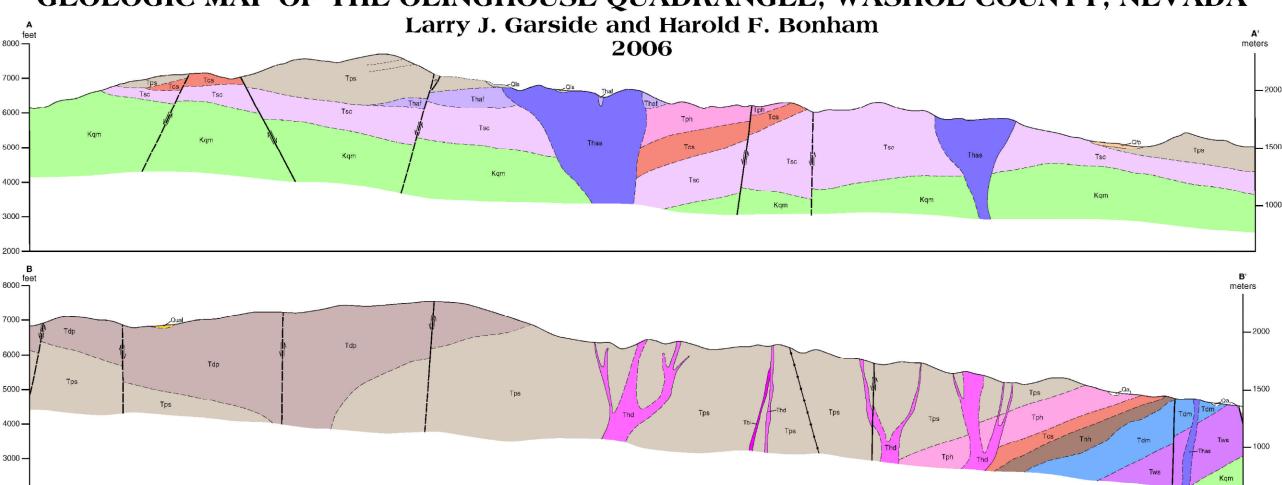


GEOLOGIC MAP OF THE OLINGHOUSE QUADRANGLE, WASHOE COUNTY, NEVADA



fragments derived from adjacent rock units and osited on steep slopes. Mapped only locally where it is extensive or conceals contacts between older units. Qa₁ Young alluvium Poorly sorted Holocene deposited on alluvial fans and as channel deposits along drainages in upland areas. Fan surfaces commonly exhibi-

bar- and swale-surface morphology and are minimally dissected. Desert pavement is not commonly developed and clasts are carbonate coated. Rare boulders ≥1 m. Qa₂ Pleistocene deposits of boulder- to silt-sized material deposited on alluvial fans. Fan surfaces are

Represents a major period of subaerial fan building between Lake Lahontan cycles. Poorly sorted as high, moderately dissected surfaces between lower Jones and Secret Canyons in the northeast corner of the

dissected. Clasts are carbonate cemented where observed

Upland alluvium Gravelly deposits of alluvial Qual fans, colluvium, and stream deposits; includes Qls Landslide deposits Holocene and Pleistocene haotic masses of boulder- to clay-sized materia and translational landslides. Includes some colluvium and

ntermediate-age boulder alluvium Coarse, poorly sorted boulder and cobble alluvium and steep-slope deposits on the mountain front and locally within

talus. Older deposits that have been dissected by Holocene

Older boulder alluvium Coarse, poorly sorted boulder and cobble alluvium and colluvium. Found slope deposits on the mountain front.

Lousetown Formation Dark-gray, dark-reddishrown-weathering, flows of olivine basalt and pasaltic andesite. Massive to vesicular or microvesicular, flow tuffs and hornblende andesite; includes minor basalt locally platy jointed. In one thin section, phenocrysts (<10% scoria, tuffaceous sandstone, and silicic lapilli tuff. mm, partly to completely altered to iddingsite) are found in a groundmass of plagioclase and pyroxene microlites and plass. Intersertal and pilotaxitic, locally with rare xenocrysts of quartz and hornblende (completely altered to pyroxene Fe-Ti oxides). Vesicles open or thinly coated with hyaline opal. The thin sectioned rock contains 56% silica and has a K-Ar date (whole rock) of 6.9 Ma (OG-163, table 1)

Tdp Dacite of Pond Peak Light-gray, light-brown weathering, flows and domes, and lesser flow breccias and lahars of pyroxene-hornblende dacite (68–71% SlO₂). Local flow banding and platy flow chloritized and felsic minerals are altered to sericite and calcite. Sanidine is found mainly as skeletal remnants. Flows mapped east of White Hill underlie Tps. Sanidine was dated at 17.75 Ma (OG-247, table 2). jointing; rarely lithophysal or spherulitic. Contains phenocrysts (10–15%) of clear to spongy plagioclase Tmb Megabreccia Poorly exposed unit apparently consisting almost entirely of small to large (<1 cm (10–12%, typically ≤1 mm, rarely to 2.5 mm), black, elongate nornblende (~1%, 1.2 mm; rarely thinly rimmed by fine to 5 m) angular to subrounded clasts of ash-flow tuffs (units yroxene and Fe-Ti oxides), green orthopyroxene (0-1% Td, Tnh, Tcs, and Tph), as well as sparse clasts of ≤0.4 mm), and trace magnetite (≤0.2 mm) in a locally flowbanded, pilotaxitic to felted groundmass of plagioclase cuts(?) across ash-flow tuff units of which it contains clasts. microphenocrysts and glass. **Tdpi**, fine-grained, intrusive dikes or small irregular masses, commonly with steep flow Matrix of megabreccia is apparently pyroclastic, containing phenocrysts similar to those of Twh (Geasan, 1980). The megabreccia is overlain by flows of Tps east of White Hill. foliation and glassy margins. Dacite to low-silica rhyolite Spatially associated with, and intruded by Twh. Tmb may be 1989; see table 3). Dated by K-Ar methods at 8.3 Ma (OGa vent breccia related to Twh volcanism

