

**Lat/Long and Northing/Easting
for Gravity Stations**

Station	Long	Lat	Northing	Easting
1	-120.999243	47.209384	76422.572	1599177.001
2	-120.999193	47.209427	76438.23	1599189.463
3	-120.999143	47.209469	76453.524	1599201.924
4	-120.999094	47.209512	76469.182	1599214.138
5	-120.999047	47.209554	76484.478	1599225.853
6	-120.998995	47.209596	76499.77	1599238.812
7	-120.998943	47.209642	76516.522	1599251.773
8	-120.998901	47.209665	76524.889	1599262.231
9	-120.998884	47.209716	76543.46	1599277.434
10	-120.998785	47.209746	76554.373	1599291.128
11	-120.99874	47.209796	76572.588	1599302.353
12	-120.998997	47.209894	76608.473	1599238.549
13	-120.999038	47.209853	76593.539	1599228.325
14	-120.99908	47.209806	76576.417	1599217.849
15	-120.999112	47.209759	76559.29	1599209.858
16	-120.999154	47.209715	76543.263	1599199.383
17	-120.999194	47.20967	76526.87	1599189.405
18	-120.999234	47.209623	76509.747	1599179.426
19	-120.999276	47.209576	76492.625	1599168.949
20	-120.999316	47.209529	76475.502	1599158.969
21	-120.999357	47.209483	76458.745	1599148.742
22	-120.998584	47.209341	76406.534	1599340.772
23	-120.998664	47.209338	76405.482	1599320.885
24	-120.998745	47.209334	76404.067	1599300.748
25	-120.998824	47.209331	76403.015	1599281.109
26	-120.998906	47.209329	76402.329	1599260.725
27	-120.998984	47.209325	76400.912	1599241.333
28	-120.999065	47.20932	76399.131	1599221.195
29	-120.999144	47.209316	76397.714	1599201.555
30	-120.999225	47.209311	76395.934	1599181.418
31	-120.998881	47.209233	76367.298	1599266.863
32	-120.998937	47.209283	76385.566	1599252.983
33	-120.999035	47.209367	76416.259	1599228.689
34	-120.999085	47.20941	76431.971	1599216.295
35	-120.99913	47.209455	76448.41	1599205.145
36	-120.999181	47.209498	76464.122	1599192.502
37	-120.999232	47.20954	76479.47	1599179.858
38	-120.999332	47.209626	76510.894	1599155.069
39	-120.999383	47.209668	76526.241	1599142.425
40	-120.999434	47.209713	76542.683	1599129.784
41	-120.999484	47.209753	76557.301	1599117.387
42	-120.999245	47.209727	76547.689	1599176.773
50	-120.995523	47.208353	76044.523	1600100.876
51	-120.995476	47.208311	76029.178	1600112.527
52	-120.995411	47.208273	76015.282	1600128.655
53	-120.995353	47.208254	76008.321	1600143.057

***Lat/Long and Northing/Easting
for Gravity Stations***

54	-120.995293	47.208207	75991.146	1600157.935
55	-120.99525	47.208156	75972.52	1600168.585
56	-120.99519	47.208121	75959.722	1600183.472
57	-120.99513	47.208085	75946.559	1600198.359
58	-120.99507	47.208047	75932.666	1600213.244
59	-120.995026	47.208004	75916.958	1600224.149
60	-120.9997	47.209736	76551.216	1599063.683
61	-120.999765	47.20977	76563.653	1599047.553
62	-120.999826	47.209805	76576.453	1599032.419
63	-120.999889	47.209839	76588.889	1599016.786
64	-120.999951	47.209874	76601.689	1599001.403
65	-121.000014	47.209908	76614.125	1598985.77
66	-121.000077	47.209941	76626.197	1598970.136
67	-121.000138	47.209976	76638.996	1598955.002
68	-121.000199	47.21001	76651.431	1598939.866
69	-121.00026	47.210046	76664.596	1598924.732
70	-121.000323	47.21008	76677.032	1598909.1
71	-121.000387	47.210113	76689.104	1598893.218
72	-121.000445	47.209697	76537.229	1598953.041
73	-121.000095	47.20974	76552.887	1598965.503
74	-121.000047	47.209783	76568.547	1598977.469
75	-120.999999	47.209828	76584.936	1598989.435
76	-120.999907	47.209919	76618.08	1599012.375
77	-120.999861	47.209964	76634.47	1599023.844
78	-120.999814	47.210008	76650.495	1599035.562
79	-120.999767	47.210052	76666.519	1599047.279
80	-120.99972	47.210097	76682.909	1599058.997
81	-120.999674	47.210141	76698.934	1599070.465

