APPENDIX S

RESULTS OF SOIL MANTLE AND PERCOLATION TESTS

RESULTS OF SOIL MANTLE AND PERCOLATION TESTS

PROPERTY:

IONE BAND OF THE MIWOK INDIANS CASINO AND HOTEL SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

PREPARED FOR:

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PREPARED BY:

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MARCH 2, 2004
(Revised 9/01/04)

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1.0 INTRODUCTION

At the request of Analytical Environmental Services (AES), Applied Engineering and Geology, Inc. (AEG) has prepared this *Results of Soil Mantle and Percolation Tests* (Report) to document investigative activities for defining near surface geologic and hydrologic conditions present at the Ione Band of Miwok Indians Casino and Hotel Site (Project). The activities performed at the Project included:

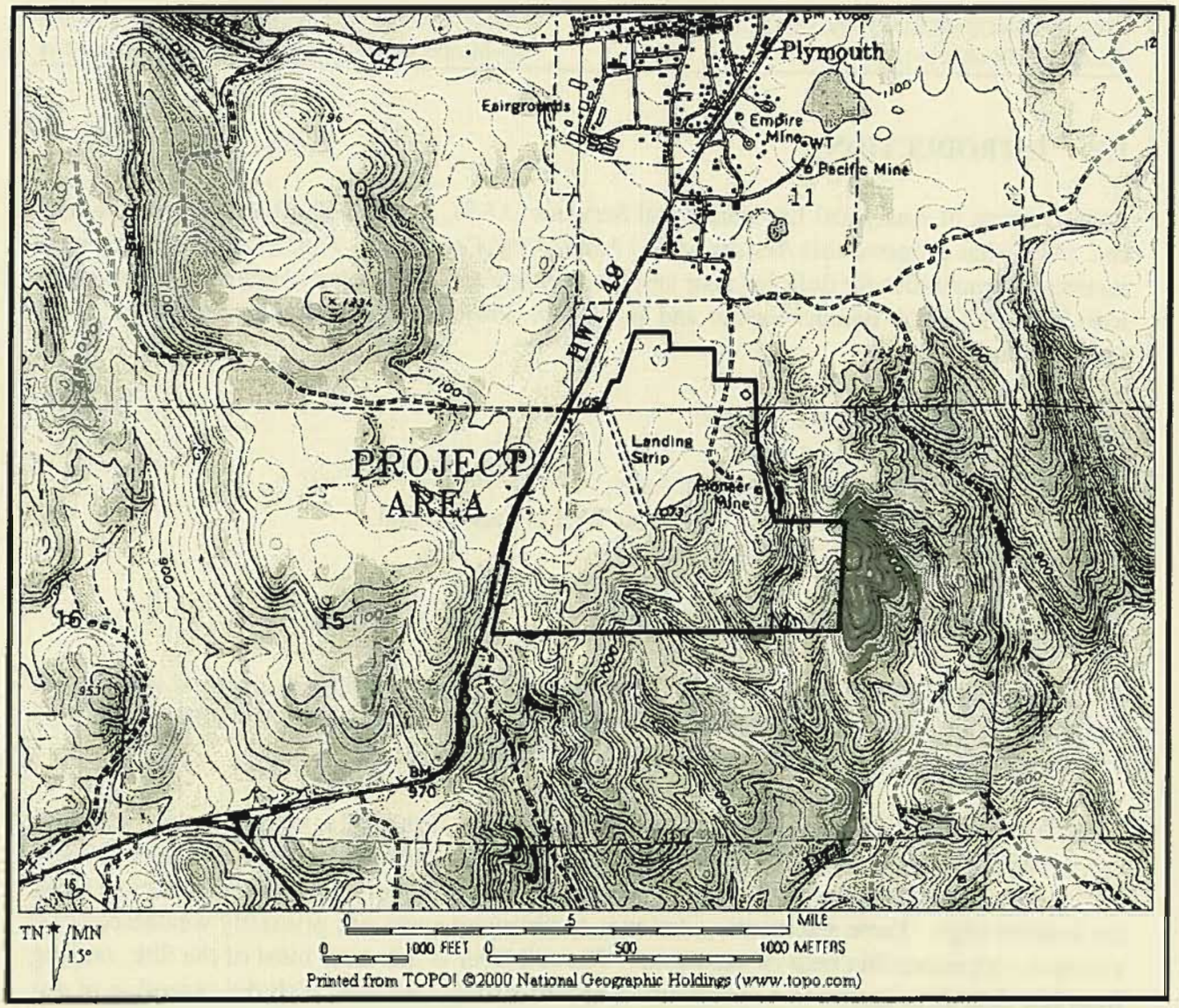
- 45 Soil Mantle Tests;
- 19 Percolation Tests;
- Four Trench Percolation Tests;
- GPS Survey of all Trench and Well Locations; and,
- Filling in of Trenches.

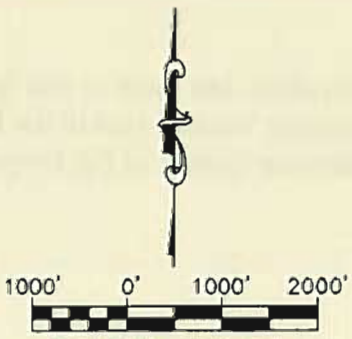
2.0 GENERAL SITE INFORMATION

The Project is located on the east side of Highway 49 at the southern edge of the City of Plymouth, Amador County, California (see **Figure 1**). A general layout of the Project and the locations of trenches and percolation holes are shown on **Figure 2**.

The Project is on the western side of the New Melones Fault Zone and is approximately 2.5 miles east of the Bear Mountain Fault Zone. The onsite geologic materials consist of Upper Jurassic marine sedimentary and metasedimentary rocks of the Mariposa Formation with greenstone along the western edge. These sedimentary and metasedimentary rocks are primarily weathered shale and slate with minor thin beds of sandstone. The soil layer is thin over most of the Site, ranging from less than three inches to a maximum of approximately two feet, with the exception of one or two locations where it is thicker.

No ground water was encountered by any of the excavation activities, but there is one spring in a drainage within the southwest quadrant and others in deep drainage courses east of the Project. A spring is also thought to supply water to the pond in the southwest corner of the Project.