Thas Hornblende andesite of Stud Horse Canyon Intrusive bodies of light- to medium-Basaltic intrusive rocks Narrow dikes dark gray andesite and dacite (table 3), consisting of phenocrysts (≤30%) of equant to elongate plagioclase podies of basalt or basaltic andesite that cut flows of Tps and older rocks. These rocks are fine grained, dark gray, (15-25%, 0.04-2.5 mm, rarely 2 x 5 mm), elongate sparsely porphyritic, with trachytic to felted textures, and only rarely vesicular. One sample from a canyon between Olinghouse Canyon and Green Hill contains phenocrysts hornblende (~8%, <0.5 x 2.4 mm), trace small (~0.2 mm) quartz, locally small biotite (trace to 2%), and orthopyroxene (<3%, ≤1.2 mm) in a fine-grained holocrystalline anhedral-(~3%) of elongate plagioclase (2-3%, 0.4-3 mm long) and granular or pilotaxitic groundmass of predominantly minor pyroxene (<0.4 mm) in a groundmass of plagioclase laths (<0.2 mm long), fine pyroxene(?) and glass(?). This 20.3 Ma (OG-143, table 1) suggests that the unit may be rock is propylitically altered, containing pyrite, chlorite, and related to Thaf. calcite. One dike from this area is reported to contain fragments of Thd (Geasan, 1980), and thus may be younger than that unit; however, some basaltic intrusive rocks of the That Hornblende andesite of Fort Defiance Creek Flows, breccias, domes(?), and lahars(?) quadrangle may be sources for rocks of unit Tos, and thus of of hornblende andesite which are intruded by and probably

masses, including rare sills(?), which form an intrusive screen cutting predominantly Tps in the main part of the Olinghouse mining district. Narrow (~1 m) dikes are (15-20%, 2 mm), elongate hornblende (5-10%, <1 x 5 mm), orthopyroxene (1% ≤0.04 mm), trace biotite (<0.4 mm), and accessory magnetite (2%) in a perlitic glassy to microcrystalline groundmass. Includes both monolithologic locally flow banded and have finer grained margins. Pale and heterolithologic breccias (lahars?); massive rocks are 25%) of plagioclase (1-2.5 mm) and a few percent each of low-aligned hornblende (elongate to distinctly acicular, ≤3) 10 mm) and equant pyroxene (<1 mm) in a finely crystalline groundmass of flow-aligned microlites or more equant eldspar and quartz(?). Textures are commonly pilotaxition although some samples are nearly seriate; fine-grained phaneritic groundmass textures are also reported (Bonham and Papke, 1969; Geasan, 1980). Rarely, quartz welded and containing sparse white to pinkish gray pumice (commonly ≤5 x 20 mm). Contains phenocrysts (25–35%) of rounded, corroded and somewhat vermicular quartz phenocrysts (commonly <0.5 mm, rarely 3 mm) are observed as darker, cognate inclusions (≤1 cm). Cubes of imonite after pyrite are common in some samples, and the mm), Fe-Ti oxides (<0.2 mm), and locally, magnetite-rimmed basaltic hornblende (0–2%, <1 mm, rarely 0.6 x 2 mm). dikes are variably but nearly ubiquitously altered to mixtures of epidote, chlorite, calcite, sericite, and adularia(?) (as patchy plagioclase replacements). Considered to be predominantly dacitic based on phenocryst mineralogy and than one cooling unit, as an abrupt change in welding is observed in mid-unit south of Tiger Canyon (Geasan, 1980) and possibly in the upper Secret Canyon area. Basal 1-1.5 major-element chemistry (Geasan, 1980, table 10). One uncommonly fresh-appearing dike from the southeast flank of Green Hill contains phenocrysts of unaltered basaltic hornblende, slightly adularized(?) plagioclase, and variably chloritized pyroxene. Hornblende from this rock has a m zone above Tcs consists of finely laminated to crossbedded tuff (ground surge?). Exposed to the northwest in the Pah Rah Range, Virginia Mountains. and Dogskin Mountain (Faulds and others, 2003; Garside and others, plateau ⁴⁰Ar/³⁹Ar age of 10.51 Ma (OG-221, table 2), suggesting that at least some dikes are symmeralization 2003; Henry and others, 2004). Probably related to Tos (Henry and others, 2004) and erupted from a caldera in the Stillwater Range (John, 1995). 40Ar/39Ar dated at 24.9 Ma dated as 10.52 Ma on vein adularia from Green Hill; see

Contains phenocrysts (-25%) of commonlismoky or reddish, corroded, embayed, and somewhat and silicic pyroclastic beds (where not mapped separately). Flows (~2-10 m thick) are massive to vermicular quartz (<10%, 1-2 mm), equant, adularescent locally vesicular and brecciated, very dark gray basalt and basaltic andesite, consisting of sparse sanidine (~10%, 1-2 mm), a few percent plagioclase, rare to common phenocrysts of plagioclase (<5–40%, 0.25–2 mm), olivine (1–3%; 0.4–3 mm, rarely 5 altered biotite (<1%, ≤1 mm in diameter), and accessory Fe-Ti oxides. Contains sparse, indistinct pumice (mostly 3 x 12 mm), and commonly sparse pyroxene (0-5%, 2 mm) in a mm, but locally up to 3 x 12 cm) and sparse lithic fragments trachytic to pilotaxitic (rarely intergranular to ophitic) groundmass of magnetite, plagioclase, and pyroxene of flow-banded rhyolite and intermediate volcanic rock monly ≤1 cm, but rarely ≤4 x 6 cm). Portions weather to microphenocrysts, and sparse brown glass. Olivine is rounded, reddish boulders of decomposition. Locally at the commonly partly to completely replaced by iddingsite, and base is a ~1 m plane-bedded tuff (ground surge?) which rare, rounded quartz xenocrysts(?) (<1 mm) and rectilinea clots of fine magnetite (possibly ghosts of basalting grades upward into nonwelded tuff. Thickness probably hornblende) are locally observed. Vesicles (rarely up to thick nonwelded zone in a paleovalley is mapped separately (Tcsn), Age 25.07 Ma (Henry and others, 2004), Thickness several centimeters in diameter) are locally rimmed or filled with chlorite(?), epidote, banded cryptocrystalline silica (agate), calcite, and the zeolites heulandite and mordenite particularly in the area of the Olinghouse mining district. Basaltic pyroclastic rocks include bedded reddish-brown scoria (commonly with steep initial dips) and propylitized breccias which have rounded to angular light-grayish-green

scoriaceous clasts (<1 to several centimeters) in a fine-

leaf fossils and rare fish bones and scales) and

volcaniclastic sandstone crop out locally, particularly in

Pierson Canyon (Axelrod, 1995) and near the base of Tps between White Horse and Tiger Canyons. The Pyramid

sequence has been mapped as Chloropagus Formation in

Pierson Canyon (Axelrod, 1995) and to the south of the quadrangle (Rose, 1969). Age probably about 12–15 Ma

