section presented below.

Table 7: Pavement Section Recommendations

Asphalt Thickness (in)	Compacted Roadbase Thickness (in)	Compacted Subbase Thickness (in)
3	6	8*
3	10*	0

* Stabilization may be required

If the pavement will be required to support more traffic than listed above, our office should be notified so that we can re-evaluate the pavement section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above in Section 8.5.
- Site grading fills below the pavements should meet structural fill composition and placement recommendations per Sections 8.3 and 8.4 herein.
- Asphaltic concrete, aggregate base and sub-base material composition should meet local,

APWA or UDOT requirements.

- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

14.0 SLOPE STABILITY

We evaluated the overall stability of the existing slope with the proposed roadway for the subject subdivision. The test pits preformed near the slope cross-section at the site extended to approximately 10 to 14 feet. The properties of the native soils at the site were estimated using laboratory testing on samples recovered during our field investigations and our experience with similar soils. Direct shear tests were performed on the native soils in encountered at 6 feet and 12 feet below the existing side grades. The results of the test at 6 feet have an internal friction angle of 37 degrees and an apparent cohesion of 280 psf. The results of the test at 12 feet have an internal friction angle of 31 degrees and an apparent cohesion of 370 psf .

For the seismic (pseudostatic) analysis, a peak horizontal ground acceleration of 0.372g for the 2% probability of exceedance in 50 years was obtained for site (grid) locations of 41.334 degrees north latitude and -111.833 degrees west longitude. Typically, one-third to one-half this value is utilized in analysis. Accordingly, a value of 0.186 was used as the pseudostatic coefficient for the stability analysis.

We evaluated the global stability of the proposed site using the computer program XSTABL. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. The configuration analyzed was based aerial photographs, our observations during the field investigation, past and present topographic maps. One cross-section section was analyzed as part of the study.

The configuration of the existing slope that was analyzed at Cross-Section A-A' it started in the fariway for the golf course and extends through the proposed lots and roadway to the top of a local hill. The slope is approximately 40 feet in height, in approximately 400 feet in length, with a maximum slope of the native grade at approximately 20 percent grade.

A water table was conservatively placed at approximately 6 feet at the base of the slope and 9½ feet at the top of the slope.

To model the load imposed on the slope by typical residential buildings and roadway, a 1,500 psf load was modeled approximately 25 feet on either site of the proposed roadway for Cross-

Exhibit B

Section A-A'. Typically, the required minimum factors of safety are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the slope configuration described above meets both these requirements. Placed fill should not exceed 3 feet above existing grades. The slope stability data are attached as Figure Nos. 15 and 16, *Stability Results*. Modifications to the slope, including the construction of retaining walls taller than 4 feet, should be properly designed and engineered.

It should be clearly understood that slope movements or even failure can occur if the slope is undermined or the slope soils become saturated. The property owner and the owner's representatives should be made aware of the risks should these or other conditions occur that could saturate or erode/undermine the soils. Surface water should be directed away from the top and bottom of the slope, the slope should be vegetated with drought resistant plants, and sprinklers should not be placed on the face of the slope.

15.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The explorations may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the explorations may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, Earthtec should be advised immediately so that the appropriate modifications can be made.

The findings and recommendations presented in this geotechnical report were prepared in accordance with generally accepted geotechnical engineering principles and practice in this area of Utah at this time. No warranty or representation is intended in our proposals, contracts, letters, or reports.

This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described herein, which may require additional analyses and possibly modified recommendations. Thus we strongly recommend consulting with Earthtec regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

To maintain continuity, Earthtec should also perform materials testing and special inspections for this project. The recommendations presented herein are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and

Exhibit B

remain appropriate (based on the actual design). Earthtec should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Earthtec also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact Earthtec at your convenience.

Respectfully;

EARTHTEC ENGINEERING

PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
3/8/16
STATE OF UTAH

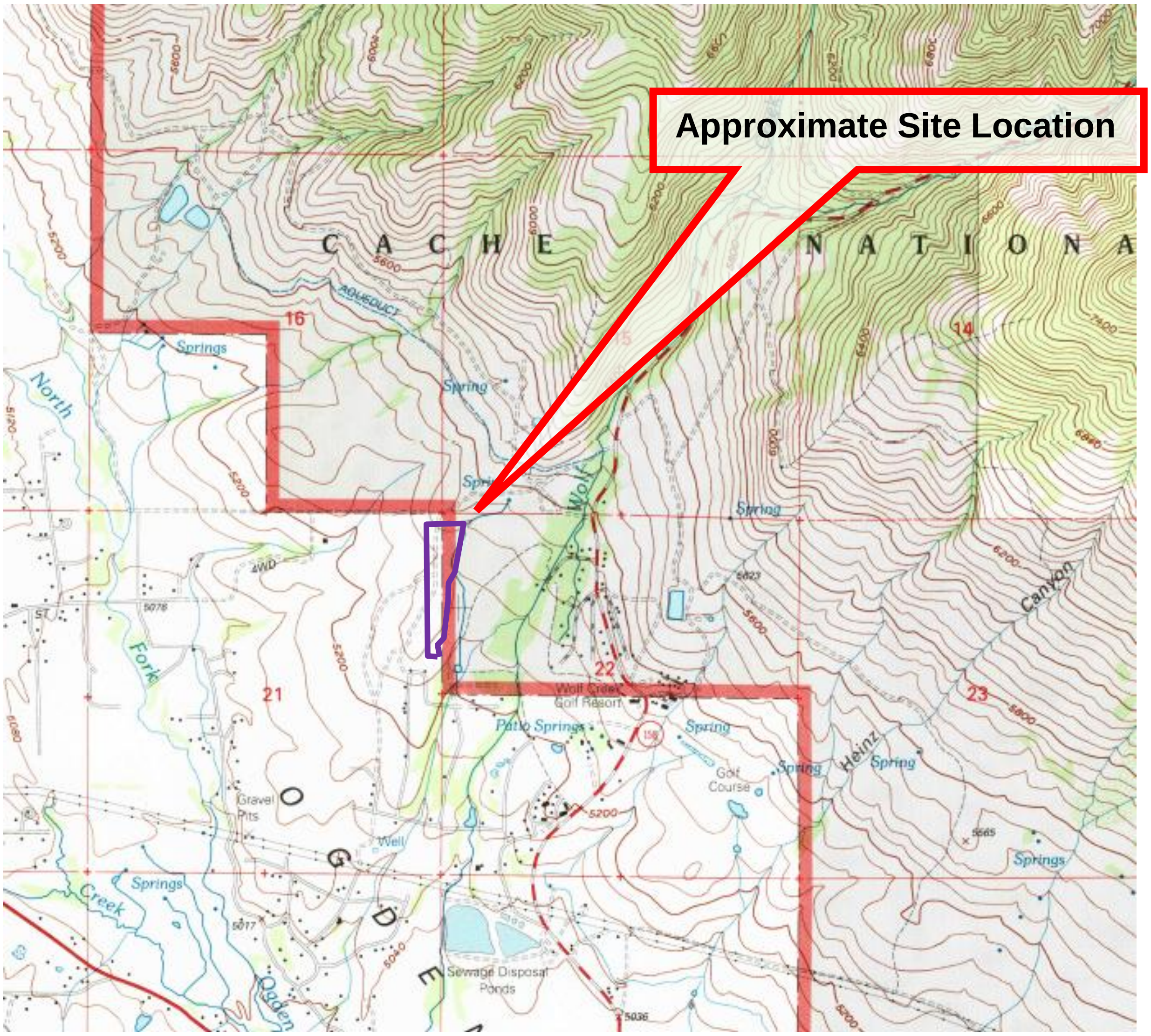
Caleb R. Allred, E.I.T.
Project Engineer

Timothy A. Mitchell, P.E.
Geotechnical Engineer

Exhibit B

VICINITY MAP

Fairways At Wolf Creek Subdivision, Phases 4 And 5
4700 East 4000 North
Eden, Utah



Approximate Site Location

Subject Property

(cida.usgs.gov)

N

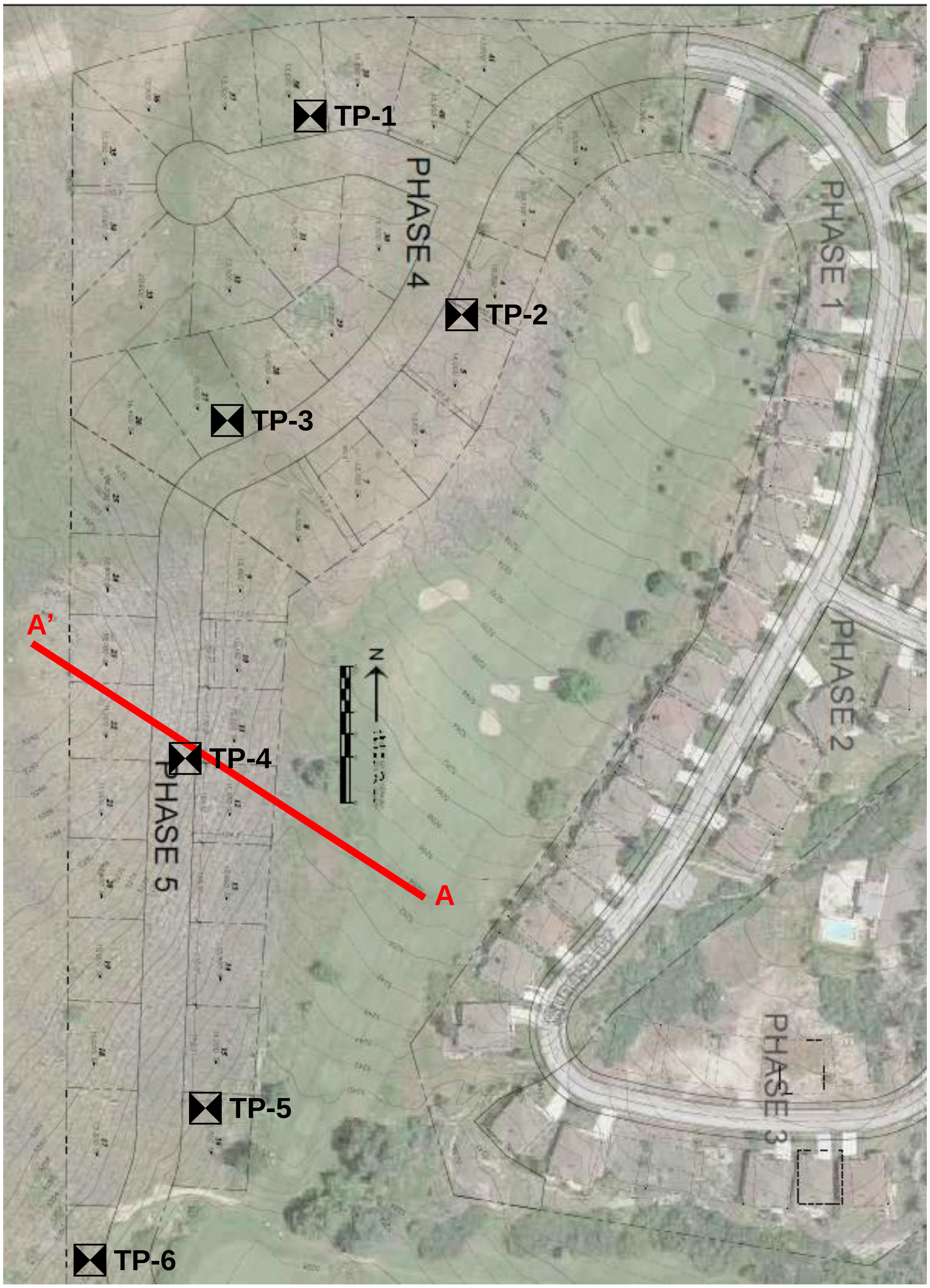
Not to Scale

PROJECT NO.: 167003	EARTHTEC ENGINEERING	**FIGURE NO.:** 1

Exhibit B

SITE PLAN SHOWING LOCATION OF TEST PITS

Fairways At Wolf Creek Subdivision, Phases 4 And 5
4700 East 4000 North
Eden, Utah



⧗ **Approximate Location of Test Pits** — **Approximate Location of Slope Cross-Section**

*Site Plan was provided by the client

PROJECT NO.: 167003	EARTHTEC ENGINEERING	**FIGURE NO.:** 2

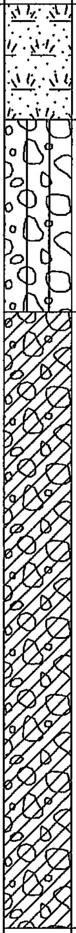
Exhibit B

TEST PIT LOG

NO.: TP-1

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters
EQUIPMENT: Trackhoe
DEPTH TO WATER; INITIAL ∇ **:**

PROJECT NO.: 167003
DATE: 02/03/16
ELEVATION: Not Measured
LOGGED BY: F. Namdar
AT COMPLETION ▼ **:** 6 ft.



Depth (Ft.)	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
				TEST RESULTS							
0		TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
1											
2		Silty GRAVEL with sand, dense (estimated), moist, olive to red-brown, iron oxide staining, some cobbles and boulders encountered.	■	13		50	21	54	24	22	
3	GM										
4		Clayey GRAVEL with sand, dense (estimated), very moist to wet, olive to brown, iron oxide staining, some cobbles and boulders encountered.	■								
5											
6		▼	■								
7											
8	GC		■								
9											
10											
11											
12		Maximum depth explored approximatley 12 feet.									
13											
14											
15											

Notes: Groundwater encountered at 6 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 3

Exhibit B

TEST PIT LOG

NO.: TP-2

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters
EQUIPMENT: Trackhoe
DEPTH TO WATER; INITIAL ▽ **:**

PROJECT NO.: 167003
DATE: 02/03/16
ELEVATION: Not Measured
LOGGED BY: F. Namdar
AT COMPLETION ▼ **:** 6 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0 1			TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
2 3 4		SC	Clayey SAND with gravel, dense to very dense (estimated), moist, reb-brown, iron oxide staining, some cobbles and boulders encountered.	■								
5 6 ▼ 7 8 9 10		GC	Clayey GRAVEL with sand, dense (estimated), very moist to wet, olive to brown, iron oxide staining, some cobbles and boulders encountered	■ ■ ■								
11 12		GP-GC	Poorly Graded GRAVEL with clay and sand, dense (estimated), wet, brown, some cobbles and boulders encountered.	■								
13 14 15			Maximum depth explored approximately 12 feet.									

Notes: Groundwater encountered at 6 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 4

Exhibit B

TEST PIT LOG

NO.: TP-3

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
PROJECT NO.: 167003
CLIENT: Watts Enterprises
DATE: 02/03/16
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: C.E. Butters
LOGGED BY: F. Namdar
EQUIPMENT: Trackhoe
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ : 7 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
1												
2		GC	Clayey GRAVEL with sand, dense (estimated), moist to wet, olive to brown, iron oxide staining, some cobbles and boulders encountered.	■								
3												
4				■								
5												
6				■								
7		CL	▼ Gravelly Lean CLAY with sand, stiff to hard (estimated), wet, brown to red-brown, some cobbles and boulders encountered.									
8				■	15	107	41	22	31	18	51	C
9												
10												
11			Maximum depth explored approximately 11 feet.									
12												
13												
14												
15												

Notes: Groundwater encountered at 7 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167003

FIGURE NO.: 5

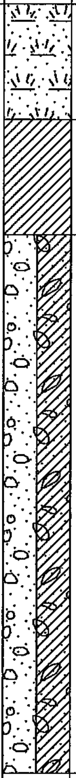
Exhibit B

TEST PIT LOG

NO.: TP-4

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters
EQUIPMENT: Trackhoe
DEPTH TO WATER; INITIAL ▽ **:**

PROJECT NO.: 167003
DATE: 01/28/16
ELEVATION: Not Measured
LOGGED BY: F. Namdar
AT COMPLETION ▼ **:** 9 ft.



Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0 1			TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
2 3		CL	Gravelly Lean CLAY with sand, stiff to hard (estimated), moist, brown to red-brown, some cobbles and boulders encountered.	■								
4 5		GP-GC	Poorly Graded GRAVEL with clay, dense (estimated), moist to wet, olive to brown, iron oxide staining, some cobbles and boulders encountered.	■								
6 7				■	5	110	49	25	78	12	10	C, DS
8 9 10		▼		■								
11 12 13 14 15			Maximum depth eplored approximatley 10 feet due large boulders and equipment refusal.									

Notes: Groundwater encountered at 9 feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167003

FIGURE NO.: 6

LOG OF TESTPIT 167003 LOGS.GPJ EARTHTEC.GDT 3/8/16

Exhibit B

TEST PIT LOG

NO.: TP-5

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
PROJECT NO.: 167003
CLIENT: Watts Enterprises
DATE: 01/28/16
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: C.E. Butters
LOGGED BY: F. Namdar
EQUIPMENT: Trackhoe
DEPTH TO WATER; INITIAL ∇ :
AT COMPLETION ▼ : 9.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
1												
2	▨		Clayey SAND with gravel, dense (estimated), moist to wet, brown to olive to red-brown.	■								
3	▨											
4	▨			■								
5	▨											
6	▨			■								
7	▨											
8	▨	SC		■								
9	▨		▼									
10	▨			■	14				20	50	30	
11	▨											
12	▨			■	20				32	38	30	DS
13	▨											
14			Maximum depth explored approximately 14 feet.									
15												

Notes: Groundwater encountered at 9½ feet.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 7

Exhibit B

TEST PIT LOG
NO.: TP-6

PROJECT:	Fairways at Wolf Creek, Phases 4 & 5	**PROJECT NO.:**	167003
CLIENT:	Watts Enterprises	**DATE:**	01/28/16
LOCATION:	See Figure 2	**ELEVATION:**	Not Measured
OPERATOR:	C.E. Butters	**LOGGED BY:**	F. Namdar
EQUIPMENT:	Trackhoe		
DEPTH TO WATER; INITIAL ▽ :		**AT COMPLETION ▼ :**	9 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay with sand with organics throught, moist, dark brown, some boulders and cobbles.									
1												
2		SC	Clayey SAND with gravel, dense (estimated), moist to very moist, brown to olive to red-brown.	■								
3												
4				■	24	96	53	32	23	55	22	C
5												
6				■								
7												
8		GP-GC ▼	Poorly Graded GRAVEL with clay, very dense (estimated), moist to wet, brown to orange-brown, some boulders and cobbles.	■								
9												
10			Maximum depth explored approximately 10 feet due to equipment refusal.									
11												
12												
13												
14												
15												

Notes: Groundwater encountered at 9 feet.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

LOG OF TESTPIT 167003 LOGS.GPJ EARTHTEC.GDT 3/8/16

PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 8

Exhibit B

LEGEND

PROJECT: Fairways at Wolf Creek, Phases 4 & 5
CLIENT: Watts Enterprises
DATE:
LOGGED BY:

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

◩ SPLIT SPOON SAMPLER
(1 3/8 inch inside diameter)

⧗ MODIFIED CALIFORNIA SAMPLER
(2 inch outside diameter)

▥ SHELBY TUBE
(3 inch outside diameter)

◨ BLOCK SAMPLE

☒ BAG/BULK SAMPLE

WATER SYMBOLS

▽ Water level encountered during field exploration

▼ Water level encountered at completion of field exploration

NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

PROJECT NO.: 167003

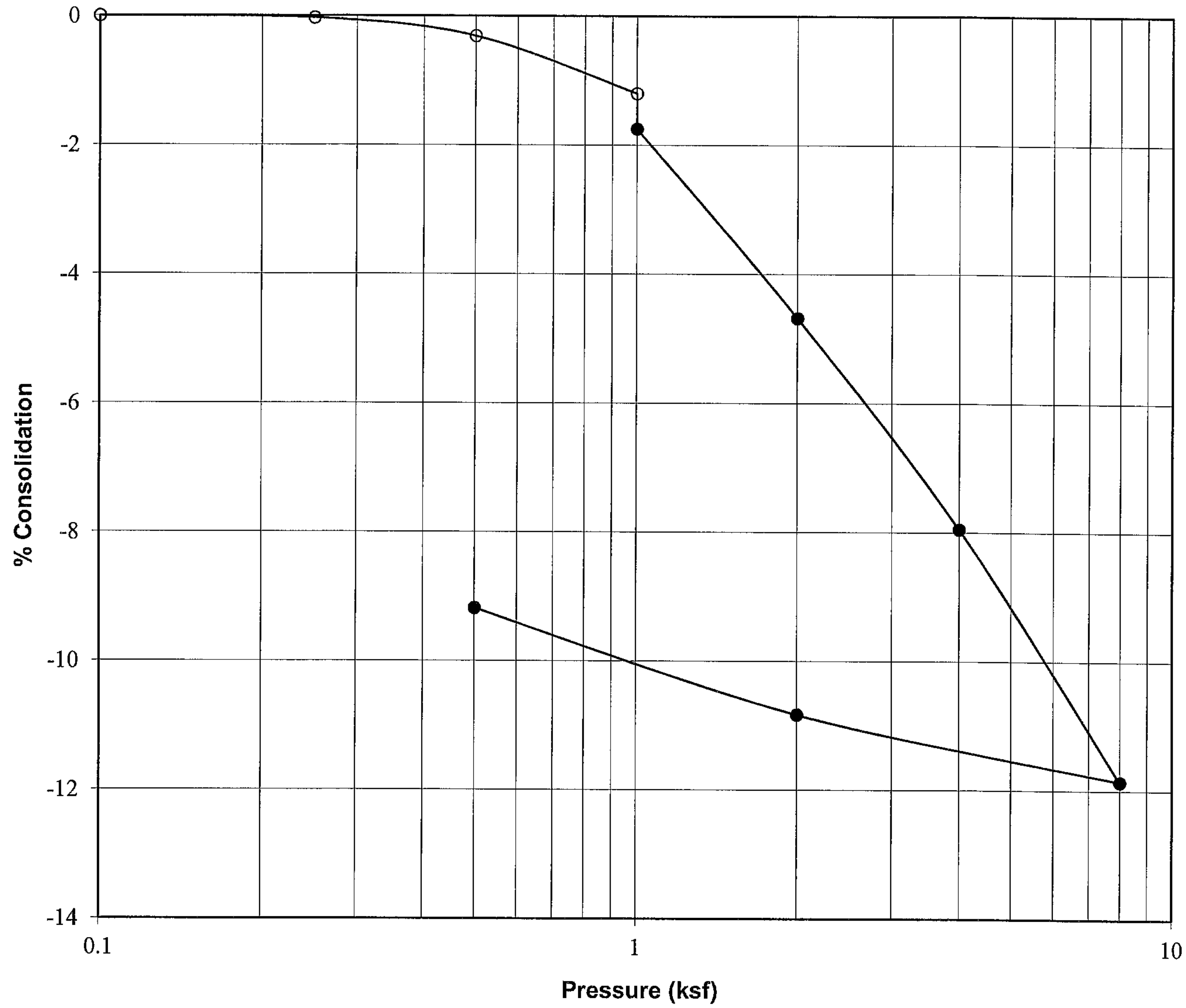
EARTHTEC ENGINEERING

FIGURE NO.: 9

LEGEND 167003 LOGS.GPJ EARTHTEC.GDT 3/8/16

Exhibit B

CONSOLIDATION - SWELL TEST

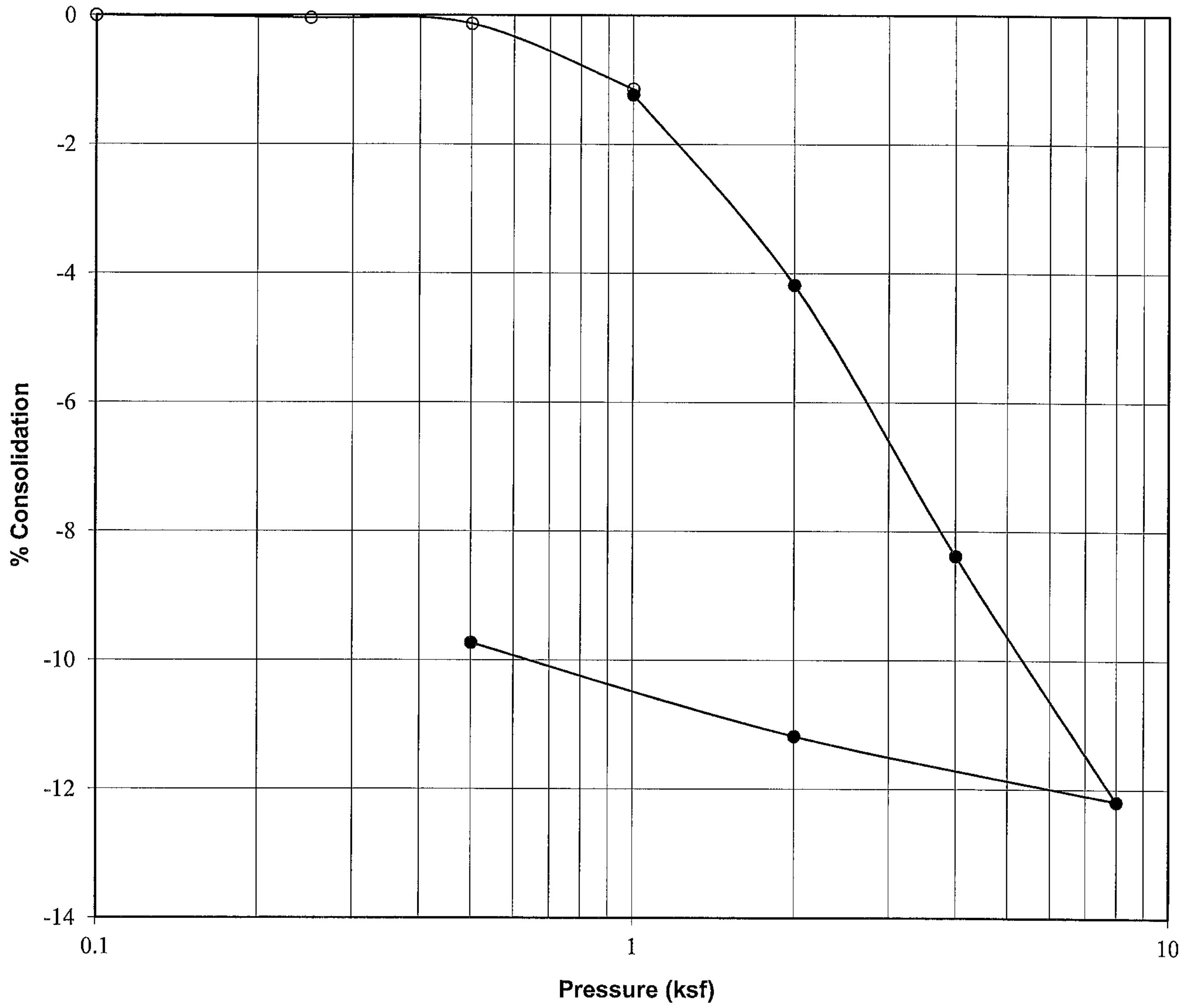


Project:	Fairways at Wolf Creek Phases 4 & 5
Location:	TP-3
Sample Depth, ft:	8
Description:	Block
Soil Type:	Gravelly Lean CLAY with sand (CL)
Natural Moisture, %:	15
Dry Density, pcf:	107
Liquid Limit:	41
Plasticity Index:	19
Water Added at:	1 ksf
Percent Collapse:	0.6

PROJECT NO.: 167003	EARTHTEC ENGINEERING	**FIGURE NO.:** 10

Exhibit B

CONSOLIDATION - SWELL TEST



Project:	Fairways at Wolf Creek Phases 4 & 5
Location:	TP-4
Sample Depth, ft:	6
Description:	Block
Soil Type:	Poorly Graded GRAVEL with clay (GP-GC)
Natural Moisture, %:	5
Dry Density, pcf:	110
Liquid Limit:	49
Plasticity Index:	25
Water Added at:	1 ksf
Percent Collapse:	0.1

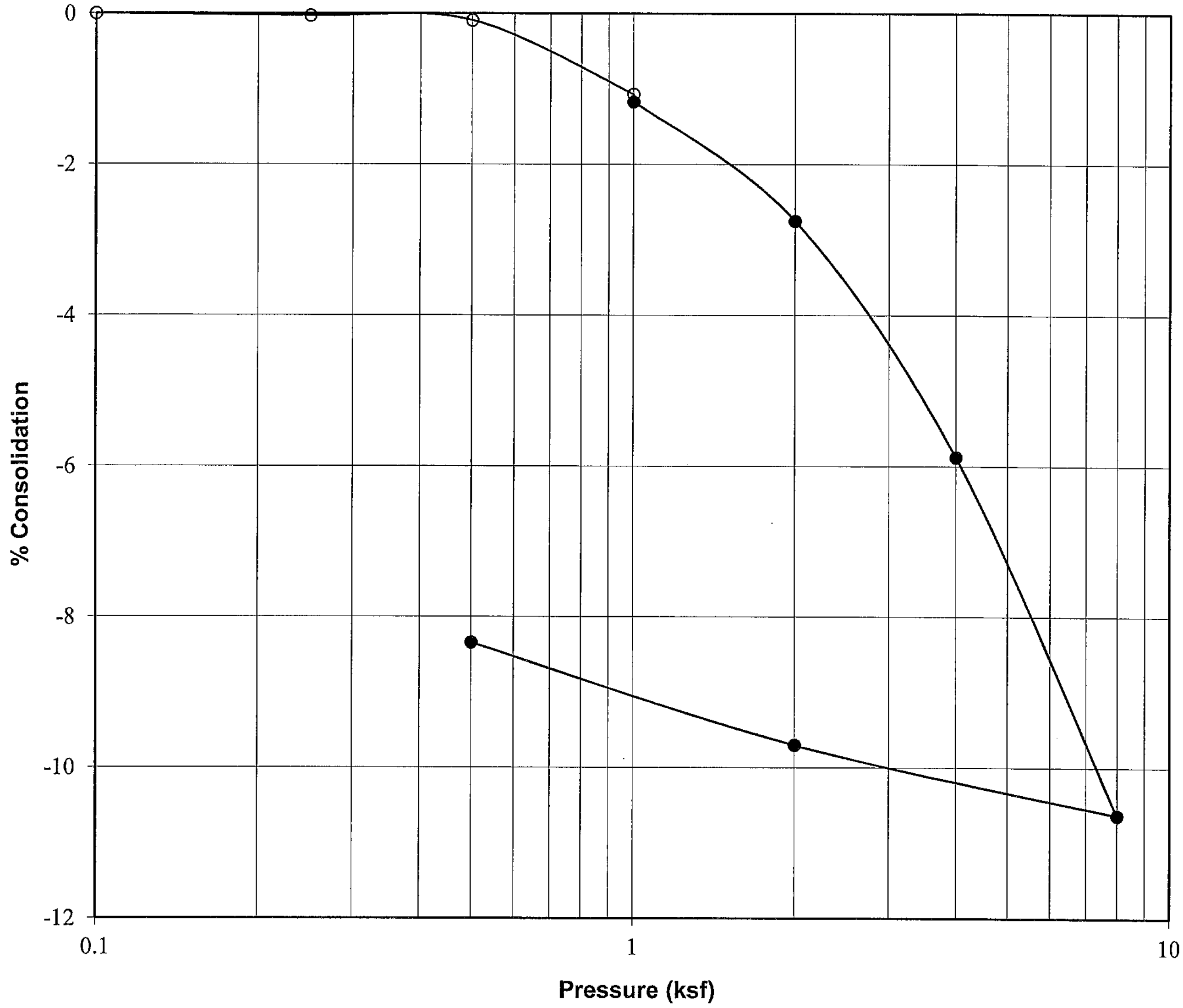
PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 11