Appendix VII
NRCS SOIL SURVEY



United States
Department of
Agriculture

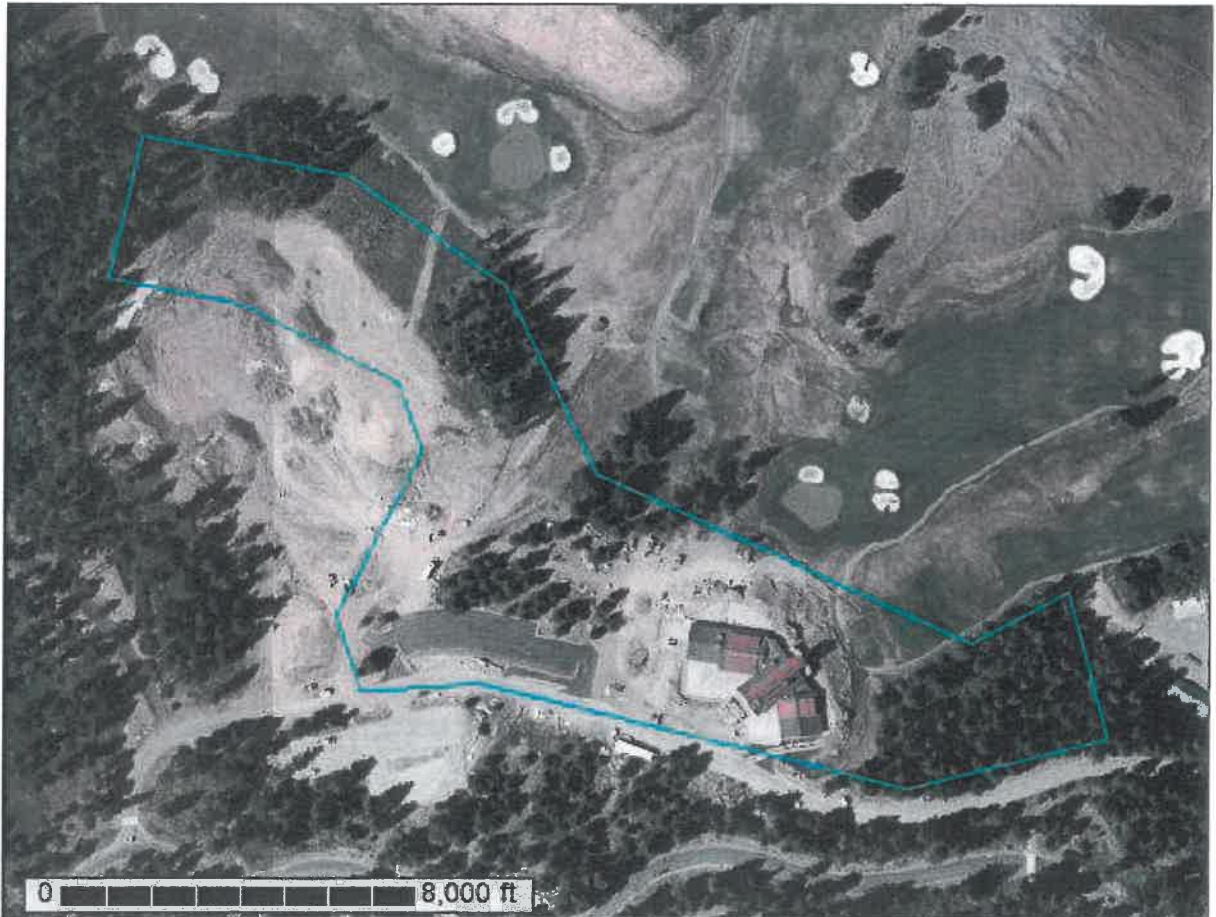
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