(see Henry and others, 2004; Garside and others, 2000;

Stewart and others, 1994), Thickness 1-2 km or more, A flow near the base of the unit in upper Jones Canyon is about 13.1 Ma (OG-285, table 2), somewhat younger than a

14.9 Ma K-Ar age (new constants) reported from Fort

Defiance Canyon by Bonham and Papke (1969, Appendix

A). Chemically (table 3) basaltic andesite and low silica andesite. **Tpt**, <30 m thick rhyolitic welded ash-flow tuff and

associated nonwelded surge(?) material intercalated in

basalt flows; vitrophyre consists of phenocrysts (~5%) of plagioclase (≤1.6 x 4 mm), quartz (~1 mm) and sparse

biotite, hornblende, and pyroxene. K-Ar age of 11.7 Ma (OG-

54 table 1; Garside and others, 1993). Probably the same

tuff dated by D. I. Axelrod at 13.3±0.7 Ma (Stewart and others, 1994, loc. J4). Crops out near south border of the

quadrangle. Tpss, White to very pale orange, massive to

lacustrine deposits of silicic ash, pumice lapilli, and small phenocrysts of biotite, quartz, and feldspar. Rare plant

fossils including reeds were observed in these rocks. Several

areas of outcrop in the south part of the quadrangle. **Tpsi**, intrusive basaltic rocks similar to Tps flows and interpreted

to be of similar age. Tpsb, Boulder gravels at and near the

base of Tps flows in Home Ranch and Jones Canyons in the

northwest part of the quadrangle. Coarse boulder gravels consisting of cobbles and boulders (≤1 x 2 m) of older ash

Twh pinkish-gray rhyolite (75.7% SiO₂; table 3), locally flow banded and spherulitic. Flow dome; obvious flows mapped as **Twhf**. Consists of phenocrysts

(15-20%) of rounded to equant and embayed to vermicular

smoky quartz (-10%, 1-2 mm), plagioclase (-4%, 1-4 mm

long), sanidine (~3%, 1–3 mm), and books of biotite (1%, 0.4–0.8 mm) in a fine-grained, (originally) devitrified

groundmass of potassium feldspar and quartz. Biotite is

adjoclase and magnetite microphenocrysts. A K-Ar age of

enetically related to Thas. Light- brownish-gray weathering.

containing phenocrysts of equant to elongate plagioclase

Tuff of Painted Hills Light-gray or light-purplish gray, locally reddish-brown-weathering, crystal-

rich rhyolitic ash-flow tuff, commonly moderately to slightly

 $(5-20\%, \le 3 \text{ mm})$, plagioclase (10-25%, <2.5 mm), equant sanidine (0-10%, $\le 1.5 \text{ mm}$), biotite ($\le 5\%$, $\le 1 \text{ mm}$, rarely $\le 3 \text{ mm}$)

Local indistinct columnar jointing. Probably consists of more

(Henry and others, 2004). Thickness is 400 m or more.

the unit is 20.15 Ma (OG-273, table 2).

lane-laminated and cross-bedded, subaerial(?) and

ained, yellowish-gray tuffaceous matrix. Thin (1-2 m),

scontinuous, lacustrine, thinly laminated, dark shale (with

Nine Hill Tuff Brownish-weathering, pinkish-gray or grayish, strongly welded rhyolitic ash-flow tuff. Contains phenocrysts (~3-15%, ~1 mm) of sanidine and anorthoclase, subequal to sparse plagioclase, trace small biotite, and accessory Fe-Ti oxides (converted to hematite) Locally contains flow-banded(?) rhyolite lithic fragments (<1 cm to 10 x 15 cm) that appear similar to Tuff. Common partial to complete vapor-phase alteration, with formation of tridymite and alkali feldspar in cavities (former pumice sites); elsewhere devitrified. Distinctive compressed pumice (1:3 to 1:7 aspect ratio) from less than 1 mm x 5 mm to 5 x 25 cm. Thickness ≤130 m, variable. Deposited in paleovalleys, Lies on Tsc or directly on Kgd in northern part quadrangle, where it is locally absent below Tcs. Age 25.25 Ma (Henry and others, 2004).

Tcc Tuff of Campbell Creek Pinkish-gray, strongly to weakly welded ash-flow tuff containing phenocrysts (~30%) of rounded, vermicular quartz (~12%, ≤1.5 mm), alkali feldspar (~8%, ≤1.2 mm), plagioclas (~8%, ≤1.2 mm), and biotite (1%, 1 mm) in a shard-rich matrix. Pumice is strongly to slightly compressed Phenocrysts and matrix are partly altered to quartz, sericite and alkali(?) feldspar. Underlies Thh in a paleovalley cut in Tdm near the east edge of the quadrangle along Fort Defiance Creek, where it is only -20 m thick. Age 28.86 Ma in the Dogskin Mountain area (Henry and others, 2004).