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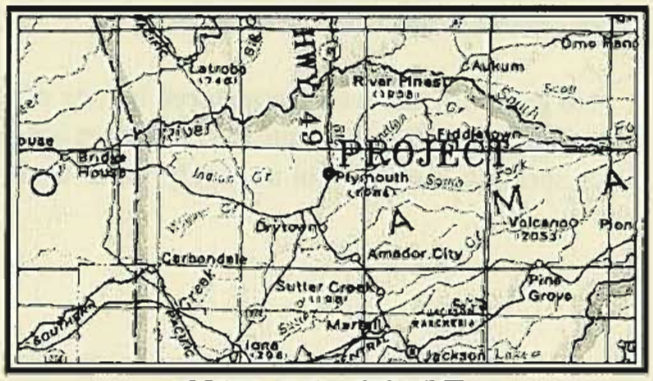

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SITE VICINITY MAP
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 1

FIGURE 2

GENERALIZED SITE MAP

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

100' 0' 100' 200'

SCALE 1" = 200' +/-

REVISED

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TP-3

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NOTES

1) REFERENCE MAP SUPPLIED BY HYDROSCIENCE ENGINEERS, INC. IN THE FORM OF AN AutoCAD (*.DWG) FILE. PHONE NUMBER 916.364.1490

2) NOT ALL UTILITIES LOCATED OR SHOWN

3) TEST PITS ARE SHOWN AT APPROXIMATELY TWO TIMES ACTUAL SIZE

LEGEND

PH-31 ●	APPROXIMATE LOCATION OF PERCOLATION HOLE PLACED BY AEG
TP-20(P) /	APPROXIMATE LOCATION OF PERC AND MANTLE TEST PIT PLACED BY AEG
TP-20 /	APPROXIMATE LOCATION OF MANTLE TEST PIT PLACED BY AEG
(G)	APPROXIMATE LOCATION OF TEST PIT GROUP PLACED BY AEG
✦	APPROXIMATE LOCATION OF DOMESTIC WATER WELL
90°	APPROXIMATE LOCATION OF ROCK OUTCROP, DIP AND STRIKE SHOWN
~	APPROXIMATE LOCATION OF SPRING, DIRECTION OF RUNOFF IS SHOWN
	APPROXIMATE LOCATION OF PROJECT AREA BOUNDARY

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3.0 MANTLE AND PERCOLATION TESTS

Mantle and percolation tests were performed in an attempt to determine vertical and horizontal movement of water within the subsurface at the Project.

3.1 Mantle Tests

The trenches were placed at locations chosen by Mike Ducker of HydroScience Engineers (HSe) and Elgar Stephens of AEG. The 45 trench locations are shown on **Figure 2**. The trenches were dug with two different size excavators operated by Price Construction and Environmental. The deep trenches were approximately 18 feet long, with a sloping base. Shallow trenches were approximately three feet deep with a flat base. Percolation holes were dug by AEG personnel at locations within or beside each trench that would allow the percolation testing to be conducted at specified depths below ground surface (bgs). Trench descriptions are included in **Appendix A**.

A total of 45 trenches were excavated to investigate soil conditions over the areas being considered for the discharge of treated water. The first few trenches were excavated using a Takeuchi 6,000 lb excavator. It soon became evident that this machine was not capable of excavating into the rocky conditions that were encountered. A John Deere 120C was then brought onsite and used for the remaining trench excavations.

Of the 45 backhoe trenches placed at the Project, only trenches TP-1 through TP-35 were logged. Trenches TP-36 through TP-45 were found to contain only a thin layer of soil, and due to time constraints were not fully logged. The logging included a description of the material, the color of the material as determined by Munsell charts, and measurements of the dip and strike of the beds where they could be determined. Trench Logs, including descriptions of the materials, are in **Appendix A**. The dips and strikes of outcrops across the Project and in cut slopes are shown on **Figure 2**. The soil types at each of the test trenches, along with the depth at which the percolation test was conducted and the percolation rate at that depth are tabulated in **Table 3-1**.

TABLE 3-1
Condensed Trench Logs and Measured Percolation Rates

Trench/ Percolation Hole	Condensed Material Description	Depth of Material (feet/inches)	Infiltration Rate at Indicated Depth (minutes per inch)
TP-1	Sandy CLAY loam	1' 2"	3.33 @ 11"
	Shale	7' 0"	
TP-2	Sandy CLAY loam	0' 6"	No Percolation Test Done Here
	Sandy Clay/Shale Mixture	2' 6"	
	Shale	7' 6"	
TP-3	Sandy CLAY loam	5"	No Percolation Test Done Here
	Broken Shale	1' 8"	
	Shale	2' 9"	
TP-4	Sandy CLAY loam	1' 2"	No Percolation Test Done Here
	Weathered Shale	3' 0"	
	Shale	8' 0"	
TP-5	Sandy CLAY loam	W: 1' 3" - E: 0'	No Percolation Test Done Here
	Weathered Shale	7' 6"	
TP-6	Sandy CLAY loam	0' 7"	No Percolation Test Done Here
	Weathered Shale	2' 0"	
	Shale	7' 0"	
TP-7	Sandy CLAY loam	0' 9"	No Percolation Test Done Here
	Shale	7' 0"	
TP-8	Sandy CLAY loam	1' 3"	3.03 @ 9"
	Shale	3' 0"	
TP-9	Sandy CLAY loam	2' 0"	0.83 @ 9" 2.78 @ 30"
	Fractured Shale	3' 0"	
	Shale	4' 6"	
TP-10	Sandy CLAY loam	0' 6"	No Percolation Test Done Here
	Shale	6' 0"	
TP-10A	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Shale	3' 0"	
TP-10B	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Weathered Shale	2' 0"	

TABLE 3-1
Condensed Trench Logs and Measured Percolation Rates

Trench/ Percolation Hole	Condensed Material Description	Depth of Material (feet/inches)	Infiltration Rate at Indicated Depth (minutes per inch)
TP-11	Sandy CLAY loam	0' 5"	No Percolation Test Done Here
	Weathered Shale	2' 0"	
	Shale	3' 0"	
TP-12	Sandy CLAY loam	0' 6"	No Percolation Test Done Here
	Weathered Shale	2' 0"	
	Shale	6' 0"	
TP-12A	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Weathered Shale	3' 0"	
TP-12B	Sandy CLAY loam	0' 6"	No Percolation Test Done Here
	Weathered Shale	2' 0"	
TP-13	Sandy CLAY loam	2' 0"	No Percolation Test Done Here
	Shale	8' 6"	
TP-13A	Shale	1' 5"	No Percolation Test Done Here
	Weathered Shale	2' 6"	
TP-13B	Shale	1' 0"	No Percolation Test Done Here
	Weathered Shale	2' 0"	
TP-14	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Weathered Shale	6' 0"	
TP-15	Sandy CLAY loam	1' 0"	No Percolation Test Done Here
	Weathered Shale	2' 6"	
	Less Weathered Shale	5' 0"	
TP-16	Sandy CLAY loam	0' 10"	16.67 @ 9" 75 @ 60"
	Weathered Shale	4' 6"	
TP-17	Sandy CLAY loam	0' 9"	0.18 @ 9" 16.67 @ 24"
	Weathered Shale	5' 0"	
TP-18	Soil	0' 3"	No Percolation Test Done Here
	Weathered Shale	6' 0"	
TP-19	Sandy CLAY loam	0' 2"	No Percolation Test Done Here
	Weathered Shale	3' 0"	

