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MEMORANDUM

Date: January 19, 2017

To: TRPA Hearings Officer

From: TRPA Staff

Subject: Tunnel Creek Properties LLC Land Capability Challenge; 1200 Tunnel Creek Road, Washoe County, NV; Assessor's Parcel No: 130-311-17, TRPA File No: LCAP2015-0470

Proposed Action: Hearings Officer review and approval of the proposed Land Capability Challenge.

Staff Recommendation: Staff recommends the TRPA Hearings Officer approve this land capability challenge which would change the land capability from Class 2 and Class 6 to Class 1a, Class 2, and Class 4.

Background: The subject parcel is shown as having both Class 1a and Class 6 on TRPA Land Capability Overlay Maps (aka Bailey Land Capability maps, Attachment A). The Class 6 land is designated for the land in the center, north and west, while the moderately sloped southeast corner is designated Class 2. The Soil Conservation Service Soil Survey of Tahoe Basin Area, California-Nevada (Rogers, 1974) identifies the west and center portions as Inville very stony sandy loam, 2 to 9% (IsC). The southeast corner of the study area is mapped as Cagwin-Rock outcrop complex, 15 to 30% slopes (CaE). The CaE soil can have 5 to 15% rock surface cover and bedrock 20 to 40 inches from the surface. The soil component is typically loamy coarse sand atop partially weathered granodiorite (grus). The grus layer may not show significant evidence of soil formation, but it can contain fine to medium-sized roots. The vicinity of this parcel has a geomorphic mapping of E-2 for Outwash, till, and lake deposits (low hazard land) for the center, north and west parts; and C-2 for Strongly dissected lands (high hazard lands) for the southeast corner. There are no Stream Environment Zones (SEZs) present, nor in close proximity.

A TRPA land capability verification (LCV) has been done on this property. A land capability challenge (LCAP2015-0128) was filed with TRPA on November 25, 2015. A detailed soil investigation was conducted for this land capability challenge on December 12, 2015 and July 12, 2016 by TRPA contractor Phil Scoles (Terra Science, Inc.). The first field date was conducted in advance of the land capability challenge application submittal, while the second field date was needed to collect additional soil profile descriptions.

Findings: TRPA's soil consultant described six test pits within the study area – the northern 1.23 acres of a 3-acre pan-shaped parcel. The panhandle portion of the parcel was excluded from the field study as it contains an existing residence, numerous rock outcrops, sparse vegetation, and other evidence of shallow depth to bedrock (hence, Cagwin-rock outcrop complex, 15 to 30% slopes, Class 2 or 30 to 50% slopes, Class 1a). Based on the field analysis and slopes, the soils for entire study area formed from granodiorite and occur on slopes 15 to more than 30%. The granite-derived characteristics include brown to yellowish brown soil color, coarse loamy sand textures, somewhat excessive drainage, low water holding capacity, low clay content, and rapid infiltration. The somewhat excessively drained condition infers both rapid permeability and no evidence of seasonal high water table in upper 40 to 55 inches. Where the soil was less than 40 inches deep (Test Pit 3 and vicinity), the partially weathered bedrock comprises a root-restricting layer. This root-restricting, partially weathered bedrock was observed in the other test pits; however, it occurs sufficiently deep (below 45+inches). As such, the deeper soils are higher capability (Class 4 vs. Class 1a or Class 2).

Where there soils are either shallow or have slopes greater than 30%, they qualify as Cagwin-Rock outcrop complex, CaE, (Class 2) or CaF (Class 1a). There are also small pockets of the Cagwin soil in the northeast and southeast parts of the study area, which also have shallow depths to bedrock and/or slopes greater than 30%. All Cagwin soils have bedrock between 20 and 40 inches of the surface, in addition to other granite-derived characteristics. The Cagwin soil was mapped by the 1974 soil survey (Soil Conservation Service-SCS) only for the southeast part of the study, while the center, north and west parts were mapped having Inville soil. Such mapping is not in error when taking into account the scale the mapping was prepared for. That is, the SCS mapping (and subsequently TRPA land capability maps) was compiled with minimum map units (polygons) not less than 10 acres in size. Thus, the use of SCS mapping units on a lot by lot basis exceeds the accuracy of the original mapping. This limitation is often not apparent when a large area is mapped having the same soil type, such as the land west of Highway 28. It is more apparent when there is an intersection of two landforms, such as a granitic hillside converging with a glacial outwash terrace. Such landform intersection is approximately where Highway 28 was constructed. The study area occurs entirely on the granitic hillside landform, so it does not contain any glacial outwash soils, like the Inville series (Class 6).