Tdm Tuff of Dogskin Mountain Light- to dark-gray, slightly to moderately welded, ash-flow tuff with a distinctive phenocryst assemblage (-15-20%) of elongate to equant plagioclase (15%, <2 mm) and biotite (~3%, 0.6-2 mm) in a shard-rich matrix. Biotite and elongate plagioclase are aligned parallel to compaction foliation. Contains a few percent moderately compressed pumice lapilli and commonly, sparse pinkish lithic fragments (1-2 cm, rarely 10 cm) of biotite-plagicclase volcanic rock. Locally very lithic rich, containing up to 25% of rounded pale purple rhyolitic lithic fragments (0.5–10 cm). Commonly propylitically altered; biotite is replaced by sericite at the Stud Mine (12.0 ; OG-167, table 1). Possibly up to 300 m thick; 40Ar/39Ar age 29.21 Ma from the Virginia Mountains (Henry and others, 2004). May be included with unit Tsc in the north part of the quadrangle Tws Tuffs of Whisky Spring Sequence of several commonly moderately welded rhyolitic ash-flow

tuffs. Pale-orange to light-brown and light-pinkish-gray rocks commonly light-brown or pale-reddish-brown-weathering containing phenocrysts of platy-fractured sanidine, plagioclase, biotite, and sparse to trace quartz. Moderately welded ash-flow tuffs commonly contain 1–2 mm phenocrysts (~10–15%) of sanidine (~0–10%), plagioclase (5-15%), biotite (commonly <1%), and rarely, hornblende. A distinctive feature of the tuffs is the shard-rich nature of the matrix, visible in thin section and hand lens I ocally, a "nubbly" weathering surface is observed on rock outcrops; this probably represents closely spaced joints developed during hydration of glassy rock. Contains compressed pumice (commonly >5%, <1 to several centimeters in diameter) and common lithic fragments (0.5 to several centimeters) of metasiltstone, and silicic and intermediate volcanic rocks. Consists of several cooling units, some of which are separated in a few places by 1–5 m of tuffaceous and volcaniclastic siltstone, sandstone, and pebbly stone (with poorly preserved fossil twigs(?) and leaves at one locality). Commonly contains variable amounts of hydrothermal alteration minerals (sericite, chlorite, epidote, and clays). Thickness >300 m just to the east in the Wadsworth Quadrangle (Bell and others, 2005), with no base exposed. The unit was originally named for ash-flow tuffs exposed near Whisky Spring in the southern Pah Rah Range: these tuffs have been subdivided elsewhere into several significant units ranging in age from 29 to 31 Ma (e.g., Henry and others, 2004). Probably correlative with at least part of a much thicker and more complex group of ashflow tuffs, Tsc.

Tsc propylitically altered ash-flow tuffs consisting of multiple cooling units which are distinctly different from overlying Tcs and Tnh. Most of the tuffs contain phenocrysts of biotite (1-2%, 1-2 mm), have plagioclase (1-2 mm) as the dominant (>2:1) or only feldspar (10-15%), and are nearly devoid of quartz (0-trace). Tuffs are strongly to slightly welded, commonly contain 5-10% pumice (0.5 x 5 cm, rarely 1 x 20 cm); shards are commonly obvious with a hand lens. Biotite is commonly altered to sericite or chlorite, plagioclase is partially altered to sericite and calcite, sanidine is recrystallized, and groundmass is altered to sericite and chlorite. Adularia from a small quartz vein in the tuffs north of Jones Canyon was dated at 17.8 Ma (OG-145 table 1). Ash-flow tuff units vary from ledge-forming to recessive, and consist of light-brownish- or pinkish-gray weathering rocks that are greenish gray or light gray or fresh surfaces. Lithic fragments (<1 to several cm) in the tuffs are common and consist predominantly of intermediate volcanic rocks with some metasiltstone. Unit Tsc crops out in Secret and Jones Canyons in the northern part of the quadrangle; it is the partial stratigraphic equivalent of Tws and Tdm (and resembles them), but is considerably thicker In the Dogskin Mountain Quadrangle, at least 10 tuff units are mapped separately in this age range (Henry and others, 2004). Thickness, as much as ~700 m; this considerable thickness results from accumulation in a paleovalley (e.g.,

Henry and others, 2004, p. 4). Kap Aplite Pinkish-gray aplitic (anhedral granular) rock consisting predominantly of subequal amounts of 0.1–0.2 mm grains of strained quartz, plagioclase, microcline (some as myrmekite), sparse smaller biotite, and Fe-Ti oxides. Comprises an irregular body that intrudes Kqm in the northwest part of the

Kqm Quartz monzodiorite Medium grained, medium gray rock consisting of euhedral and subhedral elongate plagioclase (-63%, 2 x 7 mm), mostly subhedral hornblende and biotite (-12% each, 5 mm), and anhedral, interstitial quartz (5%, 2 mm), alkali feldspar (7%, 2 mm) and accessory Fe-Ti oxides (1%). Locally, hornblende is

Sample #	Material	Age (Ma)	1σ	K ₂ O (wt %)	40 Ar _{rad} (10 ⁻¹¹	40 Ar _{rad} (%)	Map symbo	l Map unit	N. Lat.	W. Long.
					mole/g)					
OG-163	whole rock	6.9	0.3	2.144	2.12393	25.7	TI	Lousetown Fm basalt	39° 38.64'	119° 28.10'
OG-164a	hornblende	8.3	0.6	0.533	0.638956	9.2	Tdp	dacite of Pond Peak	39° 38.62'	119° 28.40'
OG-165a	hornblende	8.3	0.8	0.521	0.624136	6.8	Tdpi	dacite of Pond Peak	39° 37.63'	119° 25.72'
OG-54	biotite	11.7	0.4	6.47	1.09020	73	Tpt	tuff, Pyramid sequence	39° 38.04'	119° 25.98'
OG-167	sericite	12.0	0.4	7.79	13.50868	51.3	_	sericitized biotite in Tdm	39° 41.86'	119° 22.71'
OG-145	adularia	17.8	0.5	12.3	31.6054	73.8	-	quartz-calcite vein	39° 43.46'	119° 24.15'
OG-143	hornblende	20.3	0.7	0.662	1.94346	14.7	Thas	hornblende andesite of Stud Horse Canyon	39° 43.53'	119° 24.85'
AD-151	whole rock	14.7	1.5	1.27	2.7125	46.1, 49.4	Tps	basalt, Pyramid sequence	39° ~42.9'	119° ~24.4'
AX-19 ²	biotite	13.3	0.7	7.02	1.3525	26.8, 14.9	Tpt	tuff, Pyramid sequence	39° ~38.1'	119° ~26.3'