Exhibit B

CONSOLIDATION - SWELL TEST



Project:	Fairways at Wolf Creek Phases 4 & 5
Location:	TP-6
Sample Depth, ft:	4
Description:	Block
Soil Type:	Clayey SAND with gravel (SC)
Natural Moisture, %:	24
Dry Density, pcf:	96
Liquid Limit:	53
Plasticity Index:	32
Water Added at:	1 ksf
Percent Collapse:	0.1

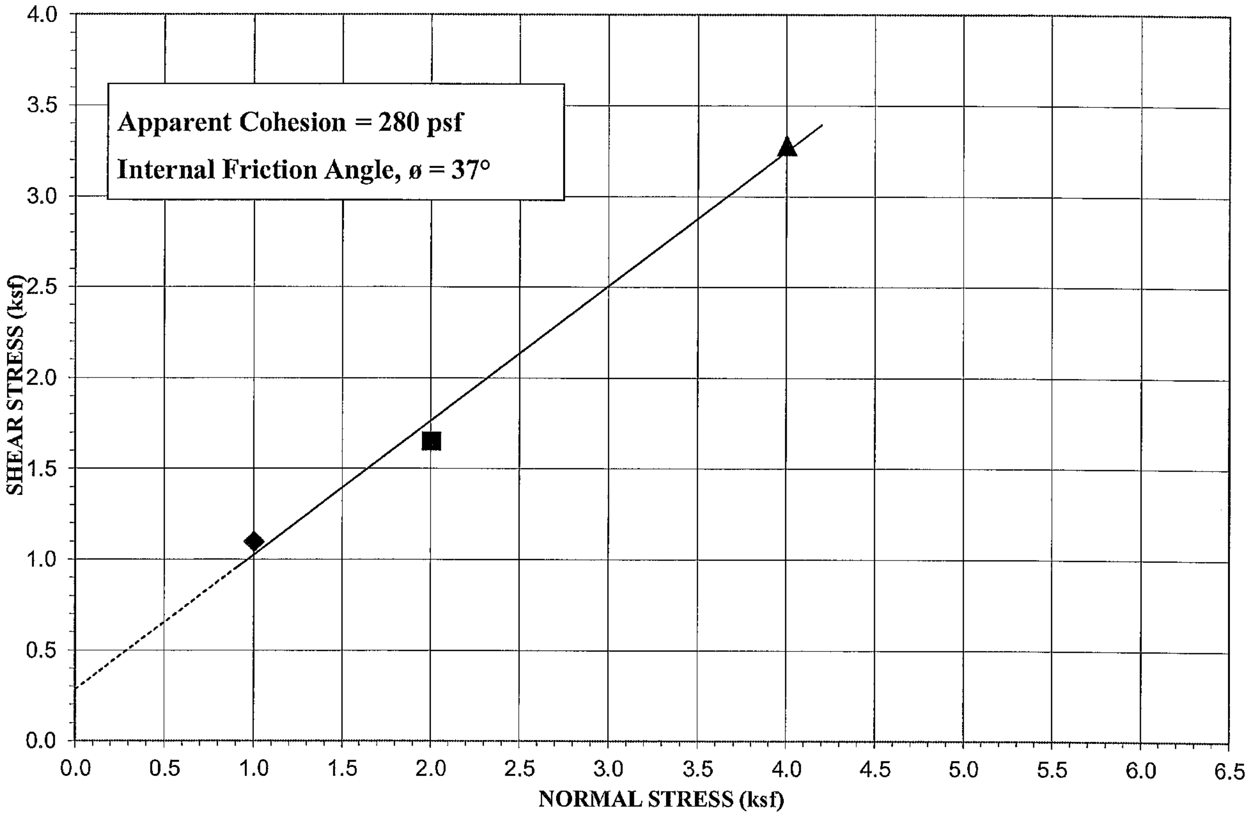
PROJECT NO.: 167003

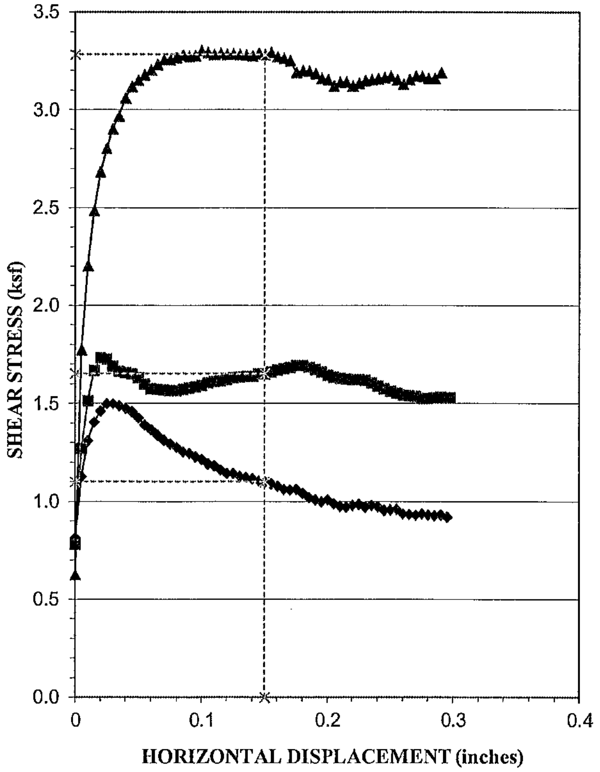
EARTHTEC ENGINEERING

FIGURE NO.: 12

Exhibit B

DIRECT SHEAR TEST





Source: TP-4	**Depth:** 6.0 ft		
Type of Test:	Consolidated Drained/Saturated		
Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1	1	1
Diameter, in.	2.4	2.4	2.4
Dry Density Before, pcf	118.6	119.2	118.9
Dry Density After, pcf	117.4	117.5	117.7
Moisture % Before	15.0	15.0	15.0
Moisture % After	23.4	23.4	23.4
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	1.10	1.65	3.28
Strain Rate	.00003567 IN/SEC		

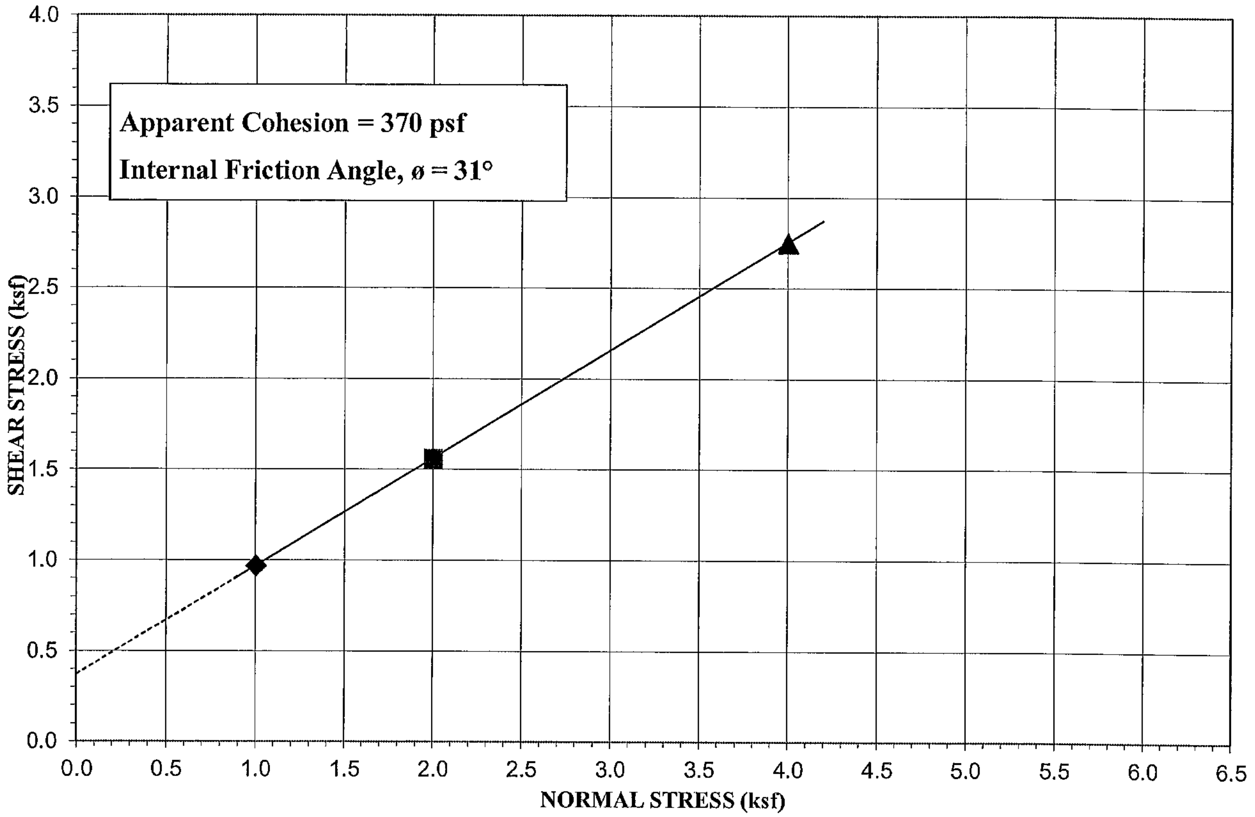
Sample Properties	
Cohesion, psf	280
Friction Angle, ϕ	37
Liquid Limit, %	49
Plasticity Index, %	25
Percent Gravel	78
Percent Sand	12
Percent Passing No. 200 sieve	10
Classification	GP-GC

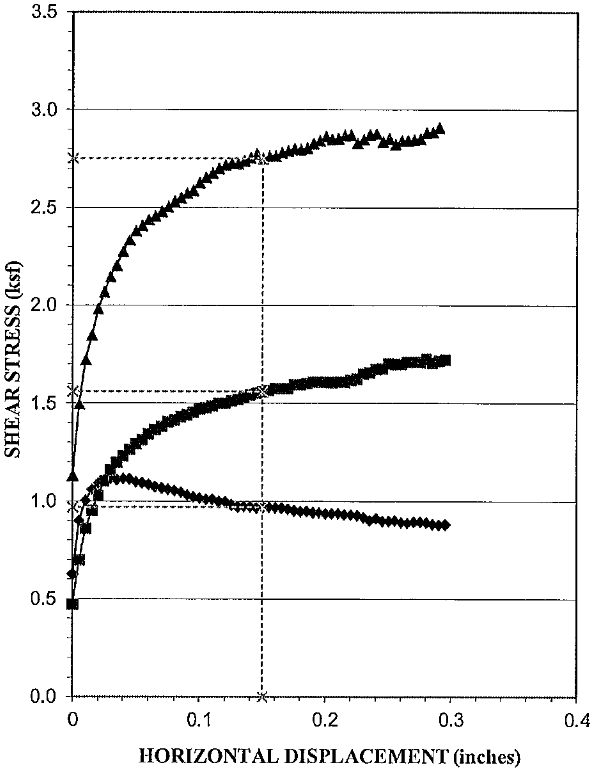
PROJECT: Fairways at Wolf Creek Phases 4 & 5

PROJECT NO.: 167003	EARTHTEC ENGINEERING	**FIGURE NO.:** 13

Exhibit B

DIRECT SHEAR TEST





Source: TP-5	**Depth:** 12.0 ft		
Type of Test:	Consolidated Drained/Saturated		
Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1	1	1
Diameter, in.	2.4	2.4	2.4
Dry Density Before, pcf	126.4	126.0	126.9
Dry Density After, pcf	126.3	126.2	126.7
Moisture % Before	14.2	14.2	14.2
Moisture % After	23.6	23.6	23.6
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	0.97	1.56	2.75
Strain Rate	.00003567 IN/SEC		

Sample Properties	
Cohesion, psf	370
Friction Angle, ϕ	31
Liquid Limit, %	
Plasticity Index, %	
Percent Gravel	32
Percent Sand	38
Percent Passing No. 200 sieve	30
Classification	

PROJECT: Fairways at Wolf Creek Phases 4 & 5

PROJECT NO.: 167003

EARTHTEC ENGINEERING

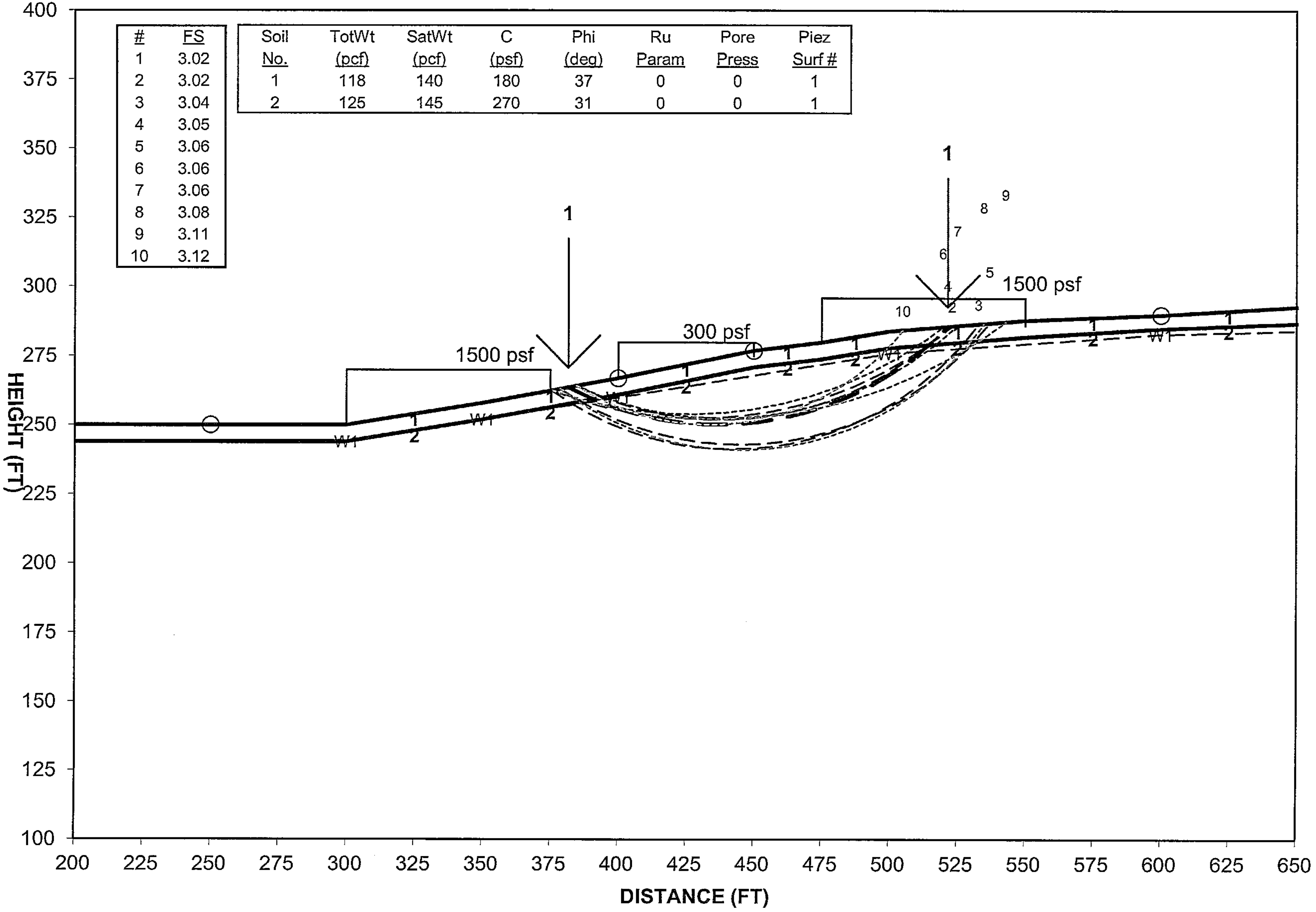
FIGURE NO.: 14

Exhibit B

STABILITY RESULTS

Fairways at Wolf Creek Phase 4 & 5, Static

Ten Most Critical Surfaces.   167003AS .OPT   Run By: Earthtec   3-07-16



#	FS
1	3.02
2	3.02
3	3.04
4	3.05
5	3.06
6	3.06
7	3.06
8	3.08
9	3.11
10	3.12

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez Surf #
1	118	140	180	37	0	0	1
2	125	145	270	31	0	0	1