TABLE 3-1
Condensed Trench Logs and Measured Percolation Rates

Trench/ Percolation Hole	Condensed Material Description	Depth of Material (feet/inches)	Infiltration Rate at Indicated Depth (minutes per inch)
TP-20	Soil	0' 2"	No Percolation Test Done Here
	Shale	6' 0"	
TP-21	Sandy CLAY loam	0' 9"	6.67 @ 9" moved horizontally @ 18"
	Shale	2' 0"	
TP-22	Sandy CLAY loam	0' 8"	No Percolation Test Done Here
	Shale	5' 0"	
TP-23	Sandy CLAY loam	0' 8"	No Percolation Test Done Here
	Very broken Shale	2' 0"	
	Less weathered Shale	7' 0"	
TP-24	Sandy CLAY loam	0' 6"	No Percolation Test Done Here
	Shale and Soil mixture	2' 0"	
	Shale	5' 0"	
TP-24A	Soil	0' 3"	No Percolation Test Done Here
	Shale	3' 0"	
TP-24B	Soil	0' 2"	No Percolation Test Done Here
	Shale	3' 0"	
TP-25	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Shale	2' 4"	
TP-26	Sandy CLAY loam	3' 0"	No Percolation Test Done Here
	Shale and Soil mixture	5' 0"	
TP-27	Sandy CLAY loam	5' 0"	42.86 @ 9" & 100 @ 30"
TP-28	Sandy CLAY loam	0' 2"	No Percolation Test Done Here
	Shale	2' 8"	
TP-29	Sandy CLAY loam	0' 1.5"	No Percolation Test Done Here
	Shale	3' 2"	
TP-30	Sandy CLAY loam	0' 4"	No Percolation Test Done Here
	Sandy Clay SHALE	2' 6"	
	Shale	6' 0"	

TABLE 3-1
Condensed Trench Logs and Measured Percolation Rates

Trench/ Percolation Hole	Condensed Material Description	Depth of Material (feet/inches)	Infiltration Rate at Indicated Depth (minutes per inch)
PH-31S	None	0' 9"	3.00 @ 9"
PH-31D	None	1' 6"	2.33 @ 18"
TP-32	Sandy CLAY loam	0' 3"	No Percolation Test Done Here
	Weathered Shale	2' 5"	
TP-33	Sandy CLAY loam	0' 4"	2.86 @ 9"
	Weathered Shale	1' 2"	
	Shale	3' 5"	
TP-34	Sandy CLAY loam	0' 6"	6.67 @ 9" 0.58 @ 18"
	Shale	9' 0"	
TP-35	Sandy CLAY loam	0' 6"	1.89 @ 9" 75 @ 18"
	CLAY loam with stone line	2' 0"	
	Weathered Feldspar	4' 0"	

3.2 Percolation Tests

All trench locations were evaluated as to the need of a percolation test. There were 45 trenches with 19 percolation test holes located within or adjacent to 11 of the trenches. It was believed that some of the trench locations exhibited soil or rock conditions that were duplicates of others, and that there was no need to place percolation holes at all of them. The very thin soil layer at many trench locations was also considered evidence that percolation testing at those locations would not provide useful data. Locations for percolation test holes were distributed over the entire area being considered for disposal of treated water. Individual percolation test holes were placed within or adjacent to the trench at a depth to test the soil layer considered most likely to be the limiting layer for downward migration of applied water. For percolation test results see **Table 3-2** and **Appendix B**.

The percolation holes have been assigned numbers that correspond to the depth and the number of the trench at which they were located. For example, in the case of Trench 16, a percolation hole on the surface near the trench has been designated TP-16S and the percolation hole within the trench has been designated TP-16D. An effort was made to dig each percolation hole to have an inside diameter of seven inches. After each test hole had been dug, approximately two inches of pea gravel were placed in the bottom, a six inch diameter sleeve constructed of ⅛-inch hardware cloth was placed in it and pea gravel was placed around the sleeve. Each was filled to a depth of approximately 12 to 14 inches with clean water on the evening of October 27, 2003 and allowed to presoak overnight.

On the morning of October 28, 2003, each hole received enough water to bring the total water level up to six inches. Water levels were checked either approximately every 30 minutes over a four hour period, or every ten minutes over a two hour period if the 30 minute intervals proved to be too long, so that the holes went dry by the time of the next measurement. However, two percolation holes had such a high infiltration rate that they went dry in less than ten minutes. Because of this, the duration of the tests at these two locations were shortened to 50 minutes (TP-9S) and to 30 minutes (TP-17S).

At those locations where the hole was repeatedly dry by the time of the next 30 minute measurement, the test was modified to start with six inches of water in the test hole and record the water level every ten minutes over the next 30 minutes. If the hole went dry in less than ten minutes, the time it took for the hole to go dry was recorded.

TABLE 3-2
Percolation Test Results

Hole Number	Test Date	Test Depth (inches)	Duration of Test (minutes)	Drop Measured by Last Reading (minutes/inch)	Infiltration Rate (minutes per inch)
TP-1S	10/29/03	11	130	1/0.3	3.33
TP-8S	10/28/03	9	151	10/3.3	3.03
TP-9S	10/28/03	9	50	5/6.0	0.83
TP-9D	10/28/03	30	110	10/3.6	2.78
TP-16S	10/28/03	9	242	30/1.8	16.67
TP-16D	10/28/03	60	241	30/0.4	75
TP-17S	10/28/03	9	30	1.08/6.0	0.18
TP-17D	10/28/03	24	160	10/0.6	16.67
TP-21S	10/28/03	9	178	10/1.5	6.67
TP-21D	10/28/03	18	249	30/-0.3*	- - -
TP-27S	10/28/03	9	260	30/0.7	42.86
TP-27D	10/28/03	30	261	30/0.3	100
PH-31S	10/28/03	9	158	12/4.0	3.00
PH-31D	10/28/03	18	160	10/4.3	2.33
TP-33S	10/28/03	9	150	10/3.5	2.86
TP-34S	10/28/03	9	176	2/0.3	6.67
TP-34D	10/28/03	18	120	3.5/6.0	0.58
TP-35S	10/28/03	9	140	10/5.3	1.89
TP-35D	10/28/03	18	451	30/0.4	75

* Water added to bring the water level to six inches caused horizontal flow into fractured rock. Water level in this test hole dropped as a result of the initial horizontal flow outward, then rose as water drained back into the test hole. No infiltration rate was calculated.

The results tabulated in **Table 3-2** show the infiltration rate in minutes per inch (mpi) as determined by the last reading. As is shown in this table, three locations had an infiltration rate greater than 60 mpi; five locations had an infiltration rate between 60 mpi and 5 mpi; and ten had infiltration rates less than 5 mpi.

3.3 Trench Percolation Tests

In addition to percolation tests, four sets of trenches were excavated to determine horizontal and vertical movement of water. For these tests, two additional trenches were excavated adjacent to an existing trench that had been excavated for a mantle test. The additional trenches were excavated to depths of two and four feet near an existing trench that was approximately six feet deep. For percolation hole data see **Appendix B**. For trench percolation test results see **Appendix C**.

Trench percolation tests were conducted by adding water to the shallowest (2 foot) trench that had been pre-soaked from the previous day. Material that had caved in and collected on the bottom of the trench was cleaned out using a shovel so that the trench depth at its deepest point was two feet. This location was marked as a reference point. A bar long enough to extend across this reference point was used as the point from which to measure depth to water within the trench.