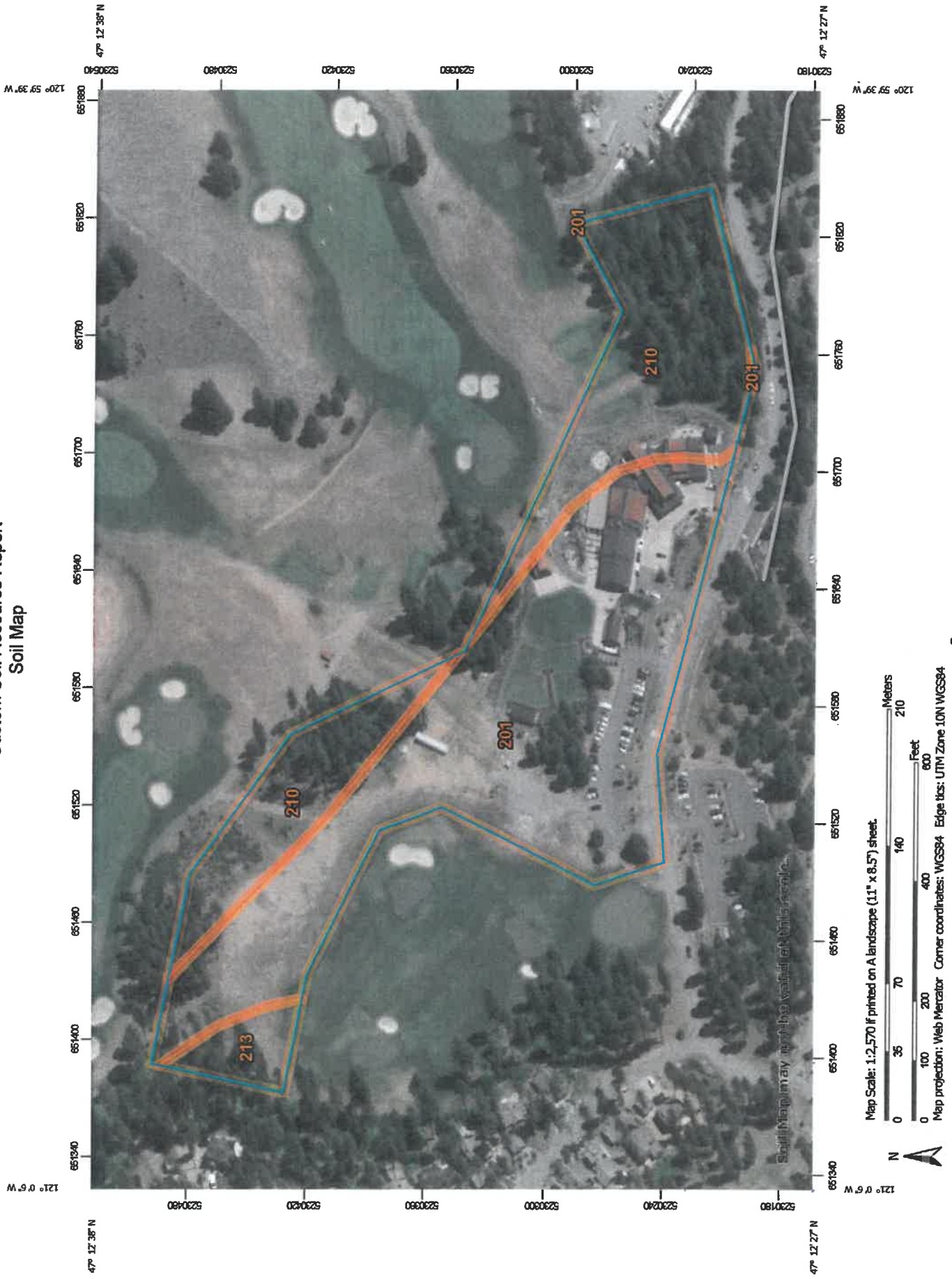
Custom Soil Resource Report for Kittitas County Area, Washington