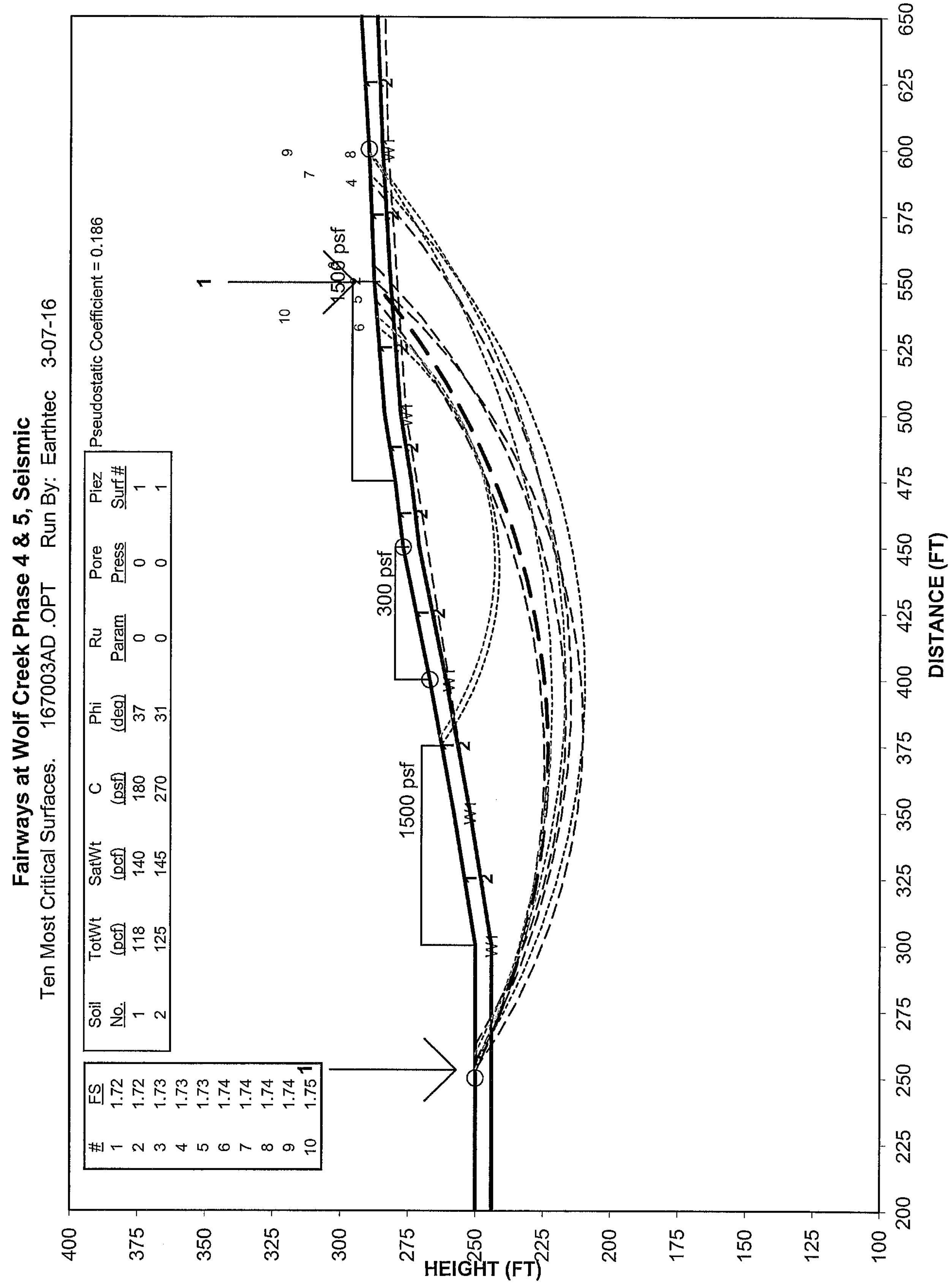
PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 15

Exhibit B

STABILITY RESULTS



PROJECT NO.: 167003

EARTHTEC ENGINEERING

FIGURE NO.: 16

Exhibit B

APPENDIX A

Exhibit B

SETTLEMENT OF FOOTINGS								
Project:	Fairways at Wolf Creek subdivision, Phase 4 and 5							
B:	2.66667	feet (width or diameter)			b =	1.333333	ft (1/2 width/dia)	
L:	25	feet (length)			l =	12.5	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	25
unit weight:	115.5	pcf (above footing depth)					Strip Load,k:	4
allowable q:	1500	psf						
footing type:	1	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	9	feet						

DEFINE SOIL PROFILE:

Soil type	C_c'	C_r'	preconsol press.,σ_c'(psf)	OCR	Density (pcf)	Collapse (%)	Below ftg. depth (ft)	Avg. OCR
Fill	0.001	0.000125			135		3.0	1.00
CL1	0.14	0.024	1300		115.5	0.1	12.5	1.07

STRIP FOOTINGS...

Soil Type	Below ftg. depth (ft)	Influence	Increased Stress (psf)	avg. ovrbn. press.(psf)	Incremnt. Sett. (in.)	Collapse Sett. (in.)	Total Set. (in.)	
Fill	1	0.896	1343.9	423.8	0.007	0.000	0.01	
Fill	2	0.668	1002.2	558.8	0.005	0.000	0.01	
Fill	3	0.503	753.8	693.8	0.004	0.000	0.02	
CL1	4	0.396	593.7	809.3	0.115	0.012	0.14	
CL1	5	0.324	486.6	924.8	0.103	0.012	0.26	
CL1	6	0.274	411.0	1040.3	0.108	0.012	0.38	<---2B
CL1	7	0.237	355.3	1124.6	0.113	0.012	0.50	
CL1	8	0.208	312.6	1177.7	0.112	0.012	0.63	
CL1	9	0.186	278.9	1230.8	0.149	0.012	0.79	
CL1	10	0.168	251.7	1283.9	0.131	0.012	0.93	
CL1	11	0.153	229.3	1337.0	0.115	0.012	1.06	
CL1	12	0.140	210.5	1390.1	0.103	0.012	1.17	
CL1	12.5	0.135	202.2	1416.6	0.049	0.006	1.23	

Exhibit B

SETTLEMENT OF FOOTINGS

Project:	Fairways at Wolf Creek subdivision, Phase 4 and 5							
B:	4.08248	feet (width or diameter)			b =	2.041241	ft (1/2 width/dia)	
L:	4.08248	feet (length)			l =	2.041241	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	25
unit weight:	115.5	pcf (above footing depth)					Strip Load,k:	4
allowable q:	1500	psf						
footing type:	2	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	9	feet						
--------------	----------	------------	------------	------------	----------------------		------------	--------

DEFINE SOIL PROFILE:

Soil type	C_c'	C_r'	preconsol press.,σ_c'(psf)	OCR	Density (pcf)	Collapse (%)	Below ftg. depth (ft)	Avg. OCR
Fill	0.001	0.000125			135		3.0	1.00
CL1	0.14	0.024	1300		115.5	0.1	12.5	1.07

SQUARE/RECTANGULAR FOOTINGS (Boussinesq Method)...

Soil Type	Below ftg. depth (ft)	Influence	Increased Stress (psf)	avg. ovrbn. press.(psf)	Incremnt. Sett. (in.)	Collapse Sett. (in.)	Total Set. (in.)	
Fill	1	0.933	1400.0	423.8	0.008	0.000	0.01	
Fill	2	0.711	1066.2	558.8	0.006	0.000	0.01	
Fill	3	0.495	743.0	693.8	0.004	0.000	0.02	
CL1	4	0.346	518.7	809.3	0.075	0.012	0.10	
CL1	5	0.249	373.2	924.8	0.042	0.012	0.16	
CL1	6	0.185	277.8	1040.3	0.038	0.012	0.21	
CL1	7	0.142	213.3	1124.6	0.039	0.012	0.26	
CL1	8	0.112	168.2	1177.7	0.038	0.012	0.31	
CL1	9	0.090	135.7	1230.8	0.076	0.012	0.40	<---2B
CL1	10	0.074	111.6	1283.9	0.061	0.012	0.47	
CL1	11	0.062	93.3	1337.0	0.049	0.012	0.53	
CL1	12	0.053	79.1	1390.1	0.040	0.012	0.58	
CL1	12.5	0.049	73.1	1416.6	0.018	0.006	0.61	

Exhibit B

SETTLEMENT OF FOOTINGS								
Project:	Fairways at Wolf Creek subdivision, Phase 4 and 5							
B:	4.08248	feet (width or diameter)			b =	2.041241	ft (1/2 width/dia)	
L:	4.08248	feet (length)			l =	2.041241	ft (1/2 length)	
foot. depth:	2.5	feet					Spread Load,k:	25
unit weight:	115.5	pcf (above footing depth)					Strip Load,k:	4
allowable q:	1500	psf						
footing type:	3	(1=strip,2&3=square/rect.,4=circular)						
	4	(4 for center, 1 for corner of square/rect.)						
water depth:	9	feet						
----------------	------------	---------------	--------------	--------------	-------------------------	-------------	-----------	----------

DEFINE SOIL PROFILE:

Soil type	C_c'	C_r'	preconsol press.,σ_c'(psf)	OCR	Density (pcf)	Collapse (%)	Below ftg. depth (ft)	Avg. OCR
Fill	0.001	0.000125			135		3.0	1.00
CL1	0.14	0.024	1300		115.5	0.1	12.5	1.07

SQUARE/RECTANGULAR FOOTINGS (Westergard Method)...

Soil Type	Below ftg. depth (ft)	Influence	Increased Stress (psf)	avg. ovrbn. press.(psf)	Incremnt. Sett. (in.)	Collapse Sett. (in.)	Total Set. (in.)	
Fill	1	0.753	1130.1	423.8	0.007	0.000	0.01	
Fill	2	0.547	820.8	558.8	0.005	0.000	0.01	
Fill	3	0.395	592.5	693.8	0.003	0.000	0.01	
CL1	4	0.417	626.2	809.3	0.132	0.012	0.16	
CL1	5	0.333	500.0	924.8	0.109	0.012	0.28	
CL1	6	0.269	403.2	1040.3	0.104	0.012	0.40	
CL1	7	0.219	329.1	1124.6	0.100	0.012	0.51	
CL1	8	0.181	271.9	1177.7	0.092	0.012	0.61	
CL1	9	0.152	227.4	1230.8	0.124	0.012	0.75	<---2B
CL1	10	0.128	192.3	1283.9	0.102	0.012	0.86	
CL1	11	0.110	164.3	1337.0	0.085	0.012	0.96	
CL1	12	0.095	141.8	1390.1	0.071	0.012	1.04	
CL1	12.5	0.088	132.1	1416.6	0.033	0.006	1.08	

Exhibit B

```
                                    167003AS
XSTABL File: 167003AS     3-07-**     15:37

               ******************************************
               *               X S T A B L              *
               *                                        *
               *         Slope Stability Analysis       *
               *                using the               *
               *            Method of Slices            *
               *                                        *
               *          Copyright (C) 1992 Ä 94       *
               *   Interactive Software Designs, Inc.   *
               *        Moscow, ID 83843, U.S.A.        *
               *                                        *
               *           All Rights Reserved          *
               *                                        *
               *  Ver. 5.004                 94 Ä 1295  *
               ******************************************

    Problem Description : Fairways at Wolf Creek Phase 4 & 5



    -----------------------------
    SEGMENT BOUNDARY COORDINATES
    -----------------------------

       11 SURFACE boundary segments

    Segment     x-left     y-left     x-right    y-right      Soil Unit
      No.        (ft)       (ft)        (ft)       (ft)     Below Segment

       1           .0      250.0      300.0      250.0           1
       2        300.0      250.0      350.0      258.0           1
       3        350.0      258.0      400.0      267.0           1
       4        400.0      267.0      450.0      277.0           1
       5        450.0      277.0      475.0      280.0           1
       6        475.0      280.0      500.0      284.0           1
       7        500.0      284.0      550.0      288.0           1
       8        550.0      288.0      600.0      290.0           1
       9        600.0      290.0      650.0      293.0           1
      10        650.0      293.0      700.0      295.0           1
      11        700.0      295.0      750.0      293.0           1

       11 SUBSURFACE boundary segments

    Segment     x-left     y-left     x-right    y-right      Soil Unit
      No.        (ft)       (ft)        (ft)       (ft)     Below Segment

       1           .0      244.0      300.0      244.0           2
       2        300.0      244.0      350.0      252.0           2
       3        350.0      252.0      400.0      261.0           2
       4        400.0      261.0      450.0      271.0           2
       5        450.0      271.0      475.0      274.0           2
       6        475.0      274.0      500.0      278.0           2
       7        500.0      278.0      550.0      282.0           2
       8        550.0      282.0      600.0      285.0           2
       9        600.0      285.0      650.0      287.0           2
      10        650.0      287.0      700.0      289.0           2
      11        700.0      289.0      750.0      288.0           2
```

Exhibit B

```
--------------------------
ISOTROPIC Soil Parameters
--------------------------

 2 Soil unit(s) specified

Soil   Unit Weight    Cohesion  Friction   Pore Pressure     Water
Unit  Moist    Sat.  Intercept   Angle  Parameter Constant  Surface
 No.  (pcf)   (pcf)    (psf)     (deg)     Ru       (psf)     No.

  1   118.0   140.0    180.0     37.00     .000        .0      1
  2   125.0   145.0    270.0     31.00     .000        .0      1


 1 Water surface(s) have been specified

Unit weight of water =    62.40  (pcf)

Water Surface No.  1 specified by  7 coordinate points

**********************************
         PHREATIC SURFACE,
**********************************

  Point       x-water     y-water
   No.          (ft)        (ft)

    1            .00      244.00
    2         300.00      244.00
    3         350.00      252.00
    4         400.00      260.00
    5         500.00      276.00
    6         600.00      283.00
    7         700.00      285.50


BOUNDARY LOADS

   3 load(s) specified

Load        x-left     x-right     Intensity    Direction
 No.         (ft)       (ft)         (psf)        (deg)

 1          300.0      375.0       1500.0          .0
 2          400.0      450.0        300.0          .0
 3          475.0      550.0       1500.0          .0

NOTE - Intensity is specified as a uniformly distributed
       force acting on a HORIZONTALLY projected surface.


A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


 1000 trial surfaces will be generated and analyzed.
```

Exhibit B

```
   20 Surfaces initiate from each of  50 points equally spaced
along the ground surface between   x =     250.0 ft
                             and   x =     400.0 ft


Each surface terminates between    x =     450.0 ft
                           and     x =     600.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is   y =       .0 ft


    9.0 ft line segments define each trial failure surface.


ANGULAR RESTRICTIONS :

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



Factors of safety have been calculated by the :

* * * * *    SIMPLIFIED BISHOP METHOD    * * * * *


  The most critical circular failure surface
  is specified by 18 coordinate points

        Point        x-surf       y-surf
         No.          (ft)         (ft)

          1          381.63       263.69
          2          389.76       259.84
          3          398.16       256.60
          4          406.78       254.02
          5          415.57       252.09
          6          424.49       250.83
          7          433.47       250.24
          8          442.47       250.34
          9          451.43       251.12
         10          460.31       252.57
         11          469.06       254.69
         12          477.62       257.46
         13          485.95       260.87
         14          494.00       264.90
         15          501.72       269.53
         16          509.06       274.73
         17          516.00       280.47
         18          521.44       285.72
```