The center and north portion of the study area was found to have soils deeper than 40 inches (maximum depth for Cagwin series). These area unnamed (designated XXX) soils have similar matrix color and textures as the Cagwin soil, but they are deeper (hence greater soil functioning). Such textures do not form root-restricting layers and they are considered Hydrologic Soil Group A (instead of HSG-C). The 1974 soil series recognized that where Cagwin soils occur there were inclusions ("unmapped pockets") having deeper soil. Such pockets were too small for soil survey mapping, but become identifiable during site-specific analyses (such as a land capability challenge). These unnamed soils are unlike Umpa soils (another soil type in the Incline Village vicinity), which formed from andesite (rather than granodiorite). They are also deeper and less steep than the Graylock and Toem soil series.

From Page 20, Table 4 of Land-Capability Classification of the Lake Tahoe Basin, California-Nevada (Bailey, 1974), the unnamed XXX soil having 9 to 30% slopes qualify as Class 4 (20%

allowable land coverage). The slope classes of CaE, CaF and XXX apply to situations having moderate and severe geomorphic hazard overlay mapping. The land capability polygons shown on Exhibit A are based on field observations, topographic survey and reflect pre-disturbance soil conditions. Where there is a driveway cut along Tunnel Creek Road, the historic contours were estimated. The table below summarizes the changes in land capability as concluded by this land capability challenge.

Land Capability District	Area (sq. ft.) TRPA Land Capability Map	Area (sq. ft.) LCAP2015-0470	Net Change (sq. ft.)
Class 1a (CaF, 30 to 50% slopes)	0	13,967	+13,967-
Class 2 (CaE, 15 to 30% slopes)	4,839	11,211	+6,372
Class 4 (XXX, 9 to 30% slopes)	0	28,587	+28,587
Class 6 (IsC, 2 to 9% slopes)	48,926	0	-48,926
Total Study Area (north part of APN 130-311-17)	53,765	53,765	0

This memorandum was jointly prepared by TRPA contractor Phil Scoles (Terra Science, Inc.) and TRPA Associate Planner, Julie Roll. If you have questions on this Hearings Officer item, please contact Julie Roll, at 775-589-5247 or jroll@trpa.org.

Attachments:

- A. Vicinity map and TRPA land capability map
- B. Existing conditions map (Exhibit A) showing topography and land capability challenge recommendation
- C. TRPA subcontractor soil profile descriptions (6 test pits)

BAILEY LAND CAPABILITY CHALLENGE FINDINGS

Site Information	
Assessor's Parcel Numbers: (APN)	130-311-17
TRPA File No. / Submittal Date:	LCAP2015-0470 / November 25, 2015
Owner or Applicant:	Craig Olson; Tunnel Creek Properties, LLC; 930 Tahoe Blvd., 3802-322, Incline Village, NV 89451
Address:	1200 Tunnel Creek Road, Incline Village, Washoe County, NV

Environmental Setting	
Bailey Soil Mapping Unit¹ / Hydrologic Soil Group (HSG) / Land Class / Geomorphic Hazard Unit	CaE (Cagwin-Rock outcrop complex, 15-30% slopes) / HSG C / C-2 Strongly dissected lands (high hazard) and IsC (Inville stony coarse sandy loam, 2 to 9% slopes / HSG-B / E-2 . Outwash, till, and lake deposits (low hazard land).
Soil Parent Material	Residuum over granodiorite bedrock
Slopes and Aspect	9 to 30% for center, north and east parts of study area, greater than 30% for west edge of site.
Elevation and Datum	6310 to 6374 ft. (from Lake Tahoe datum)
Rock Outcrops and Surface Configuration	Several clusters of exposed boulders and/or bedrock in the center and southwest parts of study area.
SEZ and Hydrology Source	None present
Vegetation	Jeffrey pine, sagebrush, rabbitbrush, grasses and forbs.
Ground Cover Condition	Good (veg. cover and rocks 40 to 50%, duff 40 to 50%, bare ground 10%)
Site Features	No structures within 1.23-acre study area; perimeter fencing on north and east edges of study area. Fence does not follow west property line.