Winemaker's Cabins at Swiftwater Cellars



September 19, 2017

Custom Soil Resource Report Soil Map



Map Scale: 1:2,570 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Kittitas County Area, Washington

201—Roslyn ashy sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2ktv
Elevation: 1,900 to 2,400 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 85 to 115 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Roslyn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roslyn

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Glacial drift with a mantle of loess and volcanic ash

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
H1 - 1 to 8 inches: ashy sandy loam
H2 - 8 to 15 inches: ashy sandy loam
H3 - 15 to 37 inches: loam
H4 - 37 to 49 inches: gravelly loam
H5 - 49 to 60 inches: gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Other vegetative classification: grand fir/common snowberry/pinegrass (CWS336)
Hydric soil rating: No

Minor Components

Nard

Percent of map unit: 10 percent
Hydric soil rating: No

Custom Soil Resource Report

Volperie

Percent of map unit: 5 percent

Hydric soil rating: No

210—Dystroxerepts, 50 to 70 percent north slopes

Map Unit Setting

National map unit symbol: 2kv5

Elevation: 1,900 to 2,700 feet

Mean annual precipitation: 30 to 50 inches

Mean annual air temperature: 45 to 46 degrees F

Frost-free period: 70 to 100 days

Farmland classification: Not prime farmland

Map Unit Composition

Dystroxerepts and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dystroxerepts

Setting

Landform: Escarpments

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Glacial outwash with an influence of volcanic ash in the upper part

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

H1 - 1 to 7 inches: very cobbly ashy loam

H2 - 7 to 18 inches: gravelly ashy loam

H3 - 18 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 50 to 70 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Other vegetative classification: grand fir/pinegrass (CWG124)

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Racker

Percent of map unit: 10 percent

Hydric soil rating: No

Roslyn

Percent of map unit: 5 percent

Hydric soil rating: No

213—Roslyn ashy sandy loam, moist, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2kv7

Elevation: 1,900 to 2,400 feet

Mean annual precipitation: 30 to 40 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 85 to 115 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Roslyn, moist, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roslyn, Moist

Setting

Landform: Kame terraces, terraces, valley sides

Down-slope shape: Concave, linear

Across-slope shape: Concave, convex

Parent material: Glacial drift with a mantle of loess and volcanic ash

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

H1 - 1 to 8 inches: ashy sandy loam

H2 - 8 to 15 inches: ashy sandy loam

H3 - 15 to 37 inches: loam

H4 - 37 to 60 inches: gravelly loam

Properties and qualities

Slope: 3 to 25 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Custom Soil Resource Report

Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Other vegetative classification: grand fir/vine maple (CWS551)

Hydric soil rating: No

Minor Components

Quicksell

Percent of map unit: 5 percent

Hydric soil rating: No

Bertolotti

Percent of map unit: 5 percent

Hydric soil rating: No

Nard

Percent of map unit: 5 percent

Hydric soil rating: No

Appendix VIII
USGS DESIGN MAPS SUMMARY REPORT

USGS Design Maps Summary Report

User-Specified Input

Report Title Winemaker's Cabins at Swiftwater Cellars
Mon November 27, 2017 19:43:38 UTC

Building Code Reference Document 2012/2015 International Building Code
(which utilizes USGS hazard data available in 2008)

Site Coordinates 47.21028°N, 121.00097°W

Site Soil Classification Site Class C – “Very Dense Soil and Soft Rock”