At a recorded start time, water from 55-gallon drums was poured into the test trench using 5-gallon buckets. When approximately 75% of the water had been poured out with the buckets, the drum was tipped over slowly to pour out the remaining water. With two people performing this task, the time to pour all of the water from the drums into the test trench was approximately one minute.

As much water was poured into the test trench as it could hold, or the total volume in the four 55-gallon drums, whichever came first. The trench tests were conducted adjacent to test pits TP-10, TP-12, TP-13, and TP-24. The rate the water level dropped was recorded in each trench until all of the water had infiltrated out of that trench. The two adjacent deeper trenches (4 and 6-foot) were monitored for evidence of water seepage from the shallow 2-foot trench. The rate at which the applied water infiltrated into the bottom of the 2-foot trench was calculated. These calculations indicated a rate of infiltration ranging from 3.78×10^{-3} to 3.3×10^{-4} centimeters per second (cm/sec).[1]

Of the four sets of trenches, only TP-24 showed evidence of horizontal flow following the test. The 4-foot trench at the TP-24 location showed moisture at its deepest point, in an area of approximately 4 feet by 1.8 feet. All of the trenches that did not show evidence of horizontal flow are assumed to have predominantly vertical flow.

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[1] 3.78×10^{-3} to 3.3×10^{-4} centimeters per second (cm/sec) = 7 to 70 gallons per day per square foot (gpd/ft^2)

3.4 Backfilling of Trenches

After all of the trenches had been logged and all of the percolation and infiltration tests had been completed, all of the trenches that had been dug as part of this investigation were backfilled. This was done October 30, 2003 using the large excavator that had been used to do the digging. All trenches were filled and then compacted by driving over them with the excavator.

3.5 Spring Investigation

In early December 2003, AEG conducted a walkover inspection of the properties on and adjacent to the Project. The inspection was primarily of low areas and drainage systems where springs might be located. The initial inspection was conducted before any winter rains so the springs were easily detected. A later inspection on December 16, 2003 was after the winter rains had started, and low flow had begun to appear in several of the gullies. Spring locations are identified by number on **Figure 3**. A description of the springs is included in **Appendix D**.

On December 16, 2003, there was a flow of an estimated 8 to 10 gallons per minute (gpm) in the main north-south gully that extends along the east side of the Pioneer Mine and continues until it intersects Dry Creek. This flow was in large part being provided by leakage from the dam that Mr. Haueter constructed south of his outbuildings. Water being discharged by the pumping of the Haueter well collected behind this dam, which leaked and provided most of the flow seen in this gully. A small amount of the total flow was from Spring 3 (see **Figure 3**). This same north-south gully is shown on the USGS map sheet as being an ephemeral stream.

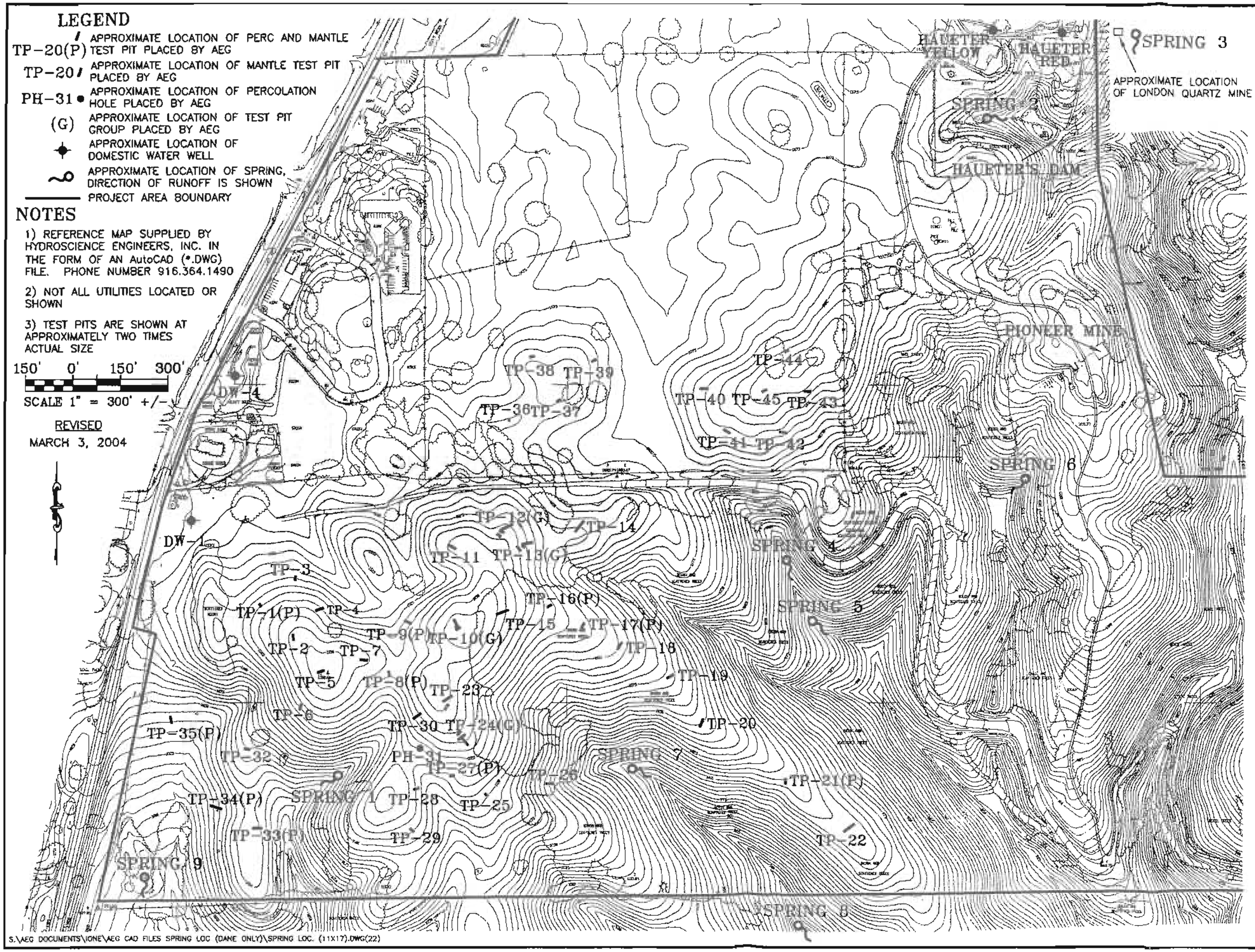
The gully on the south side of the long southeast trending ridge along which Trenches TP-16 through TP-22 were located is also shown as being an ephemeral stream. The head of this last gully is also the location of Spring 7 (see **Figure 3**).

On December 17, 2003, AEG visited an area on the east side of Dry Creek, crossing at a ford. Water flowing in the creek bed at that time was approximately ten inches deep and ten feet wide.