¹ TRPA currently relies upon the Soil Survey of Tahoe Basin, California-Nevada (Rogers and Soil Conservation Service, 1974), which the Bailey Land Capability system is predicated upon.

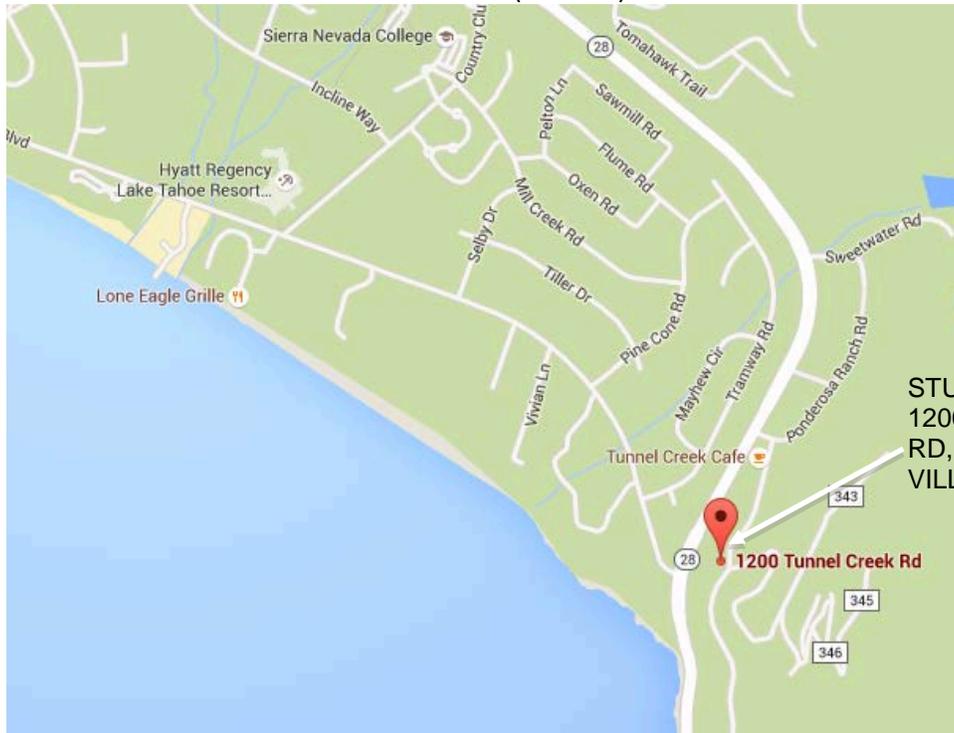
Field Investigation and Procedures	
Consultant and Address	Phil Scoles (TRPA contractor) Post Office Box 2100; Portland, OR 97208-2100
Consultant Field Date	December 10, 2014 and July 12, 2016
SEZ Mapping / NRCS Hydric Soil	None present
Number of Soil Pits or Auger Holes and Description Depth	6 test pits, dug to 53 to 60 inches (bedrock refusal below)
Additional or Repetitive TRPA Sample Locations	Not applicable
Representative Soil Profile Descriptions	Attached (6 test pits in center, north and east parts of study area)
Areas Not Examined	Study area excluded existing residence and adjacent land within panhandle portion of property (1.77 acre excluded). See attached Exhibit A.