Exhibit B

```
                                 167003AS
****  Simplified BISHOP FOS =    3.016   ****



The following is a summary of the TEN most critical surfaces

Problem Description : Fairways at Wolf Creek Phase 4 & 5

          FOS       Circle Center      Radius   Initial  Terminal   Resisting
        (BISHOP)   x-coord  y-coord            x-coord   x-coord     Moment
                     (ft)     (ft)       (ft)     (ft)      (ft)      (ft-lb)

  1.     3.016     436.68   369.24     119.04    381.63    521.44   2.889E+07
  2.     3.024     429.34   401.12     148.62    375.51    523.04   3.468E+07
  3.     3.035     441.87   355.42     114.11    375.51    532.81   3.882E+07
  4.     3.050     437.71   372.97     120.96    384.69    521.37   2.778E+07
  5.     3.055     444.74   361.63     118.65    378.57    536.83   3.994E+07
  6.     3.063     426.28   408.38     154.38    375.51    519.80   3.329E+07
  7.     3.063     438.44   381.29     128.79    384.69    525.00   3.029E+07
  8.     3.081     445.07   352.14     111.10    378.57    534.81   3.848E+07
  9.     3.108     435.94   431.76     179.64    375.51    542.80   5.107E+07
 10.     3.119     433.52   341.97      91.79    384.69    504.92   1.849E+07

                    * * *   END OF FILE   * * *
```

Exhibit B

```
                                         167003AD
XSTABL File: 167003AD    3-07-**    15:17

                 ******************************************
                 *              X S T A B L               *
                 *                                        *
                 *        Slope Stability Analysis        *
                 *              using the                 *
                 *           Method of Slices             *
                 *                                        *
                 *        Copyright (C) 1992 Ä 94         *
                 *   Interactive Software Designs, Inc.   *
                 *       Moscow, ID 83843, U.S.A.         *
                 *                                        *
                 *          All Rights Reserved           *
                 *                                        *
                 *  Ver. 5.004                94 Ä 1295   *
                 ******************************************

    Problem Description : Fairways at Wolf Creek Phase 4 & 5



    -----------------------------
    SEGMENT BOUNDARY COORDINATES
    -----------------------------

       11 SURFACE boundary segments

    Segment    x-left    y-left    x-right   y-right     Soil Unit
      No.       (ft)      (ft)      (ft)      (ft)     Below Segment

       1          .0      250.0     300.0     250.0          1
       2       300.0      250.0     350.0     258.0          1
       3       350.0      258.0     400.0     267.0          1
       4       400.0      267.0     450.0     277.0          1
       5       450.0      277.0     475.0     280.0          1
       6       475.0      280.0     500.0     284.0          1
       7       500.0      284.0     550.0     288.0          1
       8       550.0      288.0     600.0     290.0          1
       9       600.0      290.0     650.0     293.0          1
      10       650.0      293.0     700.0     295.0          1
      11       700.0      295.0     750.0     293.0          1

       11 SUBSURFACE boundary segments

    Segment    x-left    y-left    x-right   y-right     Soil Unit
      No.       (ft)      (ft)      (ft)      (ft)     Below Segment

       1          .0      244.0     300.0     244.0          2
       2       300.0      244.0     350.0     252.0          2
       3       350.0      252.0     400.0     261.0          2
       4       400.0      261.0     450.0     271.0          2
       5       450.0      271.0     475.0     274.0          2
       6       475.0      274.0     500.0     278.0          2
       7       500.0      278.0     550.0     282.0          2
       8       550.0      282.0     600.0     285.0          2
       9       600.0      285.0     650.0     287.0          2
      10       650.0      287.0     700.0     289.0          2
      11       700.0      289.0     750.0     288.0          2
```

Exhibit B

```
 --------------------------
 ISOTROPIC Soil Parameters
 --------------------------

  2 Soil unit(s) specified

 Soil    Unit Weight    Cohesion   Friction      Pore Pressure       Water
 Unit   Moist    Sat.   Intercept    Angle   Parameter  Constant   Surface
  No.   (pcf)   (pcf)     (psf)      (deg)       Ru       (psf)      No.

   1    118.0   140.0     180.0      37.00      .000         .0        1
   2    125.0   145.0     270.0      31.00      .000         .0        1


  1 Water surface(s) have been specified

 Unit weight of water =     62.40  (pcf)

 Water Surface No.  1 specified by  7 coordinate points

 **********************************
          PHREATIC SURFACE,
 **********************************

   Point          x-water       y-water
    No.            (ft)          (ft)

     1              .00        244.00
     2           300.00        244.00
     3           350.00        252.00
     4           400.00        260.00
     5           500.00        276.00
     6           600.00        283.00
     7           700.00        285.50


 A horizontal earthquake loading coefficient
 of   .186 has been assigned

 A vertical earthquake loading coefficient
 of   .000 has been assigned


 BOUNDARY LOADS

     3 load(s) specified

 Load         x-left        x-right      Intensity      Direction
  No.          (ft)           (ft)          (psf)          (deg)

   1          300.0          375.0         1500.0             .0
   2          400.0          450.0          300.0             .0
   3          475.0          550.0         1500.0             .0

NOTE - Intensity is specified as a uniformly distributed
       force acting on a HORIZONTALLY projected surface.
```

Exhibit B

```
A critical failure surface searching method, using a random
technique for generating CIRCULAR surfaces has been specified.


 1000 trial surfaces will be generated and analyzed.


   20 Surfaces initiate from each of  50 points equally spaced
along the ground surface between   x =     250.0 ft
                             and   x =     400.0 ft


Each surface terminates between    x =     450.0 ft
                            and    x =     600.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is   y =        .0 ft


     9.0 ft line segments define each trial failure surface.


ANGULAR RESTRICTIONS :

  The first segment of each failure surface will be inclined
  within the angular range defined by :

          Lower angular limit :=   -45.0 degrees
          Upper angular limit :=  (slope angle - 5.0) degrees



Factors of safety have been calculated by the :

* * * * *    SIMPLIFIED BISHOP METHOD    * * * * *


  The most critical circular failure surface
  is specified by 37 coordinate points

        Point        x-surf        y-surf
         No.          (ft)          (ft)

          1          253.06        250.00
          2          261.25        246.26
          3          269.55        242.78
          4          277.96        239.58
          5          286.47        236.65
          6          295.07        234.00
          7          303.75        231.63
          8          312.51        229.55
          9          321.33        227.76
         10          330.20        226.25
         11          339.12        225.03
         12          348.07        224.11
```