4.0 DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

4.1 Discussion

With the exception of two locations, all trenches were dug to refusal. Soil extended to the full depth of TP-26 and TP-34 (five and nine feet, respectively). TP-26 was composed of alluvial material that had migrated downslope. TP-34 was in an area of greenstone rock adjacent to shale outcrops. The geologic structure near TP-34 is unclear, but it appears to be an unconformity of steeply dipping shale on the east side of massive greenstone.



LOCATION OF SPRINGS

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 3

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The total depths of the trenches into the shale ranged from three feet to approximately eight feet. The shale was thinly bedded and steeply dipping, with a strike that was within 20° of north. The surface soil is thin, typically less than one foot thick, with a maximum thickness of less than three feet. Most of the area is covered with grass with only a few trees. Root penetration ranged from a few inches to two feet.

The rocky nature of the subsurface material at all but two or three of the trench locations precludes using standard soil types and percolation rates to determine acceptable loading. Documents such as the EPA's Table 4.3[2] require that a loading rate be based on a suitable soil type. If the soil type is not suitable, under their classification, the only allowable loading rate is 0 gallons per day per square foot (gpd/ft^2). With the exception of three trench locations, one on the eastern edge and the other two on the western edge of the Project, the material beneath the thin sandy clay loam is weathered rock.

Six of the 19 percolation tests had percolation rates within the desirable range of five to 60 minutes per inch (mpi). Only two of them had percolation rates slower than 60 mpi, with the slowest percolation rate being 100 mpi. The remaining ten tests had percolation rates that were under five mpi.

We believe the percolating water moved along bedding planes, but do not know whether it moved vertically or horizontally. In general, bedding planes were open to the depth of the excavated trench, and became very tight at about the depth where the excavator met refusal. The amount of water that was applied by the presoak and percolation testing could have migrated along bedding planes in either direction.

Percolation into test trenches was used at four locations in an effort to determine if percolation was in a vertical or horizontal direction. At all but one of these locations, water added to the two foot deep trench appeared to have migrated vertically, and did not appear in the adjacent four foot deep trench. The one location at which there was evidence of horizontal migration was the one where three trenches were cut across the strike of the beds. We therefore believe the horizontal movement was along bedding planes. The amount of water that appeared in the deeper trench was much less than what was added to the shallow trench, indicating there was also a component of vertical flow.

---

2 *Suggested Hydraulic Loading and Organic Loading Rates for Sizing Infiltration Surfaces*, from the USEPA Onsite Wastewater Treatment Systems Manual.

Ground water was originally at a depth of 43 feet below ground surface (bgs) in the well at the northwest corner of the Project. After this well had been pumped extensively, the water level rose to 38 feet bgs. The elevation of the ground surface at this location is approximately 1,082 feet, placing the elevation of the water table at approximately 1,044 feet. In addition, there is one spring within the southwest corner of the area that was investigated. This spring is at an elevation of approximately 1,060 feet, and could represent either the water table at that location or a perched zone that outcrops to the surface at that location.

Springs east of the Project are at elevations of less than 1,000 feet. The areal direction of ground water flow is believed to be toward Dry Creek, which is southeast of the Project.

4.2 Conclusions

- There is only a thin layer of soil overlying bedded shale at almost all locations;
- Based on EPA's Table 4.3[3], the thin layer of soil present at the Project is not a suitable material for the disposal of treated water;
- Water flows horizontally and vertically along the bedding planes of the shale;
- The high measured percolation rates were due to the percolation holes being placed within weathered, bedded shale, and are not representative of percolation rates into homogeneous soil;
- The vertical migration through unweathered rock was not measured, but is likely dependent on the presence of fractures; and,
- Soil mantle and percolation testing indicated that the area within the southwest corner of the Project would be suitable for subsurface disposal (see **Figure 4**). However, a review of this area after an extremely heavy rain indicated heavy flow to the surface. This has been interpreted to indicate very poor vertical transport into the clayey soil.

[3] *Suggested Hydraulic Loading and Organic Loading Rates for Sizing Infiltration Surfaces*, from the USEPA Onsite Wastewater Treatment Systems Manual.

100' 0' 100' 200'

SCALE 1" = 200' +/-

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TP-21(P)

SPRING 1

TP-34(P) TP-28 TP-25

TP-33(P) TP-29

TP-22

SPRING 9

NOTES

1) REFERENCE MAP SUPPLIED BY HYDROSCIENCE ENGINEERS, INC. IN THE FORM OF AN AutoCAD (*.DWG) FILE. PHONE NUMBER 916.364.1490

2) NOT ALL UTILITIES LOCATED OR SHOWN

3) TEST PITS ARE SHOWN AT APPROXIMATELY TWO TIMES ACTUAL SIZE

LEGEND

PH-31	APPROXIMATE LOCATION OF PERCOLATION HOLE PLACED BY AEG
TP-20(P)	APPROXIMATE LOCATION OF PERC AND MANTLE TEST PIT PLACED BY AEG
TP-20	APPROXIMATE LOCATION OF MANTLE TEST PIT PLACED BY AEG
(G)	APPROXIMATE LOCATION OF TEST PIT GROUP PLACED BY AEG
	APPROXIMATE LOCATION OF DOMESTIC WATER WELL
	APPROXIMATE LOCATION OF SPRING, DIRECTION OF RUNOFF IS SHOWN
	APPROXIMATE LOCATION OF PROJECT AREA BOUNDARY
	APPROXIMATE AREA RECOMMENDED FOR SPRAY IRRIGATION DISPOSAL
	APPROXIMATE AREA RECOMMENDED FOR EITHER SPRAY IRRIGATION OR SUBSURFACE DISPOSAL

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SHALLOW SUBSURFACE & SPRAY IRRIGATION WATER DISPOSAL

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 4

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4.3 Recommendations

- Spray irrigation should be the primary method of disposal;
- Subsurface disposal of tertiary treated water should be made at low application rates (not to exceed 0.2 gpd/ft^2);
- Subsurface disposal should not be done at high elevations (above 1125 feet) where the soil layer is thinner;
- **Figure 4** illustrates the areas that are acceptable for shallow subsurface and spray irrigation. The southeast trending ridge, along which trenches TP-16 through TP-22 were placed, is the most suitable location for tertiary treated water disposal, and could be used for either spray irrigation or subsurface disposal; and,
- The installation and calibration of subsurface disposal lines should be closely monitored by the responsible engineer.

5.0 STATEMENT OF LIABILITY

This *Results of Soil Mantle and Percolation Tests* (Report) was prepared by Applied Engineering and Geology, Inc. (AEG), at the request of Analytical Environmental Services (Client), using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers, geologists, and scientists practicing in this or similar localities in California at the time this Report was prepared. No other warranty, expressed or implied, is made as to the information and professional advice included in this Report. This Report was written to document testing activities related to the percolation rate of water at the Project based on a limited number of observation points/tests. Further investigation and testing can reduce the inherent uncertainties associated with this type of soil mantle and percolation tests. AEG's Report is based on factual information obtained from Analytical Environmental Services, and others, that has been assumed to be correct, accurate and complete. Applied Engineering and Geology, Inc., does not guarantee the correctness, accuracy, or completeness of those data.