Table 2. 40 Ar/39 Ar Age Data, Olinghouse Quadrangle

Table 2.	All Al Age Date	a, Olliigilouse Guadraligi	d.														
Step Heatii	ng																
Sample #	Map symbol	Rock type	N. Lat.	W. Long.	Mineral	mg	Plateau Age ¹				Isoch	Total Gas Age					
							Ma	±2 σ	% ³⁹ Ar ²	mswd	Ma	±2 σ	40Ar/36Ar	±2 σ	mswd	Ма	±2 σ
OG-220b		quartz-calcite vein	39° 40.15'	119° 25.21'	adularia	20.2	10.52	0.04	73.5	1.12	10.53	0.04	284.0	6.0	2.5	10.59	0.06
OG-221	Thd	hornblende dacite	39° 39.95'	119° 24.91'	hornblende	16.3	10.51	0.24	96.4	1.24	10.42	0.24	301.0	6.0	1.0	10.58	0.42
OG-285	Tps	basalt flow	39° 43.71'	119° 27.17'	whole rock	26.7	13.11	0.09	62.0	1.40	12.79	0.32	302.5	4.2	1.0	13.39	0.16
OG-273	Thaf	hornblende andesite	39° 42.81′	119° 23.87'	hornblende	27.2	22.39	0.16	53.2	2.50	20.15	0.68	311.7	8.2	1.8	26.13	0.30
Single Crys	stal																
Sample #	Map symbol	Rock type	N. Lat.	W. Long.	Mineral		Weighted mean	±2 σ	n	mswd							
OG-247	Twh	rhyolite intrusive	39° 41.56′	119° 22.70'	Sanidine		17.75	0.05	9	0.64							

Samples were analyzed at the New Mexico Geochronological Research Laboratory (OG-220b, OG-221, OG-247; methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronological Research Laboratory (OG-220b, OG-221, OG-247; methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronological Research Laboratory (OG-220b, OG-221), OG-247; methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronological Research Laboratory (OG-220b, OG-221), OG-247; methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronological Research Laboratory (OG-220b, OG-220b, OG-220), OG-247; methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronological Research Laboratory (OG-220b, OG-220b, OG-220b, OG-247); methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronology (OG-220b, OG-220b, OG-220b, OG-220b, OG-247); methodology in McIntosh and others, 2003) and at the Newada Isotope Geochronology (OG-220b, OG-220b, O Laboratory (OG-285, OG-273; Justet and Spell, 2001; Leavitt and others, 2004). Samples were irradiated at the Nuclear Science Center, College Station, TX. Neutron flux monitor Fish Canyon Tuff sanidine (FC-1); assigned age = 28.02 Ma (Renne and others, 1998). Decay constants and isotopic abundances after Steiger and Jäger (1977); λ₀= 4.963 x 10⁻¹⁰ yr⁻¹; λ_{0+to}= 0.581 x 10⁻¹⁰ yr⁻¹; ⁴⁰K/K = 1.167 x 10⁻⁴

¹ Ages in bold are best estimates of igneous or alteration age; ages in regular type are alternative age calculations. For three of the four samples, plateau and isochron ages agree within analytical uncertainty. The ages of adularia from OG-220b and homblende from OG-221 are indistinguishable at 10.5 Ma. The absolute difference between plateau and isochron ages of sample OG-285 is large but still within analytical uncertainty because of the large uncertainty in the isochron age. Based on regional age patterns for basalts of the Pyramid sequence, 13.1 Ma is probably the best estimate. The isochron age of 20.15±0.68 Ma is probably the best estimate of the age of sample OG-273, even though the sample also gives a plateau encompassing three steps and 53.2% of the ³⁹Ar. The U-shaped age spectrum for this sample suggests excess ⁴⁰Ar, which is consistent with the high initial 40Ar/36Ar of 312 (C.D. Henry, written commun., 2006).

Table 3. Chemical analyses of rocks from the Olinghouse Quadrangle and adjacent areas