TRPA Findings	
2006 Soil Survey Map Unit	Inville gravelly coarse sandy loam 9 to 15% slopes (mapping unit 7142, Class 6, HSB B) and Cassenai gravelly loamy coarse sand, 15 to 30% slopes, extremely stony (mapping unit 7422, Class 4, HSG-A)
Consultant Soil Mapping Determination and Rationale	Cagwin-Rock outcrop, 15 to >30% (CaE and CaF), HSG-C in the southwest corner of study area. This vicinity has shallow and/or steep soils derived from granodiorite. Several pockets of Cagwin soil also present in northeast and southeast part of study area. The remainder of the study area, mostly in the center and north parts, is an unnamed soil (XXX). The XXX soil is more than 40 inches deep, somewhat excessively drained, and has loamy coarse sand textures throughout. Soil is deeper than the mapped Cagwin soil. It is similar to Cassenai series in the 2006 soil survey. No evidence of perched water table. Rooting depth is usually deeper than 47 inches from the surface.
Slope Determination	Varies. Southeast part has steepest slopes, 15 to greater than 30%, while center and north parts are mostly 15 to 30%.
TRPA Conclusion(s)	Class 1A: Cagwin-Rock outcrops, HSG-C, 30 to 50% slopes; Class 2: Cagwin-Rock outcrops, HSG-C, 15 to 30% slopes; Class 4: XXX Soil, HSG-A, 9 to 30% slopes.
Applicable Area	See map (Attachment B, August 2015)

Attachment A

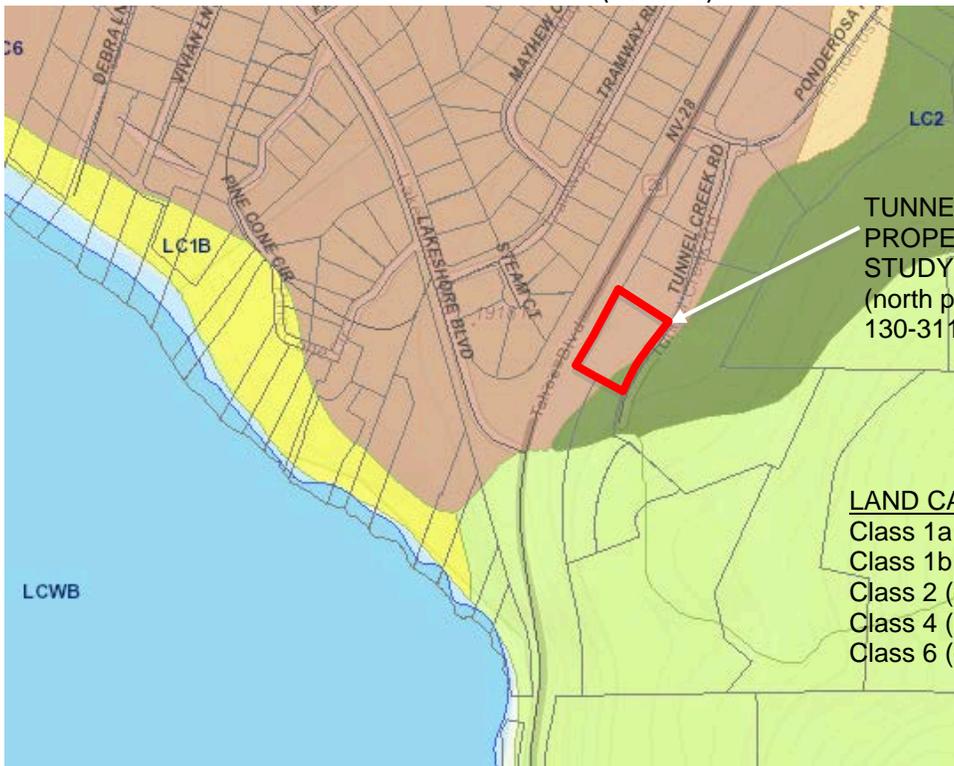
Vicinity Map and TRPA Land Capability Maps

VICINITY MAP (no scale)



STUDY AREA AT
1200 TUNNEL CK.
RD, INCLINE
VILLAGE, NV

TRPA LAND CAPABILITY MAP (no scale)



TUNNEL CREEK
PROPERTIES LLC
STUDY AREA
(north part of APN
130-311-017)

LAND CAPABILITY
Class 1a (light green)
Class 1b (yellow)
Class 2 (olive green)
Class 4 (light tan)
Class 6 (dark tan)

Attachment B

Existing Conditions Map and Recommended Land
Capability Challenge for LCAP2015-0470

Attachment C

TRPA Contractor Soil Profile Descriptions
(from Terra Science, Inc.)