Exhibit B

```
          13          357.05      223.47
          14          366.04      223.13
          15          375.04      223.09
          16          384.04      223.34
          17          393.02      223.88
          18          401.98      224.71
          19          410.91      225.83
          20          419.80      227.25
          21          428.64      228.95
          22          437.41      230.95
          23          446.12      233.22
          24          454.75      235.78
          25          463.29      238.62
          26          471.73      241.74
          27          480.07      245.13
          28          488.29      248.79
          29          496.39      252.71
          30          504.36      256.90
          31          512.18      261.35
          32          519.86      266.05
          33          527.38      270.99
          34          534.73      276.18
          35          541.91      281.61
          36          548.91      287.27
          37          549.74      287.98

****  Simplified BISHOP FOS =   1.717   ****



The following is a summary of the TEN most critical surfaces

Problem Description : Fairways at Wolf Creek Phase 4 & 5

        FOS     Circle Center     Radius   Initial  Terminal   Resisting
      (BISHOP)  x-coord  y-coord           x-coord   x-coord     Moment
                 (ft)     (ft)      (ft)     (ft)      (ft)      (ft-lb)

 1.     1.717   371.96   499.04   275.97   253.06    549.74    1.932E+08
 2.     1.720   380.65   433.57   223.56   253.06    550.28    1.951E+08
 3.     1.726   384.88   456.97   240.58   262.24    556.31    1.916E+08
 4.     1.730   394.26   499.64   285.31   256.12    587.19    2.614E+08
 5.     1.731   368.64   497.60   273.25   253.06    543.25    1.812E+08
 6.     1.736   441.87   355.42   114.11   375.51    532.81    3.789E+07
 7.     1.740   398.53   478.89   269.58   256.12    590.44    2.691E+08
 8.     1.741   390.91   569.46   347.93   253.06    598.02    2.949E+08
 9.     1.741   398.95   525.09   308.56   259.18    598.69    2.826E+08
10.     1.747   444.74   361.63   118.65   378.57    536.83    3.897E+07

                    *  *  *   END OF FILE   *  *  *
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Exhibit B

IGES®
Intermountain GeoEnvironmental Services, Inc.
12429 South 300 East, Suite 100, Draper, Utah 84020
T: (801) 748-4044 ~ F: (801) 748-4045

4153 South Commerce Drive, SLC, UT 84107
T: (801) 270-9400 ~ F: (801) 270-9401

May 19, 2016

Watts Enterprises
5200 South Highland Drive #101
Salt Lake City, Utah 84117
Attn: Mr. Rick Everson

IGES Project No. 01855-007

Subject: Reconnaissance-Level Geologic Hazards Assessment
Fairways at Wolf Creek Subdivision Phases 4 and 5
Eden, Utah

Mr. Everson:

At your request, IGES has performed a reconnaissance-level geologic hazard assessment for the Fairways at Wolf Creek Subdivision Phases 4 and 5, located in the city of Eden in Weber County, Utah (Figure A-1). This letter report identifies the nature and associated risk of the applicable geologic hazards associated with the property, based upon the results of the literature review and site reconnaissance conducted as part of this assessment.

INTRODUCTION

It is our understanding that the Fairways at Wolf Creek Subdivision Phases 4 and 5 project will involve the development of 40 conventionally-framed, one to two-story residences across an area covering approximately 15.8 acres in Eden, Utah. The property is located within the northwestern quarter of Section 22 of Township 7 North, Range 1 East, approximately 3 miles north-northwest of Pineview Reservoir. The property is bound on the east by the Wolf Creek Resort golf course, on the south by the Fairways Oaks at Wolf Creek Phase 1 development, and on the west and north by undeveloped privately owned lands.

PURPOSE AND SCOPE

This study was performed as a reconnaissance-level geologic hazards assessment to identify any surficial or subsurface geologic hazards that may be extant on the property or have the capability to adversely impact the property. Specifically, this study was conducted to:

- Assess the existing geologic conditions present on the property and relevant adjacent areas;

- Assess whether geologic hazards that could pose a risk to development are present on or have the potential to impact the property, and evaluate the associated risk for each hazard; and

- Identify the most significant geologic hazard risks, and provide recommendations for appropriate additional studies and/or mitigation practices, if necessary.

In order to achieve the purpose and scope outlined above, the following services were performed as part of this investigation:

- Review of available published geologic reports and maps for the subject property and surrounding areas;

- Stereoscopic review of aerial photographs and analysis of additional available aerial imagery, including LiDAR;

- Site reconnaissance by a geologist licensed in the state of Utah to map the surficial geology, evaluate site conditions, and assess the property for geologic hazards; and

- Preparation of this report, which is based upon the data reviewed and collected in this investigation.

REVIEW OF GEOLOGIC LITERATURE

A number of pertinent publications were reviewed as part of this assessment. Sorensen and Crittenden, Jr. (1979) provides the most recent published 1:24,000 scale geologic mapping that covers the area in which the property of interest is located. Coogan and King (2001) provide more recent geologic mapping of the area, but at a 1:100,000 scale. A United States Geological Survey (USGS) topographic map for the Huntsville Quadrangle (2014) provides physiographic and hydrologic data for the project area. A Federal Emergency Management Agency (FEMA) flood map (effective in 2015) that covers the project area was reviewed. Regional-scale geologic hazard maps pertaining to landslides (Elliott and Harty, 2010; Colton, 1991), faults (Christenson and Shaw, 2008a; USGS and Utah Geological Survey (UGS), 2006), debris-flows (Christenson and Shaw, 2008b), liquefaction (Christenson and Shaw, 2008c; Anderson et al., 1994), and radon (Solomon, 1996) that cover the project area were also reviewed. More site-specific, the EarthTec Engineering (EarthTec) geotechnical report (2016) for the subject property was also reviewed.

General Geologic Setting

The Fairways at Wolf Creek property is situated along the eastern margin of the northern part of the Ogden Valley, near the foothills of the Wasatch Mountains. Ogden Valley separates the western part of the Wasatch Range from the Bear River Range to the east, a subgroup of mountains that are part of the parent Wasatch Range. The Wasatch Mountains contain a broad depositional history of thick Precambrian and Paleozoic sediments that have been subsequently modified by various tectonic episodes that have included thrusting, folding, intrusion, and volcanics, as well as scouring by glacial and fluvial processes (Stokes, 1987). The uplift of the Wasatch Mountains occurred relatively recently during the Late Tertiary Period (Miocene Epoch) between 12 and 17 million years ago (Milligan, 2000). Since uplift, the Wasatch Front has seen substantial modification due to such occurrences as movement along the Wasatch Fault and associated spurs, the development of the numerous canyons that empty into the current Salt Lake Valley and Utah Valley and their associated alluvial fans, erosion and deposition from Lake Bonneville, and localized mass movement events (Hintze, 1988). The Wasatch Mountains, as part of the Middle Rocky Mountains Province (Milligan, 2000), were uplifted as a fault block along the Wasatch Fault (Hintze, 1988). Ogden Valley itself is a fault-bounded trough that was occupied by Lake Bonneville (Sorensen and Crittenden, Jr, 1979) before being cut through by the Ogden River and subsequently dammed to form the Pineview Reservoir.

Surficial Geology

According to Sorensen and Crittenden, Jr. (1979), the property is located entirely on Holocene-aged (~11,700 years ago to the present) colluvium and slopewash (Qcs) deposits (Figure A-2). This unit is adjacent to recent alluvium of the Wolf Creek drainage (Qal), and is likely underlain by various Precambrian rocks which both occupy the highlands and underlie the northern reaches of Ogden Valley. Coogan and King (2001; Figure A-3) denote the area underlying the subject property as Qac (alluvium and colluvium deposits), which are described as including “stream and fan alluvium, colluvium, and, locally, mass-movement deposits.” In contrast to Sorensen and Crittenden, Jr. (1979), Coogan and King (2001) mapped the adjacent Wolf Creek drainage as Qafy, young (post-Lake Bonneville) alluvial fan deposits consisting largely of poorly bedded and poorly sorted sands, silts, and gravels. This Qafy unit encroaches upon the southeastern margin of the property. Neither of the aforementioned geologic maps show any faults on the property, though both display several older (inactive) faults that project onto the property. These older faults include both northwest-southeast trending normal faults approximately ½ mile southeast of the property on the east side of the Wolf Creek Drainage and northeast/southwest trending normal faults approximately 1.5 miles to the north and east of the property in the Precambrian rocks found in the highlands (see Figure A-2). Sorensen and Crittenden, Jr. (1979) identify these faults as “pre-Tertiary normal faults.”

Hydrology

The USGS topographic map for the Huntsville Quadrangle (2014) shows that the Fairways at Wolf Creek project area is situated within the broad northwest-southeast trending Ogden Valley and near the northeast-southwest trending Wolf Creek drainage. Multiple generally north-south trending ephemeral stream drainages are found on the property, which were found to contain flowing water at least in part during the site visit. In the southern part of the property, the largest of these ephemeral stream drainages forms the boundary between the property and the golf course to the east. This drainage also passes generally north-south through the north-central portion of the property. One unnamed spring is noted on the topographic map just east of the southeastern margin of the property, and several named and unnamed springs are found within ½ mile of the property. It is possible that additional springs may occur on various parts of the property during peak runoff.

Baseline groundwater depths for the Fairways at Wolf Creek property are currently unknown, but are anticipated to fluctuate both seasonally and annually. Groundwater was encountered in all six test pits excavated by EarthTec (2016) between the depths of 6 and 9.5 feet below existing ground level in late January and early February. Groundwater flow from snowmelt is dependent upon the nature of the surface and subsurface materials, including the degree and orientation of fracturing of the bedrock. Given that the topography slopes generally downhill to the south, groundwater flow paths are anticipated to be generally to the south. Daylighting of this groundwater can be expected in the various ephemeral drainages and generally flat, low-lying parts of the property, especially during times of peak runoff as was encountered during the site visit.

The FEMA flood map that covers the Fairways at Wolf Creek project area show that the Phase 4 and 5 areas are both outside of the 500-year flood floodplain for the Wolf Creek drainage (FEMA, 2015).

Geologic Hazards

Based upon the available geologic literature, regional-scale geologic hazard maps that cover the Fairways at Wolf Creek project area have been produced for landslide, fault, debris-flow, liquefaction, and radon hazards. The following is a summary of the data presented in these regional geologic hazard maps.

Landslides

Two regional-scale landslide hazard maps have been produced that cover the project area. Neither Colton (1991) nor the more recent mapping of Elliott and Harty (2010) show any identified or suspected landslides on or adjacent to the Fairways at Wolf Creek Phase 4 and 5 properties.

Faults

Christensen and Shaw (2008a), the Quaternary Fault and Fold Database of the United States (USGS and UGS, 2006), and the Utah Quaternary Fault and Fold Database (UGS, 2016b) do not show any Quaternary-aged (~2.6 million years ago to the present) faults to be present on or projecting towards the subject property. The Ogden Valley Northeastern Margin Fault and the Ogden Valley North Fork Fault are the closest Quaternary-aged faults to the property, being northwest-southeast trending range-front faults located approximately 1.15 miles to the north and south of the property, respectively (USGS and UGS, 2006). The Weber County Natural Hazards Overlay Districts defines an active fault to be "a fault displaying evidence of greater than four inches of displacement along one or more of its traces during Holocene time (about 11,000 years ago to the present)" (Weber County, 2015). The closest active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 5.3 miles west of the western margin of the property (USGS and UGS, 2006).

Sorensen and Crittenden, Jr. (1979) show a series of northwest-southeast trending faults east of the Wolf Creek drainage and projecting onto the property to be cutting across (and therefore younger than) the Qcs surficial unit. It should be noted that Coogan and King (2001) do not show these faults, and the Quaternary Fault and Fold Database of the United States indicates that a 1988 U.S. Bureau of Reclamation (USBR) seismotectonic study for USBR dams in the Wasatch Mountains interpreted these faults as shallow landslide scarps (USGS and UGS, 2006).

Debris-Flows

Christensen and Shaw (2008b) do not show the project area to be located within a debris-flow hazard special study area.

Liquefaction

Anderson, et al (1994) and Christensen and Shaw (2008c) both show the project area to be located in an area designated as having a very low potential for liquefaction. The site-specific EarthTec geotechnical report (2016) in discussing liquefaction potential of the soils present on the property states “The soils encountered at this project do not appear liquefiable, but the liquefaction susceptibility of underlying soils (deeper than our explorations) is not known and would require deeper explorations to quantify.”

Radon

Solomon (1996) has the project area located entirely in an area with high radon levels. This is due to the property being underlain by soil partially derived from the underlying Precambrian uranium-bearing metamorphic rocks, as well as the granular nature of the soils allowing for the ease of movement of radon.

REVIEW OF AERIAL IMAGERY

A series of aerial photographs that cover project area were taken from the UGS Aerial Imagery Collection (UGS, 2016a) and analyzed stereoscopically for the presence of adverse geologic conditions across the property. This included a review of photos collected from the years 1946 and 1963, which were all taken prior to the development of the nearby residences and their neighborhoods. A table displaying the details of the aerial photographs reviewed can be found in the *References* section at the end of this report.