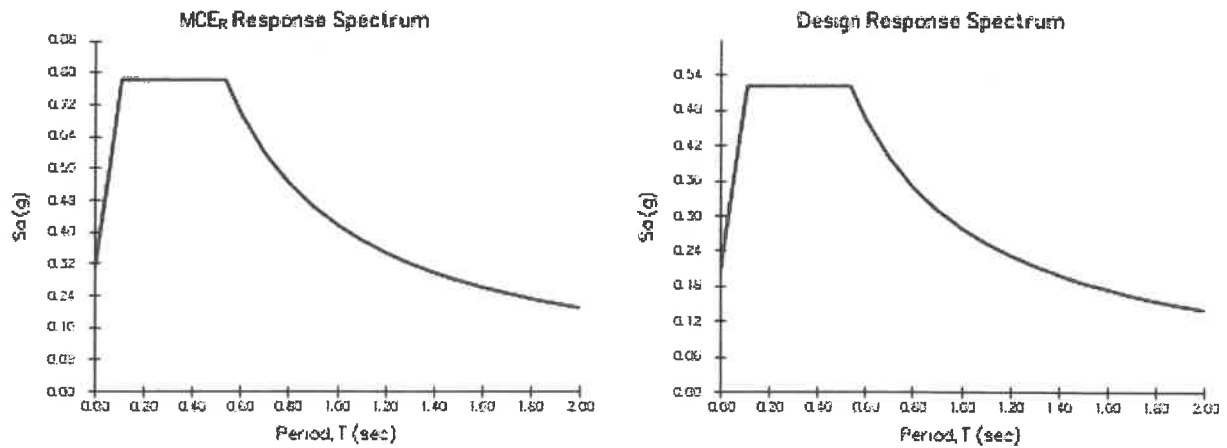
Risk Category I/II/III



USGS-Provided Output

$S_s = 0.699 \text{ g}$	$S_{MS} = 0.783 \text{ g}$	$S_{DS} = 0.522 \text{ g}$
$S_1 = 0.275 \text{ g}$	$S_{M1} = 0.419 \text{ g}$	$S_{D1} = 0.279 \text{ g}$

For information on how the S_S and S_1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the “2009 NEHRP” building code reference document.



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



Consulting Engineers Environmental Scientists Construction Materials Testing

June 4, 2018

Swiftwater Custom Homes
Swiftwater Cellars Properties, LLC
PO Box 492
Roslyn, WA 98941

Attention: Jeff Hansell

Subject: **Supplemental Coal Mine Hazards Assessment
Winemaker's Cabins at Swiftwater Cellars
301 Rope Rider Drive, Cle Elum, Kittitas, Washington**

GNN Project No. 217-871

References: GN Northern, Inc., December 4, 2017, *Coal Mine Hazards Assessment & Geotechnical Evaluation Report, Winemaker's Cabins at Swiftwater Cellars*, 301 Rope Rider Drive, Cle Elum, Kittitas, Washington, GNN Project No. 217-871.

Dear Mr. Hansell,

As requested, GN Northern (GNN) has completed a supplemental coal mine hazards assessment for the above referenced residential and mixed-use development to be constructed at 301 Rope Rider Drive within the Suncadia Resort community near Cle Elum, Kittitas County, Washington.

Based on our understanding, the project areas are underlain by portions of the abandoned Roslyn No.9 Mine, and were classified in Icicle Creek Engineers (ICE) Coal Mine Hazard Assessment Report dated February 2008 as a 'sinkhole hazard area' due to the presence of open and partially collapsed mine shafts. GNN since completed a Coal Mine Hazards Assessment & Geotechnical Evaluation Report on December 4, 2017 presenting updated delineation maps for coal mine hazards based on a new land use classification system. GNN's evaluation highlighted *unbuildable* areas associated to a moderate to severe mine hazard based on limited subsurface exploration and microgravity surveys.