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 1 (TP-1)**



Photo 1 – View of soil profile. Test pit depth 60+ inches. Weathered bedrock occurs at 46-inch depth.

Photo 2 – View to south toward Test Pit 1, located on 17% slope, in northeast part of study area. Slope dips (falls) to north by northwest.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
O	0 to 0.5	Black (10YR 2/1)	DUFF, twigs, pine needles, grass thatch, abrupt boundary.
A	0.5 to 2.5	Very dark brown (10YR 2/2)	LOAMY COARSE SAND, weak granular structure, <5% gravel, no redox features, many very fine, fine, medium roots, many fine interstitial pores, abrupt boundary. Appears that 6 to 8 in. topsoil previously removed.
Bw	2.5 to 28	Dark yellowish brown (10YR 3/4)	LOAMY COARSE SAND, weak subangular blocky structure, 10 to 15% gravel, no redox features, few fine, medium and coarse roots, many medium interstitial pores, clear boundary.
C	28 to 46	Dark yellowish brown (10YR 4/4)	LOAMY COARSE SAND, massive structure, 20 to 25% gravel, no redox features, few fine and coarse roots, many medium interstitial pores, abrupt boundary. Pea-sized fragments mostly break down to coarse sand when wetted – soil fines within matrix. This layer contain floater rocks (partially weathered).
Cr / R	46 to 60+	White and Black (speckled grains)	BEDROCK (partially weathered granodiorite), coarse roots penetrate fractures in bedrock 24 to 36 inches apart (horizontally). Backhoe able to dig through bedrock, but rock is too hard to dig with shovel.

Soil is significantly different than mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes-CaE and Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Soil is similar, but less developed than Cassenai series (2006 NRCS soil survey, 15 to 30% slopes); however, this is an unnamed soil (XXX) in the 1974 SCS soil survey. For moderate hazard lands, slopes 16 to 30% qualify as Class 4 (20% allowable coverage).

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 2 (TP-2)**



Photo 3 – View of soil profile. Test pit depth 55+ inches. Weathered bedrock occurs at 52-inch depth.

Photo 4 – View to north toward Test Pit 2, located on 13% slope, in southeast part of study area. Slope dips (falls) to north.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
AC	0 to 4	Very dark grayish brown (10YR 3/2)	FILL (old), weak granular structure, 10% gravel, no redox features, many fine and very fine roots, many fine interstitial pores, abrupt boundary. Grass/forb coverage is >90%.
Ab1	4 to 8.5	Very dark brown (10YR 2/2)	LOAMY COARSE SAND, weak granular structure, <5% gravel, no redox features, many fine and very fine roots, few medium and coarse roots, many fine interstitial pores, abrupt boundary.
Ab2	8.5 to 15	Very dark grayish brown (10YR 3/2)	LOAMY COARSE SAND, weak subangular blocky structure, 15% gravel, no redox features, common fine and medium roots, common coarse roots, many medium interstitial pores, abrupt boundary.
C	15 to 30.5	Dark yellowish brown (10YR 3/ 4)	LOAMY COARSE SAND, massive structure, 20% gravel, no redox features, common fine, medium and coarse roots, many medium interstitial pores, abrupt boundary. This layer includes floater rocks (grus).
C / Cr	30.5 to 55+	Light olive brown (2.5Y 5/3)	LOAMY COARSE SAND, massive structure, 40% cobbles and stones, no redox features, common fine and medium roots, few coarse roots, many medium interstitial pores. This layer has bedrock separated by soil with many roots. Bedrock is mostly less than 24 in. wide, thus considered a soil layer.