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Should you have any questions regarding the content of this report, please contact the undersigned at 916.645.6014.

Sincerely,

APPLIED ENGINEERING AND GEOLOGY, INC.

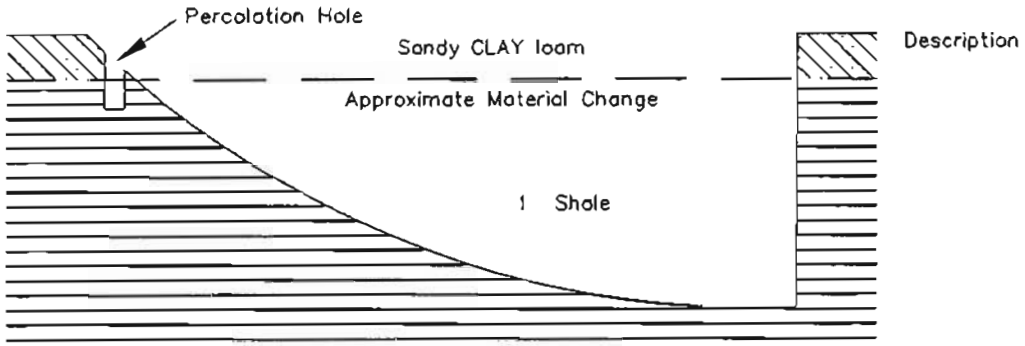
Katherine Waring
Staff Geologist

Earl Stephens RCE 45335
Principal Engineer

Appendix A

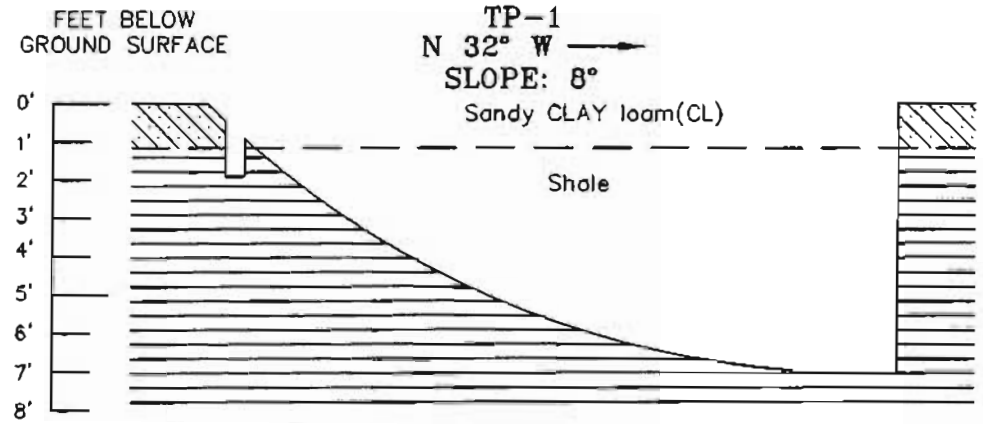
Profiles and Cross Sections of Test Pits

BOREHOLE LOG LEGEND
(TEST PIT PROFILE)



MATERIAL SYMBOLS

- Gravel
- Sand
- Fine Sand
- Silt
- Clay
- Silty SAND or Sandy SILT
- Sandstone
- Greenstone
- Volcanics
- Granitic Rock
- Slate
- Grovelly Clay
- Top Soil / Vegetation
- Asphalt
- Concrete
- Clayey SAND or Sandy CLAY
- Clayey SILT or Silty CLAY
- Shale
- Hardpan
- Phyllite
- Limestone
- No Sample Collected Material Not Logged
- Fill Material
- Tuff

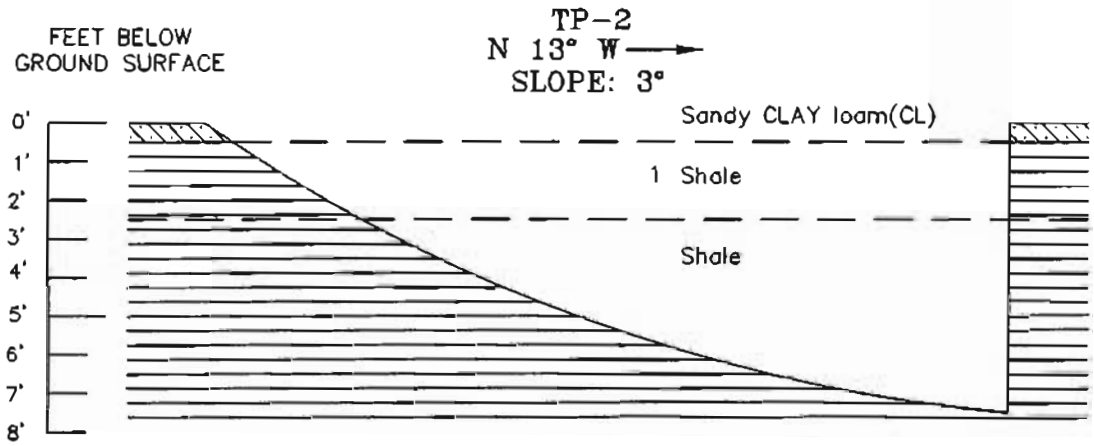


Sandy CLAY loam, soil, heavy roots to approximately 2", lesser roots to 2', light brown to 7.5 YR 6/4, moderate dry strength

Shale, thin bedded with soil and clay bedding plane filling to full depth of trench, clay material at 2.5' is mostly reddish 2.5 YR 4/4, fat clay that is moist below depth of 30", shale N10°W, 85°E

14" to 24": Very weathered shale, beds <1", rock is very weathered, abundant infilling of soil, dry

24" to 7': Shale beds are 1"-3" thick, slightly weathered

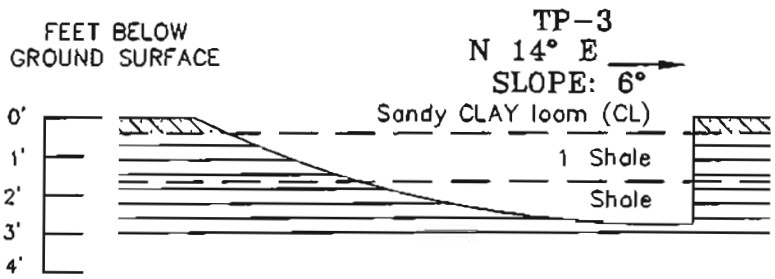


Sandy CLAY loam, soil, heavy roots to 3", lesser roots to 2', dry, light brown 7.5 YR 5/2, moderate dry strength, very porous, many shale fragments 1/4" thick and 2"-4" long

Mixture of weathered broken shale and soil from above

Shale thin beds, 1/4" to 2", all planes of fractures filled with light red 2.5 YR 6/6 fat clay, moist, soil from above, shale N11°E, 57°E