The purpose of this Supplemental Coal Mine Hazards Assessment was to refine the delineations between *buildable* and *unbuildable* areas based on the published mine map along with location-specific exploration. Our evaluation was completed in general accordance with our *Proposal for Additional*

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509-893-9400

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81006 HWY 395
Hermiston OR 97838
541/564-0991

Visit our website at www.gnnorthern.com
Email: gnnorthern@gnnorthern.com

Geotechnical Services dated January 26, 2018; notice to proceed was provided by Mr. Hansell on January 29, 2018 in the form of a signed authorization of our proposal. The scope of work included additional subsurface exploration by advancing eight (8) exploratory borings, additional microgravity surveys of selected areas of the project site, and preparation of revised coal mine hazard maps based on the findings of this supplemental evaluation.

Field Exploration

Supplemental exploratory borings were drilled using a track-mounted Terra Sonic TSi 150 Compact Crawler drill rig operated by Holt Services to depths of approximately 40 to 62 feet BGS between April 23rd and 25th. The exploratory borings were logged by a GNN geotechnical engineer. Upon completion, the borings were backfilled in general accordance with Washington State guidelines. Boring locations are shown on *Site & Exploration Maps* (Figures 2A & 2B, Appendix I).

Photographs of the site and explorations are presented in Appendix IV following this report. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation.

Microgravity Survey

In an effort to further evaluate and confirm the locations and extent of voids and open mine tunnels, microgravity surveys were completed by Global Geophysics of Redmond, Washington at the site to identify apparent low-density zones. The gravimeter instrument used for micro-gravity survey measures the earth's gravitational acceleration. After corrections are made to the gravity measurements for latitude, elevation, tide, drift, regional trend, and terrain at each station, the gravity values represent an excess or deficiency in mass of the subsurface geology. Encompass Surveying of Cle Elum completed a survey of each of the gravity test points to collect location data. The gravity survey report (dated June 4, 2018) is attached to this report.

Soil/Bedrock Conditions

Our understanding of the soil/bedrock conditions at the project site was developed from our site-specific exploration during this round and a previous round, and review of borings logs previously completed by ICE in the project vicinity. Boring logs provided in Appendix II include detailed descriptions of the soils/rock encountered. In general, the subsurface geologic setting at the project site (Area 1 and Area 2)

typically consists of Quaternary glacial outwash deposits [Outwash] overlying the local Tertiary sedimentary bedrock [Roslyn Formation].

The Roslyn Formation bedrock profile generally consists of poorly indurated siltstone atop carbonaceous shale underlain by coal, overlying a unit of sandstone. The carbonaceous shale unit was observed to include coal-rich seams with increasing depth, ultimately transitioning to coal at the bottom. Each of our borings during this round penetrated through the Big Seam coal unit (or void) to terminate upon the hard, intact sandstone. The following table provides a summary of the current condition of the coal mine workings at the project site:

Project Area	Borehole ID	Mined Condition of Big Seam
Area 1	B-6	Void at ~55 to 61 feet BGS
	B-7	Void at ~52.5 to 57.5 feet BGS
	B-8	Void at ~38 to 44 feet BGS
	B-9	Intact Coal from ~41.5 to 52.5 feet BGS
	B-10	Apparent collapsed mine from ~55 to 60.5 feet BGS
	B-11	Void at ~42 to 48 feet BGS
Area 2	B-12	Void at ~42 to 48 feet BGS
	B-13	Apparent collapsed mine from ~38 to 40 feet BGS

Findings, Conclusions & Recommendations

The following is a summary of our findings, conclusions and professional opinions based on the data obtained from a review of selected technical literature and supplemental site evaluations:

- ***Based on our current understanding of the proposed development and subsurface conditions encountered, from a geologic and geotechnical perspective, it is our professional opinion that some portions of the site (as planned) currently remain unsuitable (identified as ‘Unbuildable’ on revised Figures 3 and 4) for the proposed development due to the significant risk of ground subsidence resulting from remaining subterranean mine works. The remaining proposed development areas (identified as ‘Buildable’ on revised Figures 3 and 4) are suitable for development provided the recommendations in this report are followed in the design and construction of this project. Unbuildable areas require special mitigation measures through engineering design recommendations, followed by confirmation with insitu testing as described below to mitigate threats to human health, public safety, and property.***