Soil is significantly different than mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes-CaE and Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Soil is similar, but less developed than Cassenai series (2006 NRCS soil survey, 15 to 30% slopes); however, this is an unnamed soil (XXX) in the 1974 SCS soil survey. For moderate hazard lands, slopes 16 to 30% qualify as Class 4 (20% allowable coverage).

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 3 (TP-3)**



Photo 5 – View of soil profile. Test pit depth 53+ inches. Weathered bedrock occurs at 40.5-inch depth.

Photo 6 – View to northwest toward Test Pit 3, located on 24% slope, in west-center part of study area. Slope dips (falls) to north by northwest.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
AC	0 to 4	Very dark grayish brown (10YR 3/2)	FILL (old), weak granular structure, <5% gravel, no redox features, many fine and very fine roots, many fine interstitial pores, abrupt boundary. Grass/forb coverage is 100%.
Ab	4 to 8	Very dark brown (10YR 2/2)	LOAMY COARSE SAND, weak granular structure, <5% gravel, no redox features, many fine and very fine roots, few medium roots, many fine interstitial pores, abrupt boundary.
Bw	8 to 30	Dark grayish brown (10YR 3/4)	LOAMY COARSE SAND, weak subangular blocky, 10-20% gravel, no redox features, common fine and medium roots, few coarse roots, many medium interstitial pores, abrupt boundary.
C	30 to 40.5	Yellowish brown (2.5Y 5/3)	LOAMY COARSE SAND, massive structure, 30% gravel, no redox features, common medium and coarse roots, many medium interstitial pores, abrupt boundary. Pea-sized fragments mostly break down to coarse sand when wetted – soil fines within matrix.
Cr / R	40.5 to 53+	White and Black (speckled grains)	BEDROCK (partially weathered granodiorite), few medium roots penetrate fractures in greater than 30 inches apart (horizontally). Rock material is too hard to dig with shovel.

Soil resembles the mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes-CaE), but not Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Excluding fill material, soil depth is less than 40 inches thick, which corresponds to the Cagwin series (where the parent material granodiorite). Cagwin soils (CaE) on 15 to 30% slopes are designated as Class 2 (1% allowable coverage).

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 4 (TP-4)**



Photo 7 – View of soil profile. Test pit depth 54+ inches. Hard bedrock occurs below 54-inch depth.

Photo 8 – View to west toward Test Pit 4, located on 22% slope, in south part of study area. Slope dips (falls) to north by northwest.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
A1	0 to 2	Very dark brown (10YR 2/2)	LOAMY COARSE SAND, moderate granular structure, <5% gravel, no redox features, many fine and very fine roots, many fine interstitial pores, abrupt boundary. Grass/forb coverage is 40%, while shrub cover is additional 20%, remainder is duff.
A2	2 to 6	Dark brown (10YR 3/3)	LOAMY COARSE SAND, moderate granular structure, <5% gravel, no redox features, many fine and very fine roots, few medium roots, many fine interstitial pores, abrupt boundary.
Bw	6 to 23.5	Dark yellowish brown (10YR 3/4)	LOAMY COARSE SAND, weak subangular blocky, <5% gravel, no redox features, common fine, medium and coarse roots, many fine interstitial pores, clear boundary.
C	23.5 to 46	Brown (10YR 4/3)	LOAMY COARSE SAND, massive structure, <5% gravel, no redox features, few fine and coarse roots, common medium roots, fine interstitial pores, clear boundary.
C2	46 to 54+	Dark yellowish brown (10YR 4/4)	LOAMY COARSE SAND (Grus), massive structure, <5% gravel, no redox features, few fine and medium roots, medium interstitial pores. Pea-sized fragments mostly break down to loamy coarse sand when wetted – soil fines within matrix.

Soil is significantly different than mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes-CaE and Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Soil is similar, but less developed than Cassenai series (2006 NRCS soil survey, 15 to 30% slopes); however, this is an unnamed soil (XXX) in the 1974 SCS soil survey. For moderate hazard lands, slopes 16 to 30% qualify as Class 4 (20% allowable coverage).