No geologic lineaments, fault scarps, landslide headscarps, or landslide deposits were observed in the aerial photography on the subject property.

Google Earth imagery of the property from between the years of 1993 and 2015 were also reviewed. No landslide or other geological hazard features were noted in the imagery. The property was observed to contain abundant surficial gravel, cobbles, and boulders, as well as the several ephemeral drainages discussed above. Most of the project area was found to be covered in various forms of vegetation, with no bedrock exposures anywhere on the property.

Utah Geological Survey 1 meter LiDAR data (UGS, 2011) for the project area was reviewed. The northern half of the property was observed to be significantly gullied, while the southwestern part of the property exhibited minor shading. No landslide or other geologic hazard features were readily identified on the property.

SITE RECONNAISSANCE

Mr. Peter E. Doumit, P.G., C.P.G., of IGES conducted reconnaissance of the site and the immediate adjacent properties on May 13, 2016. The site reconnaissance was conducted with the intent to assess the general geologic conditions present across the property, with specific interest in those areas identified in the geologic literature and aerial imagery reviews as potential geologic hazard areas. Additionally, the site reconnaissance provided the opportunity to geologically map the surficial geology of the area. Figure A-4 is a site-specific geologic map of the Fairways at Wolf Creek Phases 4 and 5 property and adjacent areas.

Variously-sized boulders and cobbles were found scattered across the property. These were typically subrounded to subangular, and were found to be as large as 5 feet in diameter. The rock clasts were found to be comprised of three distinct lithologies:

1. A medium gray to bluish gray to light gray quartzite; banded in places
2. An orange-brown to dark reddish brown well indurated sandstone gradational to quartzite; commonly contained calcite veining
3. Reddish orange to light gray pebbly conglomerate

In general, the proportion of these lithologies was fairly consistent across the property, with approximately 40% of the clasts comprised of quartzite, approximately 40% comprised of conglomerate, and approximately 20% comprised of sandstone. Rare dark reddish orange siltstone was also found in places. Clasts were commonly found to exhibit abundant desert varnish, and associated with the desert varnish was a weathered surface commonly exhibiting curvilinear fractures.

The presence or absence and setting within which these boulders were encountered provided the means by which the surficial geology was able to be mapped across the property. Three largely gradational geologic units were differentiated on the property. Each of these units are discussed in turn below.

Qac (Quaternary alluvium and colluvium)

This unit was mapped in generally low-lying areas and straddling the multiple ephemeral stream drainages where there was a significantly greater proportion of alluvial (running water-deposited) material present than colluvial (gravity-deposited with the aid of rain; slopewash) material. This unit underlies nearly all of the northern half of the property, and consists of both areas in which boulders are found in abundance and areas where few boulders are encountered. The northern half of the property was found have intermittent boulder fields and patches of fine sediment, having the appearance of intertwining braided stream deposits. Where present, boulders were typically found to be rounded to subrounded, and up to 5 feet in diameter.

Qca (Quaternary colluvium and alluvium)

This unit was generally mapped in areas with gentle slopes, and represents a transitional unit between the predominantly alluvial deposits of the Qac unit and the almost exclusive colluvial deposits of the Qc unit. The unit was gradational in terms of the proportion of alluvial and colluvial material, with some areas having slightly more alluvial material than colluvial material, and vice versa. Much of the area west and south of the property is underlain by the Qca unit.

Qc (Quaternary colluvium)

This unit was mapped in areas with steeper slopes with concentrated boulder fields and was characterized by a general absence or the minor presence of fine-grained soils (silts and clays). Typically, this unit comprised the higher elevation knobs encountered during the mapping exercise, including along the southwestern margin of the property and the small hills to the north of the property. Boulders in the boulder fields in this unit were commonly subangular to subrounded, could be as much as 3 feet in diameter, and exhibited extensive desert varnish, indicative of remaining stationary for an extended period of time.

Surface Water/Groundwater

At the time of the site visit, the ephemeral stream drainage that runs along the southeastern margin of the property was found to be flowing with water, with a larger volume of water and stronger current further to the south. The low-lying central portion of property contained several small gullies with flowing water and also ponded, marshy conditions (see Figure A-4). The EarthTec Test Pits 1 and 3 were completely filled with water. Approximately 415 feet north of the northern margin of the property, the main north-south ephemeral drainage was found to be moist but did not display any flowing water.

No springs were identified on the property, though a shallow water table was found to be present across much of the northern half of the property.

Geologic Hazards

No mass-movement deposits, faults, or any additional geologic hazards were observed on or adjacent to the property during the site reconnaissance.

GEOLOGIC HAZARD ASSESSMENT

Geologic hazard assessments are necessary to evaluate the potential risk associated with particular geologic hazards that are capable of adversely affecting a proposed development area. As such, they are essential in evaluating the suitability of an area for development and provide critical data in both the planning and design stages of a proposed development. The geologic hazard assessment discussion below is based upon a qualitative assessment of the risk associated with a particular geologic hazard, based upon the data reviewed and collected as part of this investigation.

A "low" hazard rating is an indication that the hazard is either absent, is present in such a remote possibility so as to pose limited or little risk, or is not anticipated to impact the project in an adverse way. Areas with a low-risk determination for a particular geologic hazard generally do not require additional site-specific studies or associated mitigation practices with regard to the geologic hazard in question. A “moderate” hazard rating is an indication that the hazard has the capability of adversely affecting the project at least in part, and that the conditions necessary for the geologic hazard are present in a significant, though not abundant, manner. Areas with a moderate-risk determination for a particular geologic hazard may require additional site-specific studies and associated mitigation practices in the areas that have been identified as the most prone to susceptibility to the particular geologic hazard. A “high” hazard rating is an indication that the hazard is very capable of adversely affecting the project, that the geologic conditions pertaining to the particular hazard are present in abundance, and/or that there is geologic evidence of the hazard having occurred at the area in the historic or geologic past. Areas with a high-risk determination generally always require additional site-specific hazard investigations and associated mitigation practices. For areas with a high-risk geologic hazard, simple avoidance is often considered.

The following are the results of the reconnaissance-level geologic hazard assessment for the Fairways at Wolf Creek Phases 4 and 5 properties.

Landslides/Mass Movement/Slope Stability

The property is not located on or adjacent to landslide deposits or headscarps, as determined by the geologic literature review, aerial imagery evaluation, and site reconnaissance. Additionally, the steepest slopes on the property are found to be greater than 5:1 (horizontal:vertical), which do not warrant site-specific slope stability analyses. As such, the risk associated with landslide and slope stability hazards on the property is considered to be low.

Rockfall

No bedrock is exposed upslope of the property, and it is more than ¼ mile to the north before there is a significant increase in slope. As such, the rockfall hazard associated with the property is considered to be low.

Surface-Fault-Rupture and Earthquake-Related Hazards

No faults are known to be present on the property, and the closest active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 5.3 miles to the west of the property (USGS and UGS, 2006). Though some nearby faults may project onto the property, there is no surficial evidence for their existence on the property. Additionally, these faults are pre-Tertiary-aged, have long been inactive, and are unassociated with the Wasatch Fault Zone, so the risk associated with their future activity is low. Given this information, the risk associated with surface-fault-rupture on the property is considered low.

The entire property is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault. Given the distance from the Wasatch Fault, the hazard associated with ground shaking is considered to be moderate. Proper building design according to appropriate building code and design parameters can assist in mitigating the hazard associated with earthquake ground shaking.

Liquefaction

Given the generally very coarse and likely relatively thin nature of the surficial materials, and consistent with the existing geologic literature for the area, the risk associated with earthquake-induced liquefaction is expected to be low. However, both shallow groundwater and granular soils are present on the property; therefore, we cannot preclude the possibility for liquefaction to occur onsite. A liquefaction study, which would include borings and/or CPT soundings to a depth of at least 50 feet, was not performed for this project and is not a part of our scope of work.

Debris-Flows and Flooding Hazards

Young alluvial fan deposits (Qafy) have been mapped adjacent to the property by Coogan and King (2001) in association with the Wolf Creek drainage. However, only the southeastern margin of the property is partially within this mapped alluvial fan deposit (and on the western edge of the mapped fan deposit), the Wolf Creek drainage is approximately 0.2 miles to the east of the property, and the property is not located on the Wolf Creek floodplain. Given this situation, the debris-flow hazard associated with the property is considered to be low.

Additionally, given the small size of the ephemeral drainages found on the property (generally 2 to 5 feet wide by a 1 to 3 feet deep), the distance away from the Wolf Creek drainage, and the elevated topography above the Wolf Creek floodplain, the flooding hazard for the property is considered to be low. This is consistent with the FEMA flood map that covers the area (FEMA, 2015).

Shallow Groundwater

Groundwater was encountered in all six tests geotechnical test pits excavated on the property between the depths of 6 and 9.5 feet below existing grade (EarthTec, 2016). These test pits were excavated in late January and early February, and the groundwater levels observed in the test pits are likely to be at or near seasonal lows. With the site reconnaissance occurring in mid-May near the expected peak runoff and seasonal high for groundwater, shallow groundwater was noted to be prevalent on the property. Extensive shallow groundwater was observed especially in the north-central part of the property in areas of gentle topography and near the multiple ephemeral stream drainages and gullies found in the area, though no springs were observed.

Given the existing data, it is expected that groundwater levels will fluctuate both seasonally and annually between approximately 9.5 feet below the existing ground surface and ground level. As such, the risk associated with shallow groundwater hazards is considered high. However, shallow groundwater issues can be mitigated through appropriate grading measures and/or the avoidance of the construction of residences with basements, or through the use of land-drains.

Radon

Limited data is available to address the radon hazard across the property. However, at least one study (Solomon, 1996) shows the site situated within an area designated as having a high radon hazard. To be conservative, the radon hazard associated with the property is considered to be high. A site-specific radon hazard assessment is recommended to adequately address radon concerns across the property.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected and reviewed as part of this assessment, IGES makes the following reconnaissance-level conclusions regarding the geological hazards present at the Fairways at Wolf Creek Phases 4 and 5 project area:

- **From a reconnaissance-level perspective, the Fairways at Wolf Creek Phases 4 and 5 project area does not appear to have major geological hazards that would adversely affect significant portions of the development as currently proposed. As such, no subsurface geologic hazards investigative methods are considered to be necessary for the property preceding development.**

- Earthquake ground shaking, shallow groundwater, and radon are the only hazards that may potentially affect all parts of the project area, while other hazards have the potential to affect only limited portions of the project area, or pose minimal risk.

- Landslide, rockfall, surface-fault-rupture, debris-flow, and flooding hazards are considered to be low for the property.

- Published literature and the site-specific geotechnical report (EarthTec, 2016) indicate that the liquefaction potential for the site is low. However, due to the presence of granular soils and shallow groundwater and the unknown character of the soils underlying those examined in the geotechnical report, the potential for liquefaction occurring at the site cannot be ruled out.

Given the conclusions listed above, IGES makes the following recommendations:

- The prevalence of shallow groundwater across the property makes necessary mitigation practices to adequately address this potential hazard. Appropriate grading measures in

Exhibit B

low-lying areas susceptible to near-surface groundwater conditions is recommended, as is the construction of the proposed residences without basements or with land-drains.

- To adequately address the radon hazard for the property, a site-specific radon assessment is recommended. This could be conducted either on a property-wide basis or a lot-by-lot basis.

LIMITATIONS