1: Shale layers generally less than 1", many fractures, all bedding planes and fractures filled with soil, dry



Sandy CLAY loam, dry, light red-brown, 5 YR 6/3, heavy roots to 2", many roots to 18"

Broken shale, beds commonly 2"

Shale, becomes fresh, refusal at 33". Local small lenses sandstone fine to medium grained quartz and feldspar, fracture filling, moist at 24", shale N05W, 89E

1: Very weathered with all bedding planes and fractures filled with dry soil from above. Less weathered with depth

HORIZONTAL SCALE: 1" = 5'

VERTICAL SCALE: 1" = 5'

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PROFILES OF TEST PITS TP-1 - TP-3
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-1

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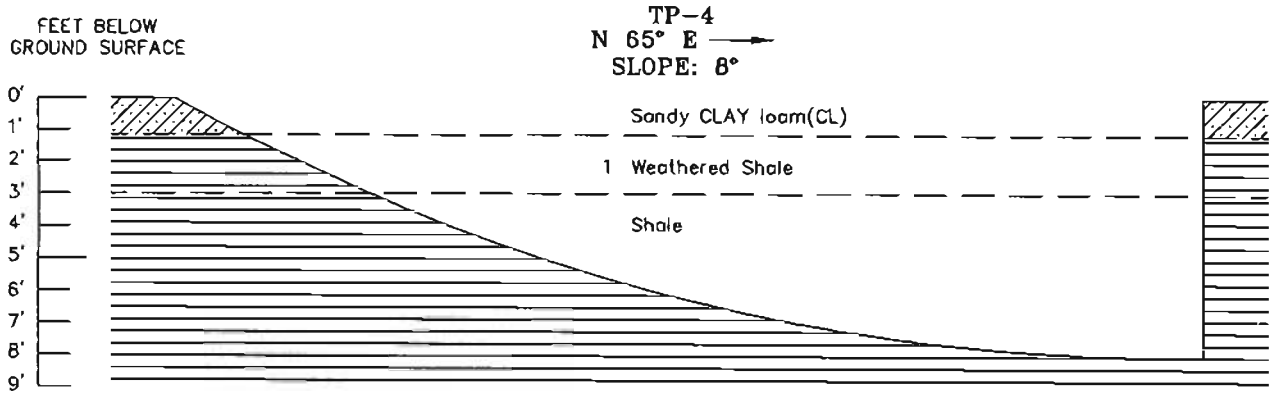
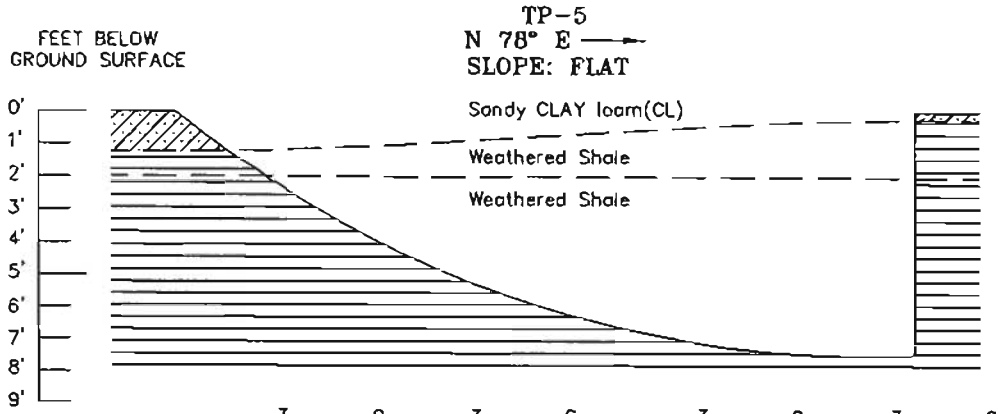


Sandy CLAY loam, soil, moderate to high dry strength, dry, pale brown 10 YR 6/3, very porous, heavy roots to 2", many roots to 18", many shale fragments throughout.

Shale beds have been tilted downslope. Breakage and parting along bedding planes. Shale, 1"-2" thick with moist red clay fracture filling. A fault at 8' from Northeast end, gouge is very moist, olive brown 2.5 YR 5/4, fat clay.

1: Mixed very broken weathered shale and soil from above



Sandy CLAY loam, soil, medium dry strength, red-grey 5 YR 5/2, dry. Heavy roots to 2", porous, many roots to 12" below soil layer, locally to 24"

Shale, thin beds with heavy infilling of soil, weathered shale. Middle of trench - soil to 2", fresh hard shale from 2" to 4'

West end: soil to 15" then thin broken weathered shale to 7.5. Heavy infilling of soil in this weathered shale. Approximately upper 3" of shale tilted to the West (downslope).

Fault with gouge, 2.5 YR 5/4 olive brown in west end, N 20° W, near vertical, fault in middle at N09E, 70W