- The primary geologic hazard and site constraint for the proposed project is the risk of catastrophic surface subsidence and associated structural damage above the old coal mine works resulting from potential collapse related to unmitigated mine openings. Engineered design and careful construction measures as recommended within this report can mitigate these geologic mine hazard constraints and increase stability and safety for the proposed development.
- An acceptable option for mitigation of open mine hazards includes drilling multiple access holes from the surface and backfilling the noted voids with concrete slurry. Appropriate backfilling will allow for reclassification of the ‘Unbuildable’ areas to ‘Buildable’. Some additional exploration/evaluation shall be performed post-backfilling to confirm that the open mine areas have been appropriately remediated. A qualified specialty contractor familiar with this type of work shall be employed. GNN is available to work with your specialty contractor for mitigation of unbuildable areas.
- Based on our estimation of the apparent remaining voided areas derived from the published mine map, along with our site-specific subsurface exploration, we have developed maps (Figures 5 & 6) showing the underground mine workings in Areas 1 & 2. Based on the mapped mine layout, we estimate that approximately 3,500 to 4,500 cubic yards of concrete slurry will likely be required to backfill the open mine shafts in Area 1. Additionally, we estimate that approximately 800 to 1,000 cubic yards of concrete slurry will likely be required to backfill the open mine shafts in Area 2. It should be understood that the actual quantity of concrete slurry needed to appropriately mitigate the voids could vary significantly, greater or lesser, due to uncertainty of the underground conditions.
- Unless underground mines are fully collapsed or are reclaimed by backfilling, development must be restricted within areas located above existing open and/or partially collapsed underground mines that are less than 100 feet below the ground surface (revised Figures 3 and 4 for ‘Non-Buildable’ areas).
- Development within areas located above fully collapsed underground mines that are less than 100 feet below the ground surface must be constructed with appropriate mitigations and structural enhancements. The structural engineer should consider the use of rigid foundation systems supporting a flexible superstructure and structurally reinforced slab-on-grade.

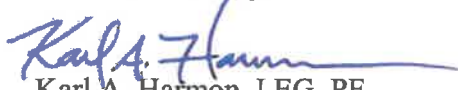
This supplemental report serves as an addendum to GNN's 2017 Coal Mine Hazards Assessment & Geotechnical Evaluation Report. Except as modified in this report and on the attached hazard maps (revised Figures 3 & 4), the findings, conclusions, and recommendations presented in the referenced GNN report remain valid.

If you have any questions regarding this report, please contact us at 509-248-9798.

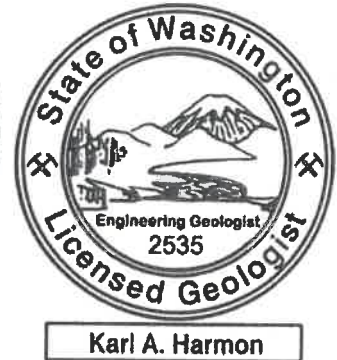
Respectfully submitted,
GN Northern, Inc.



M. Yousuf Memon, PE
Geotechnical Engineer



Karl A. Harmon, LEG, PE
Senior Geologist/Engineer



Attachments:

- *Site Exploration Map for Area 1 (Figure 2A rev.1);*
- *Site Exploration Map for Area 2 (Figure 2B rev.1);*
- *Coal Mine Hazards Map Overlay of Area 1 (Figure 3 rev. 1);*
- *Coal Mine Hazards Map Overlay of Area 2 (Figure 4 rev. 1);*
- *Open Mine Workings Within Area 1 (Figure 5);*
- *Open Mine Workings Within Area 2 (Figure 6);*
- *Boring Logs (B-6 through B-13), Key Chart;*
- *Site & Exploration Photographs (Plates 1-5);*
- *Microgravity Survey Report.*