² %³⁹Ar = percent ³⁹Ar used in plateau

Table 3. Cil	emicai anai	yses of fock	s nom me	omignouse	Quaurangle	anu aujacei	il dieds.														
Sample	OG-91b	OG-60	OG-77	OG-153b	OG-154	OG-160 ¹	OG-54	OG-64 ²	OG-73 ¹	OG-104	OG-158 ²	OG-143	OG-159 ²	OG-5a	OG-127	OG-5b	OG-31b	OG-156 ²	OG-155b ²	OG-120	
Map symbol	TI	Tdpi	Tdp	Tdp	Tdp	Tdp	Tpt	Tps	Tps	Tps	Twh	Thas	Thas	Tph	Tph	Tcs	Tdm	Tdm	Tws	Tsc	
Rock name	bas-and	dacite dike	dacite	dacite	dacite	dacite	rhyolite tuff	andesite	andesite	basalt	rhyolite	dacite	andesite	rhyolite tuff	rhyolite tuff	rhyolite tuff		dacite tuff	rhyolite tuff	rhyolitic tuff	
W. Long.	119° 25.01'	119° 25.72'		1190 28.381	119° 28.55'		119° 25.98'	119° 20.47'	119° 23.81'	119° 22.92'	119° 22.45'	119° 24.85'	119° 22.19'	119° 23.01'	119° 23.86'	119° 23.00'	119° 22.77′	119° 22.23'	119° 21.93'	119° 29.67'	
N. Lat.	39° 38.64'	39° 37.63'	39° 38.62′	39° 38.62′	39° 37.66′	39° 37.43'	39° 38.08'	39° 38.10'	39° 37.37'	39° 41.27'	39° 41.46'	39° 43.53′	39° 41.46′	39° 40.50'	39° 43.35′	39° 40.39'	39° 40.41'	39° 41.54'	39° 41.46′	39° 43.80'	
SiO ₂	56.84	67.95	69.47	68.01	71.09	68.21	75.95	57.26	57.64	51.80	75.71	64.32	61.42	71.64	68.19	75.56	71.88	69.43	74.84	65.17	
TiO ₂	1.06	0.43	0.45	0.45	0.37	0.44	0.14	0.78	0.79	1.65	0.11	0.51	0.70	0.34	0.55	0.22	0.39	0.46	0.15	0.65	
Al_2O_3	17.69	16.20	15.91	16.36	15.58	16.36	13.58	18.38	17.93	16.60	13.19	16.95	17.52	15.35	16.51	13.82	15.81	16.72	13.89	18.00	
FeO*	7.51	4.10	3.42	3.35	2.32	3.53	1.40	7.62	7.15	10.21	1.42	4.63	5.06	2.62	3.56	2.47	2.64	3.40	2.77	3.52	
MnO	0.14	0.09	0.06	0.08	0.09	0.09	0.06	0.13	0.14	0.22	0.05	0.09	0.15	0.04	0.06	0.02	0.03	0.13	0.03	0.05	
MgO	3.23	1.26	0.59	1.21	0.83	1.03	0.24	3.58	3.28	4.99	0.25	2.57	2.67	0.47	1.22	0.27	0.42	0.48	0.22	0.95	
CaO	7.33	4.14	2.76	3.64	2.27	3.23	0.86	6.85	7.82	10.72	0.59	4.13	5.83	0.77	2.89	0.25	0.80	1.41	0.10	1.68	
Na ₂ O	3.37	4.40	4.11	3.30	3.33	3.80	3.09	3.88	3.44	2.76	3.20	3.73	4.12	3.06	3.07	2.42	3.33	4.34	2.18	2.50	
K ₂ O	2.52	1.21	3.02	3.39	3.91	3.10	4.58	1.24	1.60	0.40	5.38	2.80	2.21	5.52	3.74	4.88	4.49	3.52	5.70	7.27	
P ₂ O ₅	0.31	0.21	0.20	0.21	0.21	0.20	0.10	0.28	0.20	0.65	0.10	0.26	0.31	0.20	0.21	0.10	0.21	0.10	0.10	0.21	
LOI	0.52	3.62	0.84	2.13	1.99	1.34	3.50	0.43	0.21	4.19	1.18	1.05	2.92	1.38	2.06	1.23	1.60	1.76	1.06	3.24	
Total**	99.16	99.12	99.25	99.09	99.16	99.51	99.37	100.29	99.71	100.45	100.67	98.88	100.50	99.38	99.97	99.17	99.27	100.21	99.97	100.29	
Cr	78	6	6	17	10	40	19	19	40	189	4	33	57	<5	21	6	<5	7	25	<5	
Ni	25	10	9	9	6	9	4	15	28	93	5	8	17	5	8	6	6	7	6	6	
Cu	61	50	31	28	25	37	20	51	67	77	32	37	41	24	27	26	29	32	36	23	
Zn	105	54	49	72	58	78	45	107	92	115	41	86	107	48	69	59	53	82	64	62	
Ga	21	17	18	19	17	17	14	19	18	19	13	19	21	18	17	21	19	18	17	19	
Rb	41	144	70	68	96	63	97	17	25	4	119	59	44	149	98	141	128	110	188	152	
Sr	687	603	409	495	394	493	151	818	714	647	69	667	810	191	474	87	243	433	128	414	
Υ	26	13	12	14	13	14	11	21	19	33	10	17	16	23	14	42	19	18	22	18	
Zr	242	196	189	190	177	185	98	128	132	209	90	166	180	218	186	264	251	261	219	217	
Ва	966	1170	1280	1110	1140	1060	1180	618	672	545	245	1090	868	1250	1280	285	1330	1630	648	1450	
Pb	40	40	30	50	50	40	30	30	70	50	40	30	40	30	40	40	30	30	30	40	
Th	6	4	5	9	9	10	123	4	5	<4	13	5	9	15	14	23	17	15	23	14	
Mo	20	21	13	12	12	17	17	21	20	18	23	21	18	12	13	13	14	20	23	8	

and the Painted Rock I-80 interchange, 8 km to the south (in the Fernley West Quadrangle; see Faulds and Ramelli,

district in the southeast part of the quadrangle was from high grade ore shoots along narrow quartz+calcite veins on the southeast flank of Green Hill may slightly postdate

Historical vein production was mainly from mines on Gold Co., which began in 1998 and was suspen due to low gold prices, was initiated in a small pit on Green Hill and a larger pit just to the south (J. Cox, oral commun.

others, 1999) is found in the Olinghouse veins with quartz (in places amethystine), epidote, adularia, and calcite. The crystalline gold, and has been marketed as specimer material. It has not been found disseminated in wall rock zones of ore consisting of crushed vein material and wallrock. Zeolite minerals are commonly present in the veins (Jones, 1998) and include heulandite, scolecite, and epistilibite. Scheelite occurs locally as stubby, white to clear crystals to 1 cm (Garside and others, 2000, p. 86). Pyrite, chalcopyrite, galena, sphalerite, bornite, and argentite (acanthite) are also present, but are generally very minor phases (Hill, 1911; Bonham and Papke, 1969). Telluride minerals (petzite and coloradoite) were reported in ore from the Gus Shave property (probably in the area of the Buste Mines), and 1% Te was reported from the Buster Mines (Hill, 1911), located about 2.3 km northeast of Green Hill (Hill, 1911; Townley, 1985). In addition, Kleine (2004a, b) reported hessite and laumontite. As, Sb, and Hg are reported to be

The paragenetic sequence in the veins seems to be, from early to late: epidote, quartz, scheelite, gold, zeolite minerals, and calcite; possibly reflecting deposition from progressively cooler fluids. The sulfide minerals appear to be relatively early, and the paragenetic place of adularia is not known (Garside and others, 2000), However, Wilson and others (1999) reported that adularia and sericite preceded gold and sulfides.

White Horse Canyon to Secret Canyon

Several minor underground workings and small prospect pits are in the area east and northeast of White Hill. The amount of workings suggests that production from this area was small. The more significant workings are along northeast-striking, vertical or southeast dipping quartz veins The veins have drusy quartz, local cockade structure, chalcedonic quartz, sparse pyrite, barite(?), and supergene iron and manganese oxide minerals. Samples of veir material contain up to 5 ppm Ag and 17 ppm Au (Tingley and Garside, 1999). Blottle phenocrysts in the wall rock adjacent to the veins are altered to sericite, which was dated at 12.0 Ma (OG-167, table 1) from a dump sample collecte at the Stud Mine. It is uncertain if this determination dates mineralizing event older than that at Olinghouse, or if the mica age was incompletely reset by the mineralization.