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 5 (TP-5)**



Photo 9 – View of soil profile. Test pit depth 48+ inches. Weathered bedrock occurs below 43-inch depth.

Photo 10 – View to north toward Test Pit 5, located on 17% slope, in east-center part of study area. Slope dips (falls) to north.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
A	0 to 2.5	Very dark grayish brown (10YR 3/2)	LOAMY COARSE SAND, weak granular structure, 5% gravel, 10% cobbles, no redox features, many fine and very fine roots, many med. interstitial pores, abrupt boundary. Brome grass coverage is 50%, Idaho fescue is 5%, while sagebrush cover is additional 10%, remainder is duff.
AB	2.5 to 19.5	Dark yellowish brown (10YR 3/ 4)	LOAMY COARSE SAND, weak granular structure, 10% gravel, 10% cobbles, no redox features, many fine and very fine roots, common medium roots, few coarse roots, many med. interstitial pores, clear boundary.
BC	19.5 to 43	Brown (10YR 4/3)	LOAMY COARSE SAND, massive structure, 10% gravel, 10% cobbles, no redox features, common fine and medium roots, common coarse and very coarse roots, many med. interstitial pores, abrupt boundary.
C	43 to 48	Brown (10YR 4/3)	LOAMY COARSE SAND (Grus), massive structure, 20% gravel, no redox features, few fine and coarse roots, common, med. interstitial pores. Pea-sized fragments mostly break down to loamy coarse sand when wetted – soil fines within matrix.

Soil is significantly different than mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes-CaE and Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Soil is similar, but less developed than Cassenai series (2006 NRCS soil survey, 15 to 30% slopes); however, this is an unnamed soil (XXX) in the 1974 SCS soil survey. For moderate hazard lands, slopes 16 to 30% qualify as Class 4 (20% allowable coverage).

**APN 130-311-17 -- 1200 Tunnel Creek Road (Tunnel Creek Properties LLC),
Incline Village, Washoe County, Nev. – Test Pit 6 (TP-6)**



Photo 11 – View of soil profile. Test pit depth 47+ inches. Weathered bedrock occurs below 47-inch depth.

Photo 12 – View to north toward Test Pit 6, located on 19% slope, in east-center part of study area. Slope dips (falls) to north by northwest.

Layer	Depth (In.)	Color (moist)	Soil Properties / Features
A1	0 to 2.5	Very dark grayish brown (10YR 3/2)	LOAMY COARSE SAND, weak granular structure, 5% gravel, 10% cobbles, no redox features, many fine and very fine roots, many med. interstitial pores, abrupt boundary. Bromegrass coverage is 60%, Idaho fescue is 2%, while sagebrush cover is additional 2%, remainder is duff.
A2	2.5 to 10	Very dark grayish brown (10YR 3/2)	LOAMY COARSE SAND, weak granular structure, 5% gravel, no redox features, many fine and very fine roots, common medium roots, many med. interstitial pores, clear boundary.
Bw	10 to 18	Dark brown (10YR 3/3)	LOAMY COARSE SAND, weak subangular blocky structure, 5% gravel, no redox features, common fine and medium roots, few coarse and very coarse roots, many med. interstitial pores, abrupt boundary.
C1	18 to 37.5	Dark brown (10YR 3/3)	LOAMY COARSE SAND, massive structure, 10% gravel, no redox features, few fine roots, common medium and coarse roots, many med. interstitial pores, abrupt boundary.
C / Cr	37.5 to 47	Olive brown (2.5Y 4/3)	LOAMY COARSE SAND, massive structure, 10% gravel, no redox features, few fine, medium and coarse roots, common, med. interstitial pores.

Soil is significantly different than mapped soils (Cagwin-Rock outcrop complex, 15-30% slopes—CaE and Inville stony coarse sandy loam, 2 to 9% slopes—IsC). See report discussion. Soil is similar, but less developed than Cassenai series (2006 NRCS soil survey, 15 to 30% slopes); however, this is an unnamed soil (XXX) in the 1974 SCS soil survey. For moderate hazard lands, slopes 16 to 30% qualify as Class 4 (20% allowable coverage).