The conclusions and recommendations presented in this report are based on limited geologic literature review and site reconnaissance, and our understanding of the proposed construction. It should be noted that these conclusions are based solely upon the geological hazards investigated for this report, and do not pertain to other potential geologic hazards that may be present on the property. Additional geologic hazards may be present that may not be identified until construction activities expose adverse geologic conditions. Therefore, the geologic hazard classifications as denoted in this report are potentially subject to change with data collected from site-specific excavations across the property. 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.

CLOSURE

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

Respectfully Submitted,
IGES, Inc.

LICENSED PROFESSIONAL GEOLOGIST
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STATE OF UTAH

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David A. Glass, P.E.
Senior Geotechnical Engineer

Exhibit B

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Utah Geological Survey, 2016a, Utah Geological Survey Aerial Imagery Collection https://geodata.geology.utah.gov/imagery/

AERIAL PHOTOGRAPHS

Data Set	**Date**	**Flight**	**Photographs**	**Scale**
1947 AAJ	August 10, 1946	2B	46, 47, 48	1:20,000
1963 ELK	June 25, 1963	2	82, 169, 170	1:15,840

*https://geodata.geology.utah.gov/imagery/

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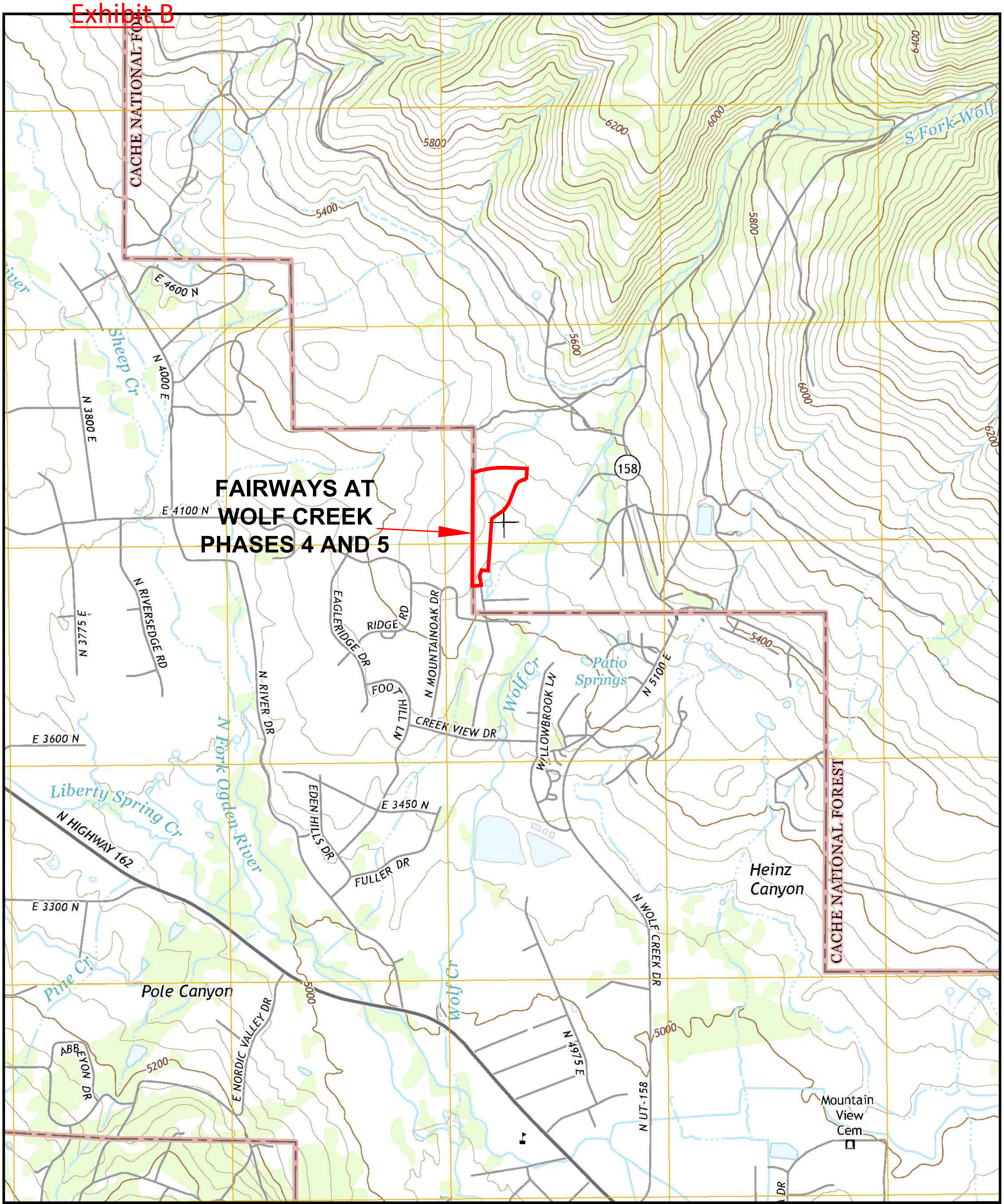
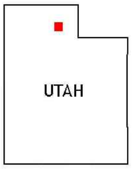
Exhibit B



BASE MAP:

USGS Huntsville 7.5-Minute Topographic Quadrangle Map (2014)



QUADRANGLE LOCATION

N

0 1000 2000 3000

FEET

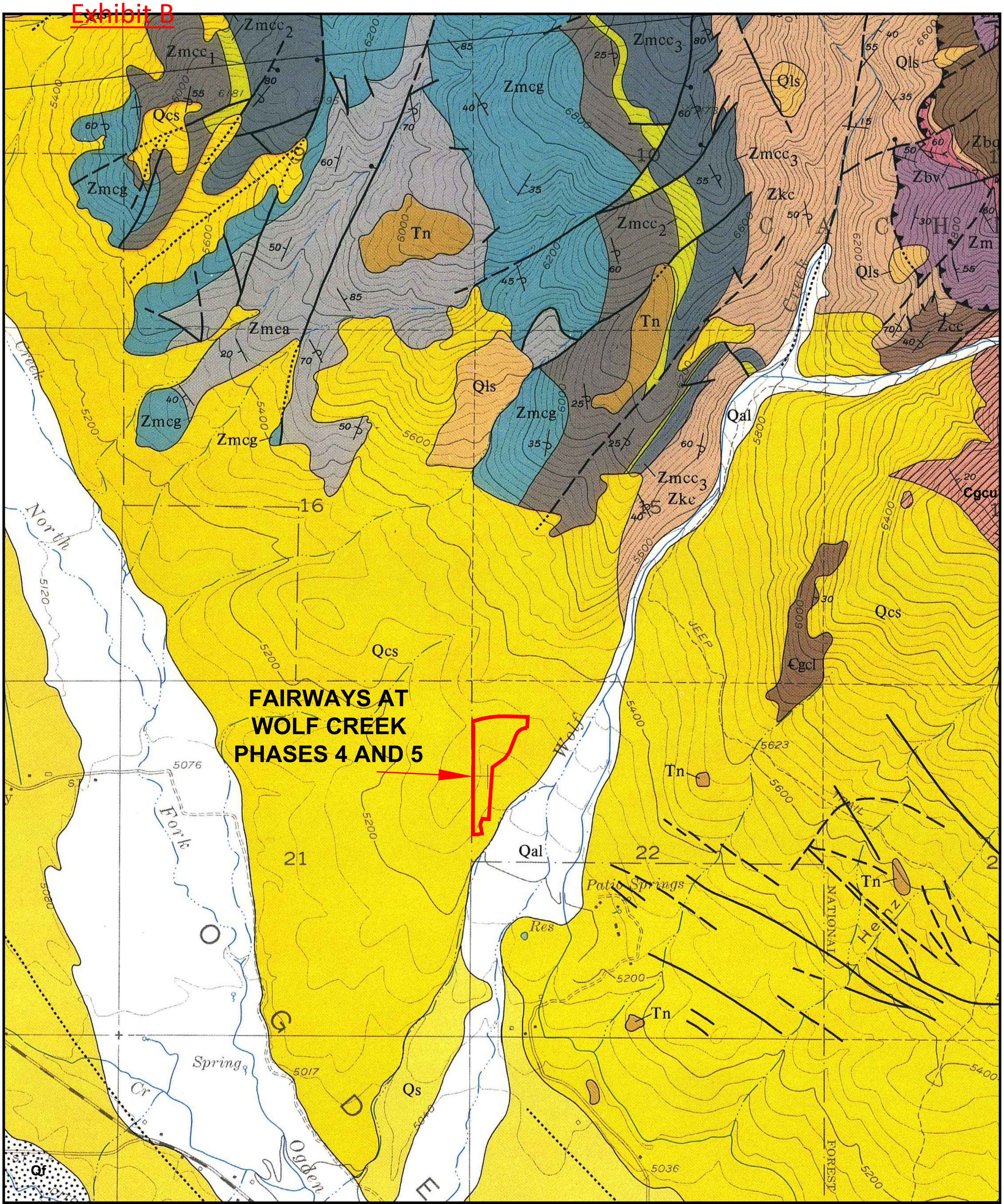
FIGURE A-1

GENERAL LOCATION MAP

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

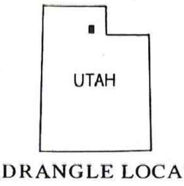
DATE: 05/17/2016
PROJECT:01855–007
SCALE: 1"=2,000'

IGES



BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

N

0 1000 2000 3000

FEET

FIGURE A-2a

REGIONAL GEOLOGY MAP 1

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

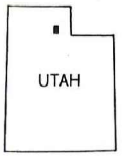
DATE: 05/17/2016
PROJECT:01855-007
SCALE: 1"=2,000'
IGES

MAP LEGEND

Qal	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (Holocene) – Unconsolidated gravel, sand, and silt deposits in presently active stream channels and floodplains; thickness 0-6 m
Qcs	COLLUVIUM AND SLOPEWASH (Holocene) – Bouldery colluvium and slopewash chiefly along eastern margin of Ogden Valley; in part, lag from Tertiary units; thickness 0-30 m
Qf	ALLUVIAL FAN DEPOSITS (Holocene) – Alluvial fan deposits; postdate, at least in part, time of highest stand of former Lake Bonneville; thickness 0-30 m
Qls	LANDSLIDE DEPOSITS (Holocene) – thickness 0-6 m
Qs	SILT DEPOSITS (Pleistocene) – Tan silt and sand forming extensive flats in Ogden Valley; deposited during high stands of Lake Bonneville, but may include older alluvial units; thickness 0-60 m
Tn	NORWOOD TUFF (lower Oligocene and upper Eocene) – Fine- to medium-bedded, fine-grained, friable, white- to buff-weathering tuff and sandy tuff, probably waterlain and in part reworked; thickness 0-450+(?) m
	BRIGHAM GROUP (Crittenden and others, 1971) – Includes: GEERTSEN CANYON QUARTZITE (Lower Cambrian) – Includes:
€gcu	Upper member – Pale-buff to white or flesh-pink quartzite, locally streaked with pale red or purple. Coarse-grained; small pebbles occur throughout unit and increase in abundance downward. Base marked by zone 30-60 m thick of cobble conglomerate in beds 30 cm to 2 m thick; clasts, 5-10 cm in diameter, are mainly reddish vein quartz or quartzite, sparse gray quartzite, or red jasper; thickness 730-820 m
€gcl	Lower member – Pale-buff to white and tan quartzite with irregular streaks and lenses of cobble conglomerate decreasing in abundance downward. Lower 90-120 m strongly arkosic, streaked greenish or pinkish. Feldspar clasts increase in size to 0.6-1.3 cm in lower part of unit; thickness 490-520 m

BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

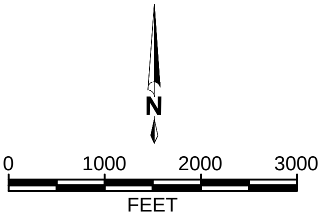


FIGURE A-2b

REGIONAL GEOLOGY MAP 1

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
PROJECT: 01855-007
SCALE: 1"=2,000'

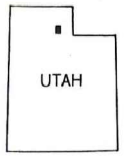
Exhibit B

MAP LEGEND

Zbq	**BROWNS HOLE FORMATION (Precambrian Z) – Includes:** Quartzite member – Medium- to fine-grained, locally friable-weathering, well-rounded, well-sorted, terra-cotta-colored quartzite, with some small- to large-scale crossbedding; thickness 30-45 m
Zbv	Volcanic member – Unit comprises volcanic rocks ranging in composition from basalt or andesite to trachyte. Includes gray-weathering, fine-grained basaltic flows and a variety of black to red, scoriaceous to amygdaloidal volcanic breccias, all locally reworked as volcanic conglomerate. K/Ar age of hornblende from cobble of alkali trachyte is 570 ± 7 m.y. (Crittenden and Wallace, 1973); thickness 55-140 m
Zm	**MUTUAL FORMATION (Precambrian Z)** – Coarse- to medium-grained, commonly gritty, locally pebbly, grayish-red to pale-purple or pink quartzite and feldspathic quartzite with abundant cross-bedding; thickness 370 m
Zcc	**CADDY CANYON QUARTZITE (Precambrian Z)** – Medium-grained, vitreous, white to tan quartzite; unit is dominantly light-colored near top and tan- to pale-brown-weathering in lower part, with abundant intercalated red siltstone at base; thickness 460-600 m
Zkc ls	**KELLEY CANYON FORMATION (Precambrian Z)** – Upper part interbedded olive-drab siltstone and thin-bedded, tan- or brown-weathering quartzite, generally in wavy or contorted beds cut by small sandstone dikelets; contact with overlying unit may be marked by zone of thin-bedded quartzite (0.5-2-cm beds) with red-weathering wavy laminae of shale and siltstone. Middle part is gray to lavender argillite enclosing and intercalated with thin-bedded pinkish-gray silty limestone (at Middle Fork Ogden River, shown on map as ls). Lower part is lavender-gray, purple-gray, or olive-drab shale, with thin beds of greenish fine-grained sandstone at top. Base of unit marked by 3-m thin-bedded to laminated, tan-weathering, fine-grained dolomite; thickness 600 m

BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

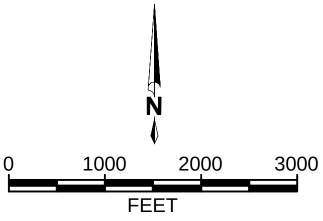


FIGURE A-2c

REGIONAL GEOLOGY MAP 1

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
PROJECT:01855–007
SCALE: 1"=2,000'

Exhibit B

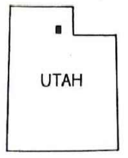
MAP LEGEND

	MAPLE CANYON FORMATION (Precambrian Z) – Includes:
Zmcc	Conglomerate member – Total thickness 30-150 m. Includes:
Zmcc$_3$	Upper conglomerate – Coarse-grained, locally conglomeratic, white quartzite
Zmcc$_2$	Argillite – Olive-drab to silvery-gray laminated argillite
Zmcc$_1$	Lower conglomerate – White to pale-gray conglomeratic quartzite, with pebble- to cobble-size clasts of white quartz and white, gray, or pale-pink quartzite
Zmcg	Green arkose member – Massively bedded pale-green arkosic sandstone, with K-feldspar content locally to 40 percent. Zone of siliceous arkosic quartzite locally present approximately 60 m below top of unit; intercalated quartzitic conglomerates locally present near base of unit; thickness 150-300 m
Zmca	Argillite member – Olive-drab, locally gray, thin-bedded siltstone and silty argillite, with a medial zone of greenish-gray arkosic sandstone. Argillite commonly shows small-scale folding and marked schistosity. May include rocks of Precambrian Y age near base of unit; thickness 150 m

┴┴	Recently active normal fault – Dashed where inferred. Ticks on downthrown side
─•─	Pre-Tertiary normal fault – Dotted where concealed Bar and ball on downthrown side
▲▲	Thrust fault – Dashed where inferred Sawteeth on upper plate

BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

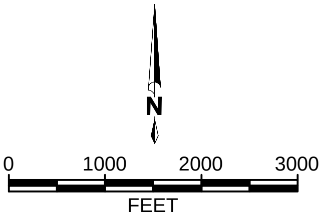


FIGURE A-2d

REGIONAL GEOLOGY MAP 1

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
PROJECT:01855-007
SCALE: 1"=2,000'

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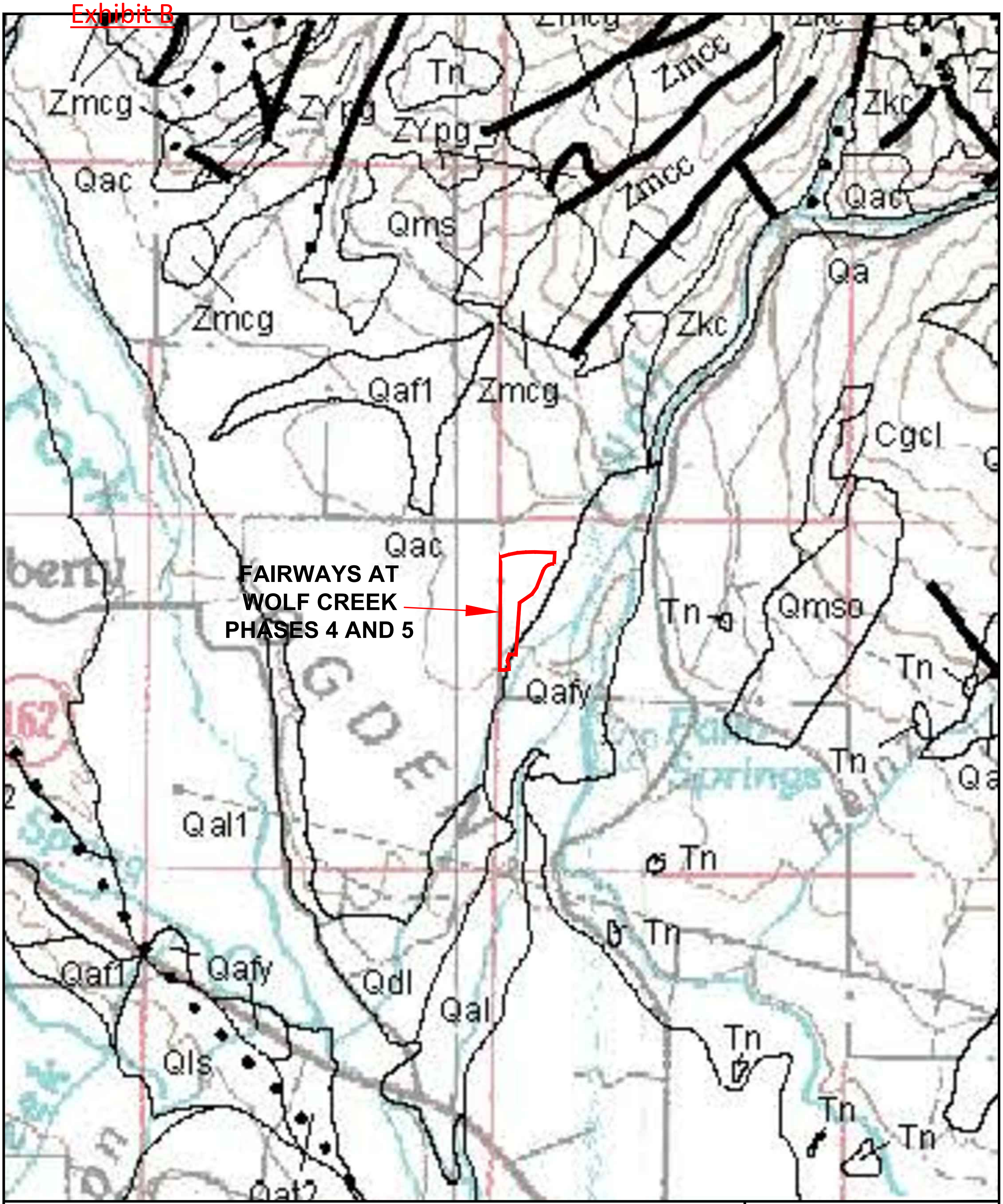
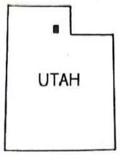
Exhibit B



BASE MAP:

UGS Ogden 30' x 60' Progress Report
Geologic Quadrangle Map (OFR-380),
Coogan and King (2001)



QUADRANGLE LOCATION

N

0 1000 2000 3000
FEET

FIGURE A-3a

REGIONAL GEOLOGY MAP 2

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
PROJECT:01855-007
SCALE: 1"=2,000'
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MAP LEGEND

OGDEN 30' x 60' PRELIMINARY MAP UNITS

QUATERNARY (number suffixes show local levels/relative age, with "1" the youngest; other common suffixes are: o = older and y = younger; see correlation chart for unit suffixes)

Qa1, Qa2, Qa[p], Qab, Qay, Qao Stream and fan alluvium -- Sand, silt, clay, and gravel. Alluvium labeled Qa[p] and Qab are graded to the Provo (and slightly lower) and Bonneville shorelines of late Pleistocene Lake Bonneville, respectively. Near former Lake Bonneville, units labeled 1 and 2 are younger than Lake Bonneville; elsewhere relative-age numbers only apply to local drainages.

Qal1, Qal2 Stream alluvium, Holocene -- Sand, silt, clay, and gravel in channels and floodplains; composition depends on source area; suffixes 1 and 2 indicate ages where they can be separated in the area of former Lake Bonneville, with 2 including low terraces.

Qat2, Qat3, Qatp, Qaty, Qato, Qat4-7 Stream-terrace deposits -- Sand, silt, clay, and gravel in terraces above floodplains. Terraces labeled Qatp are graded to the Provo and slightly lower shorelines of late Pleistocene Lake Bonneville and are only present in Morgan and Mantua Valleys. Near former Lake Bonneville, units with suffixes 2 and 3 are younger than Lake Bonneville; elsewhere relative-age numbers only apply to local drainages and the lowest terraces are labeled 2.

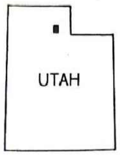
Qaf1, Qaf2, Qafy, Qafp, Qafb, Qaf3, Qafo Alluvial-fan deposits -- Mostly sand, silt, and gravel that is poorly bedded and poorly sorted. Fans labeled Qafp and Qafb are graded to the Provo (and slightly lower) and Bonneville shorelines of late Pleistocene Lake Bonneville, respectively; unit Qaf3 is used where these fans can't be separated. Near former Lake Bonneville, units with suffixes 1 and 2 are younger than Lake Bonneville and are shown as Qafy where they can't be separated; here, unit Qafo is older than Lake Bonneville. Elsewhere relative-age numbers and letters only apply to local drainages.

QafO Lower and middle Pleistocene alluvial-fan deposits – Fans located above pre-Lake Bonneville older alluvial-fan deposits (Qafo) near Mountain Green; contain mostly sand, silt, and gravel that is poorly bedded and poorly sorted.

Qap	Pediment-mantle deposits (also labeled as Qs = erosion surface with uncertain mantle thickness) -- Gravel, sand, silt, and clay alluvium and colluvium capping erosional surfaces.
Qac	Alluvium and colluvium -- Includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits.
Qc	Colluvium -- Includes slopewash and soil creep; composition depends on local bedrock.
Qcg	Colluvial and residual gravel deposits – Includes Quaternary gravel-armored

BASE MAP:

UGS Ogden 30' x 60' Progress Report Geologic Quadrangle Map (OFR-380), Coogan and King (2001)



QUADRANGLE LOCATION

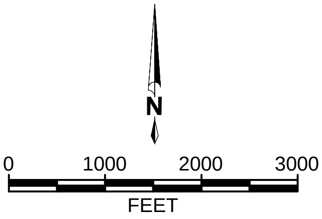


FIGURE A-3b

REGIONAL GEOLOGY MAP 2

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
PROJECT:01855-007
SCALE: 1"=2,000'

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MAP LEGEND (cont.)

surfaces that don't resemble pediments; previously included in Huntsville fanglomerate.

Qmc Colluvium and mass-movement deposits, undivided – Includes landslide, slump, slopewash, and soil creep with subdued morphology on steep slopes.

Qm, Qmo Mass-movement deposits, undivided – Includes slides, slumps, and flows, as well as colluvium, talus, and alluvial fans that are mostly debris flows; composition depends on local sources. Qmo locally used where younger mass-movements (including landslides and slumps) are mapped.

Qms, Qms1, Qms2, Qms3, Qmsy, Qms4, Qmso Landslide and slump deposits (locally, unit involved is shown in parentheses) – Poorly sorted clay to boulder-sized material; locally includes flow deposits. Near former Lake Bonneville units with relative-age number suffixes were: 1) emplaced in the last 80 to 100 years; 2) are post Lake Bonneville in age; 3) were emplaced during or shortly after Lake Bonneville regression; and 4) were emplaced before Lake Bonneville transgression; extensive deposits in Lake Bonneville sediments in North Ogden and Kaysville quadrangles include earthquake liquefaction features. Suffixes y (as well as 1&2) and o (as well as 3&4) indicate probable Holocene and Pleistocene ages, respectively.

Qmt Talus, and lesser colluvium -- Angular debris at the base of and on steep slopes. Includes rock glaciers that form lobate mounds in cirques in the Wasatch Range; probably inactive.

Qg, Qgw Glacial till and outwash -- Mostly Pinedale (~15,000 to 30,000 yrs old) but probably includes Little Ice Age (1500 to 1800 A.D.) and may include Bull Lake (~130,000 to 150,000 yrs old) deposits; locally includes rock glaciers. Unit Qgw is outwash and, possibly, alluvially reworked outwash that obscures older deposits and bedrock.

Qly Lacustrine deposits other than those in Lake Bonneville – Fine-grained material and locally marsh deposits in lakes outside the Great Salt Lake basin; typically younger than Lake Bonneville deposits.

Qla Lake Bonneville deposits; and post- and pre-Lake Bonneville alluvial-fan deposits, undivided -- Mostly poorly sorted and poorly bedded sand, silt, and gravel.

Ql Lake Bonneville deposits, undivided.

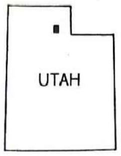
Qlf Fine-grained lacustrine deposits -- Mostly clay, silt, and fine sand deposited offshore in Lake Bonneville. In the Kaysville quadrangle, deposits below the Gilbert shoreline are the same age as the shoreline, while deposits below the historic-highstand shoreline (4,213 feet [1,284.5 m]) of Great Salt Lake are recent.

Qls Lake Bonneville sand -- Mostly sand with some silt and gravel deposited nearshore; grades downslope into unit Qlf with decreasing sand content. Typically sand in the Ogden and Morgan Valleys.

Qlg Lake Bonneville gravel -- Mostly interbedded gravel and sand deposited along

BASE MAP:

UGS Ogden 30' x 60' Progress Report
Geologic Quadrangle Map (OFR-380),
Coogan and King (2001)



QUADRANGLE LOCATION

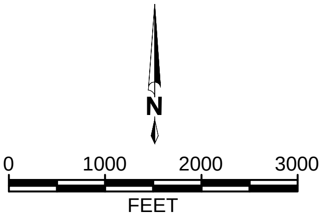


FIGURE A-3c

REGIONAL GEOLOGY MAP 2

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

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SCALE: 1"=2,000'

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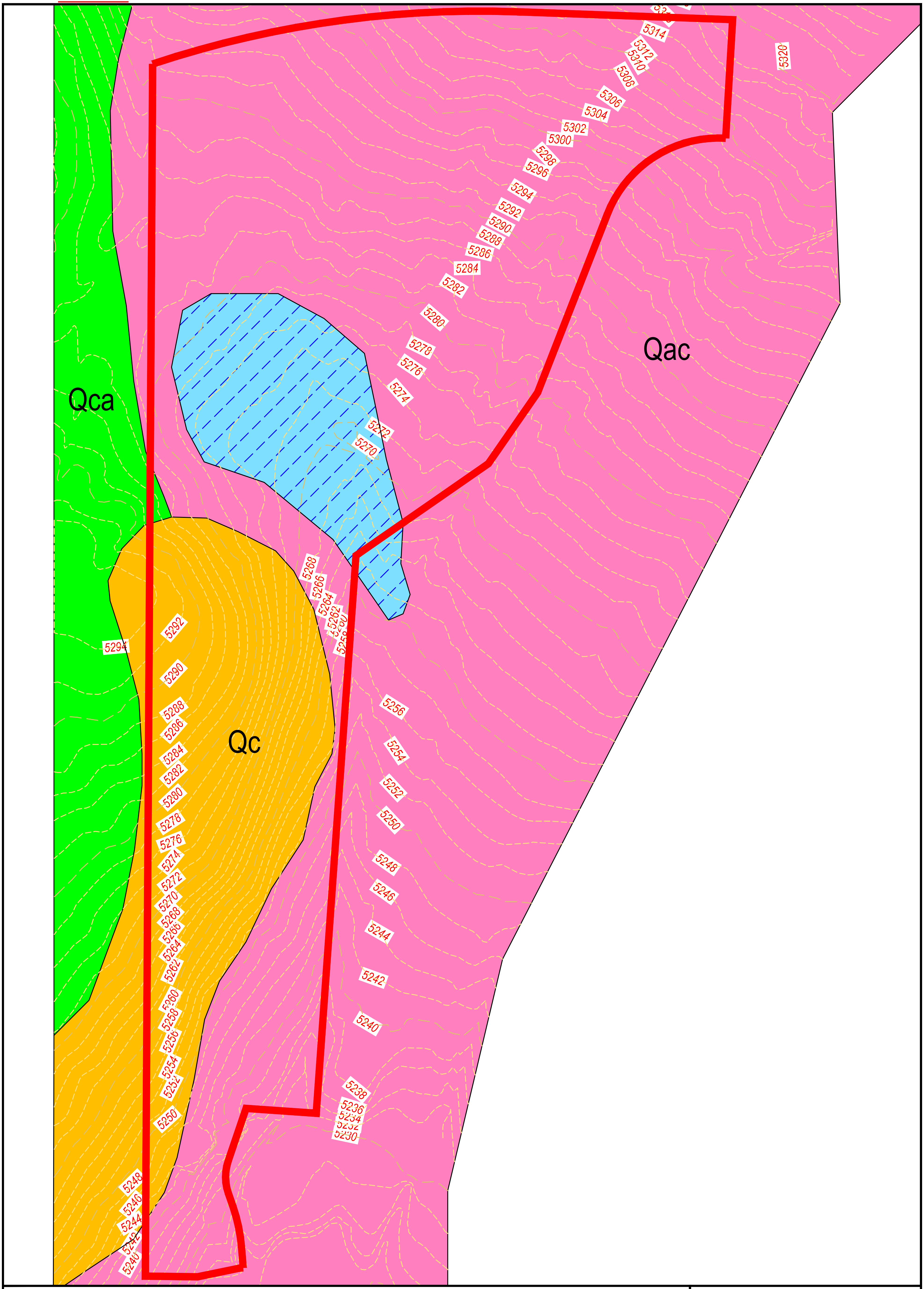
Exhibit B



LEGEND

🟪 Qac PREDOMINANTLY ALLUVIUM AND SOME COLLUVIUM

🟩 Qca COLLUVIUM AND ALLUVIUM; GRADATIONAL

🟧 Qc BOULDERY COLLUVIUM

▨ AREA OF STANDING WATER/MARSHY CONDITIONS

PROPERTY BOUNDARY

N

0 200

FEET

FIGURE A-4

LOCAL GEOLOGY MAP

FAIRWAYS AT WOLF CREEK
SUBDIVISION PHASES 4 AND 5
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/17/2016
FILE: 01855–007
SCALE: 1"=200'

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