Northwest-striking silicified faults (ledges) exposed in the area of Rabbit Creek (map) have been only explored by small prospect pits. The ledges locally exhibit a vuggy silica texture. A sample from one ledge contained anomalous S (sample 4151, Tingley and Garside, 1999), suggesting the

Jones and Secret Canyons, there are a number of prospects in Oligocene ash-flow tuffs. The prospects explore veins and altered fault zones, where examined, these faults and veins strike N30-50°W and dip steeply northeast or southwest, or are vertical. Horizontal striae were observed on one mineralized fault in Secret Canyon. Drusy quartz, a vein material or stockworks, is present, locally with calcite of adularia. The wall rocks adjacent to the veins are argillized or sericitized(?). Select vein samples contain up to 19 ppm Au and 29 ppm Ag (Tingley and Garside, 1999). Adularia from one prospect was dated at 17.8 Ma (OG-145, table 1), an age similar to rhyolitic magmatism at White Hill, 5 km to

southeast corner of the quadrangle are a part of the left-lateral Olinghouse fault zone. Southwest of the quadrangle, the fault zone has a ~N60°E strike, which appears to change to -N30°E as it crosses the quadrangle (Briggs and Bonham, H.F., Jr., and Papke, K.G., 1969, Geology and mineral deposits of Washoe and Storey Wesnousky, 2005) and approaches the right-lateral, northwest-striking Pyramid Lake fault zone in the Wadsworth Quadrangle to the east (Bell and others, 2005). There are faulted Quaternary units and areas of drainage mnoundment associated with northeast-striking faults to the the Olinghouse mining district and dikes and veins that were emplaced or formed along them are parallel to these active faults. These mineralized or dike-filled bedrock faults are at least 10.5 Ma, based on the age of the dikes and vein mineralization (see below). Both low- and high-angle faultstriae rakes were observed on bedrock fault surfaces, but faults in this part of the quadrangle as part of the left-lateral Olinghouse fault zone. There is considerable down-to-the-

striking faults predominate. The northwest-striking faults may be part of the right-lateral fault systems of the Pyramie Lake and Warm Springs Valley fault zones, and northstriking faults may be kinematically linked normal faults (e.g., Faulds and others, 2005). Significant offset is apparent across a west-northwest fault zone in the vicinity of Jones

Historical lode production from the Olinghouse mining

MINERAL DEPOSITS

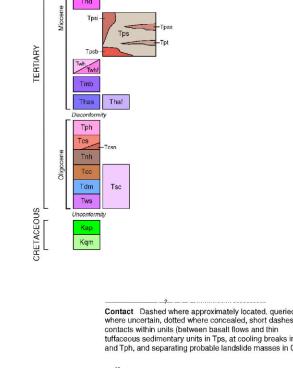
and from tabular stockworks along fault zones. Most of the workings are near the head of Olinghouse Canyon, and a few mines are found to the north in Tiger Canyon. Most of the veins strike northeast and commonly dip steeply northwest and southeast (Bonham and Papke, 1969; are propylitically altered over a broad area, with epidote being more abundant in the center of the district (Green Hill and vicinity). A narrow alteration envelope of sericite+adularia (replacing plagioclase) is found around some veins; the alteration may best be observed in thin section (Jones, 1998), Adularia from vein material collected from a dump near the top of Green Hill (before open-pit mining) yielded an 40Ar/39Ar age of 10.52 Ma (table 2). In and around the main Olinghouse district, the Pyramid sequence is intruded by an anastomosing screen of ortheast-striking hornblende dacite dikes. The dikes are immonly propylitically altered along with the enclosing Pyramid sequence. They are probably close in age to nineralization in the district, but they can be no older than 1 or 12 Ma (the older age limit for the Pyramid sequence in the district). Most of the dikes are apparently dacitic, but altered basaltic dikes with similar strike are recognized in the area of the modern (Alta Gold Co.) Olinghouse Mine open pit (Wilson and others, 1999). A relatively unaltered pyroxene-hornblende andesite dike (10.4-10.5 Ma, table 3)

Green Hill between 1898 and 1904, but minor production continued into at least the 1950s (Bonham and Papke, 1969). Placer mining of fine to coarse gold of 680 fineness (i.e., 680 parts per thousand) took place between 1860 and the early 1990s in alluvial gravels near Olinghouse, eluvial gravels near Green Hill, and in alluvial fan deposits over 2 km downstream east of the mouths of Olinghouse, Frank Free, and Tiger Canyons (Vanderburg, 1936; Bonham and Papke, 1969: Robyn, 1994). Modern open-pit mining by Alta

weak mineralization is of the high-sulfidation type.

In the northeast corner of the quadrangle, between lower

Mineral contents of igneous rocks were estimated visually from thin sections and rock slabs (which were stained for potassium feldspar). Igneous rock names are based on the IUGS classification (e.g., Le Maitre, 1989). Unit thickness estimated from the geologic map and topographic base map. Strikes and dips were averaged or rounded to the nearest 5° unless accuracy was better than that. Widths of narrowest dikes on map and cross sections were commonl



Counties, Nevada: Nevada Bureau of Mines and Geology Bulletin 70, 152 p., 1:52,500.

Briggs, R.W., and Wesnousky, S.G., 2005, Late Pleistocene and Holocene paleoearthquake activity in the Olinghouse fault zone, Nevada: Bulletin of the Seismological Society of America, v. 95, p.

Faulds, J.E., Henry, C.D., and dePolo, C.M., 2003, Preliminary geologic map of the Tule Peak

Faulds J.E. Henry C.D. and Hinz N.H. 2005. Kinematics of the northern Walker Lane: An incipient

Quadrangle, Lyon, Storey, and Washoe Counties, Nevada: Nevada Bureau of Mines and Geology Open-File Report 06-13.

Garside, L.J., and Bonham, H.F., Jr., Tingley, J.V., and McKee, E.H., 1993, Potassium-argon ages of

igneous rocks and alteration minerals associated with mineral deposits, western and southern Nevada and eastern California: Isochron/West, no. 59, p. 17–23.

Garside, L.J., Castor, S.B., dePolo, C.M., and Davis, D.A., 2003, Geology of the Fraser Flat

Quadrangle and the western half of the Moses Rock Quadrangle, Washoe County, Nevada:

field trip 2 guidebook, Geological Society of Nevada, Geology and ore deposits 2000—the Great

Basin and beyond, 180 p. san, D.L., 1980, The geology of a part of the Olinghouse Mining District, Washoe County,

Mountain Quadrangle, Washoe County, Nevada: Nevada Bureau of Mines and Geology Map

Stillwater Range, Nevada: Cross sections of an Oligocene igneous center: Geological Society of

Bearhead Rhyolite, Jemez Volcanic Field, New Mexico: Journal of Volcanology and Geothermal

Nevada [M.S. thesis]: University of Nevada, Reno, 118 p. Henry, C.D., Faulds, J.E., dePolo, C.M., and Davis, D.A., 2004, Geologic map of the Dogskin

Hill, J.M., 1911, Notes on the economic geology of the Ramsey, Talapoosa, and White Horse Mining

Districts in Lyon and Washoc Counties, Nevada: U.S. Geological Survey Bulletin 470, p. 99–108. John, D.A., 1995, Tilted middle Tertiary ash-flow calderas and subjacent granitic plutons, southern

America Bullielin, V. 107, p. 180–200.

Jones, B.K., 1998, Geology of the Olinghouse Gold Mine [abs]: Geological Society of Nevada Newsletter, October 1998.

Justet, L. and Spell, T.L., 2001, Effusive eruptions from a large shallow magma chamber: The

Research, v. 107, p. 241–264.

Kleine, S., 2004a, Mineral collectables from Nevada, in Castor, S.B., and Ferdock, G.C., 2004,

Kleine, S., 2004b, Specimen gold from the Olinghouse District, Washoe County, Nevada: Rocks and Minerals, v. 79, January-February, p. 44–54. Leavitt, E.D., Spell, T.L., Goldstrand, P.M., and Arehart, G.B., 2004, Geochronology of the Midas low-

Le Maitre, R.W., ed., 1989, A classification of igneous rocks and glossary of terms;

Systematics of Igneous Rocks: Blackwell Scientific Publications, Oxford, 193 p. McIntosh, W.C., Heizler, M., Peters, L., and Esser, R., 2003, 40Ar/39Ar geochronolo

Minerals of Nevada: Nevada Bureau of Mines and Geology Special Publication 31, p. 110-115

sulfidation epithermal gold-silver deposit, Elko County, Nevada: Economic Geology, v. 99, p.

recommendations of the International Union of Geological Sciences Subcommission on the

Mexico Bureau of Geology and Mineral Resources: New Mexico Bureau of Geology and Mineral

Renne, P.R., Swisher, C.C., Deino, A.L., Karner, D.B., Owens, T.L., and DePaolo, D.J., 1998, Intercalibration of standards, absolute ages and uncertainties in ⁴⁰Ar/²⁰Ar dating. Chemical Geology, v. 145, p. 117–152.

Robyn, T.L., 1994, Geology and ore controls of the lower Olinghouse placer gold mine, Nevada:

Economic Geology, v. 89, p. 1641–1622.

Rose, R.L., 1969, Geology of parts of the Wadsworth and Churchill Butte Quadrangles, Nevada:

Steiger, R.H., and Jäger, E., 1977, Subcommission on geochronology; Convention on the use of

Stewart, J.H., McKee, E.H., and John, D.A., 1994, Map showing compilation of isotopic ages of

Tingley, J.V., and Garside, L.J., 1999, Mineral report, Pah Rah Amendment Area, Washoe County,

Townley, J.M., 1985, Olinghouse mining district: Jamison Press, Heno, Nev., Powder Box Mining Series No. 1, 25 p. Vanderburg, W.O., 1936, Placer mining in Nevada: Nevada Bureau of Mines and Geology Bulletin 27,

180 p.
Wilson, W. R., Cox, J. W. and Jones, B. K., 1999, Geology of the Olinghouse Gold Mine, *in* Kizis, J.A.,

ed., Low-sulfidation gold deposits in northern Nevada: Geological Society of Nevada 1999

Nevada: Nevada Bureau of Mines and Geology Open-File Report 99-12.

Spring Field Trip Guidebook, Special Publication 29, p. 175-180.

Cenozoic rocks in the Reno 1° by 2° Quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2154D.

decay constants in geo- and cosmochronology: Earth and Planetary Science Letters, v. 36, p. 359–362.

America Bulletin, v. 107, p. 180-200.

Resources Open File Report OF-AR-1, 10 p.

Nevada Bureau of Mines and Geology Bulletin 71, 27 p.

Nevada Bureau of Mines and Geology Map 146, 1:24,000.

Garside, L.J., Castor, S.B., Henry, C.D., and Faulds, J.E., 2000, Structure, volcanic stratigraphy, and ore deposits of the Pah Rah Range, Washoe County, Nevada: Geological Society of Nevada

Quadrangle, Washoe County, Nevada: Nevada Bureau of Mines and Geology Open-File Repor

transform fault along the Pacific-North American plate boundary: Geology, v. 33, no. 6, p.

1301-1313

where uncertain, dotted where concealed, short dashes for contacts within units (between basalt flows and thin tuffaceous sedimentary units in Tps, at cooling breaks in Tsc

Fault Showing dip, arrows show relative direction of movement, ball on downthrown side; dashed where approximately located, queried where uncertain, dotted where concealed.

Generalized open-pit outline (from Wilson and others,

Landslide scarp

Lineament Determined from aerial photography.

......... Vein Showing dip. Quartz-calcite veins and silicified and

Strike and dip of beds

— 15 Inclined ⊕ Horizontal Approximate strike and dip of beds or flows

- 15 Inclined

Strike and dip of compaction foliation in ash-flow tu ____20 Inclined

Morizontal

Approximate strike and dip of compaction foliation in ash-flow tuff

Strike and dip of platy jointing in lava

Strike and dip of flow foliation in igneous rock Sample locations, tables 1-3

Scale 1:24,000

Field work 1989-1994, 1999.

Base map: U.S. Geological Survey Olinghouse 7.5' Quadrangle, 1985 Universe Transverse Mercator projection, 1927 North American Datum

eld Review: John Bell (NBMG), Craig dePolo (NBMG), James iulds (NBMG), Wright Parks, Bill Wilson (US BLM) nted by Nevada Bureau of Mines and Geology Edited by Dick Meeuwig and Elizabeth Crous artography by Robert Chaney, Susan Tingley, Christine Arri id Jennifer Mauldin Nevada Bureau of Mines and Geology University of Nevada, Mail Stop 178 Reno, Nevada 89557-0178 (775) 784-689 (775) 784-689 www.nbmg.unr.edu; nbmgsales@unr.edu