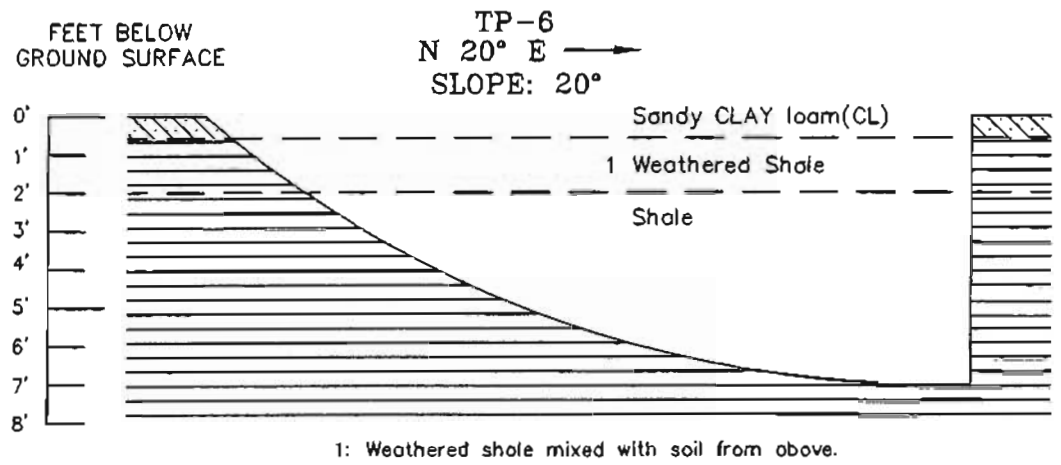
Shale N15°W, 56°E

PROFILES OF TEST PITS TP-4 - TP-5

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-2



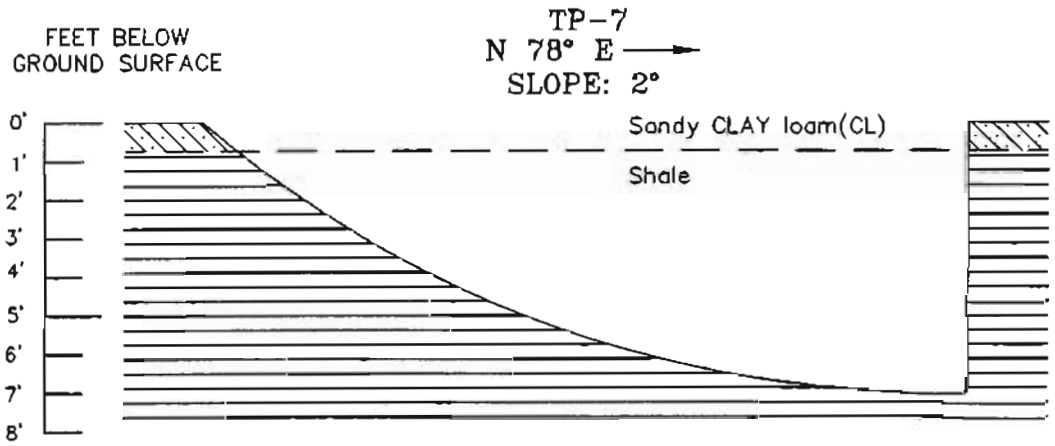
Sandy CLAY loam, light red-brown 5 YR 6/3 dry, moderate to high dry strength, heavy roots to 4".

Very porous, rock is mostly small frogments – 1/2" to 6"

Shale beds 1"–3", moderately weathered, abundont infillling with soil to full depth of the trench. 1" sondstone bed at 3.5' in middle of trench, a bed within shale – red, fat, cloy 2.5 YR 4/6 ot 3.5' deep in the middle of the trench.

Shale N20E, 41°SE

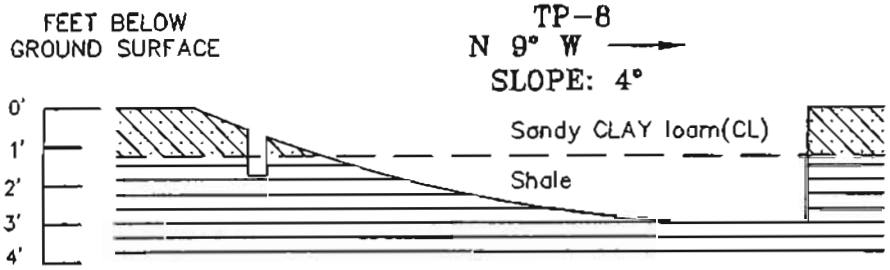
1: Weathered shale mixed with soil from above.



Sandy CLAY loam, abundont roots to full depth, red-gray 5 YR 5/2, dry, high dry strength

Shale, thin beds ½"–2" with soil in bedding planes to total depth. Upper 3' tilt down slope

Shale N03E, 80W



Sandy CLAY loam, gray 5 YR 6/2, dry, high dry strength, porous, heavy roots in upper 2", many roots to 20", many shale frogments in soil zone

Shale, hard, moderately weathered, becoming less weathered with depth, refusal ot 3'. Beds ¼" to 2". Bedding plones and fractures filled with soil from above.

Shale N04E, 81NW

HORIZONTAL SCALE: 1" = 5'

VERTICAL SCALE: 1" = 5'

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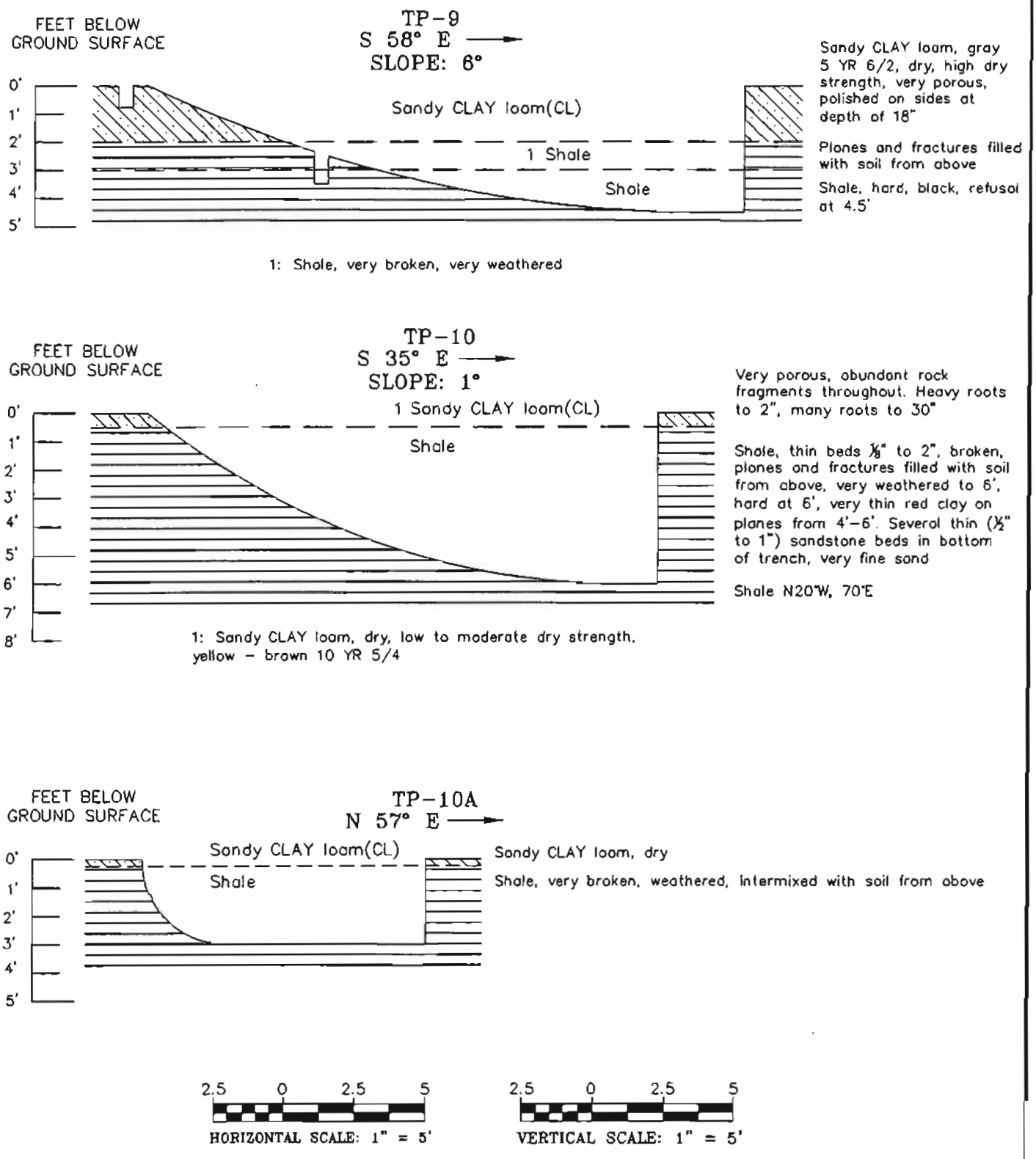
PROFILES OF TEST PITS TP-6 – TP-8
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A–3



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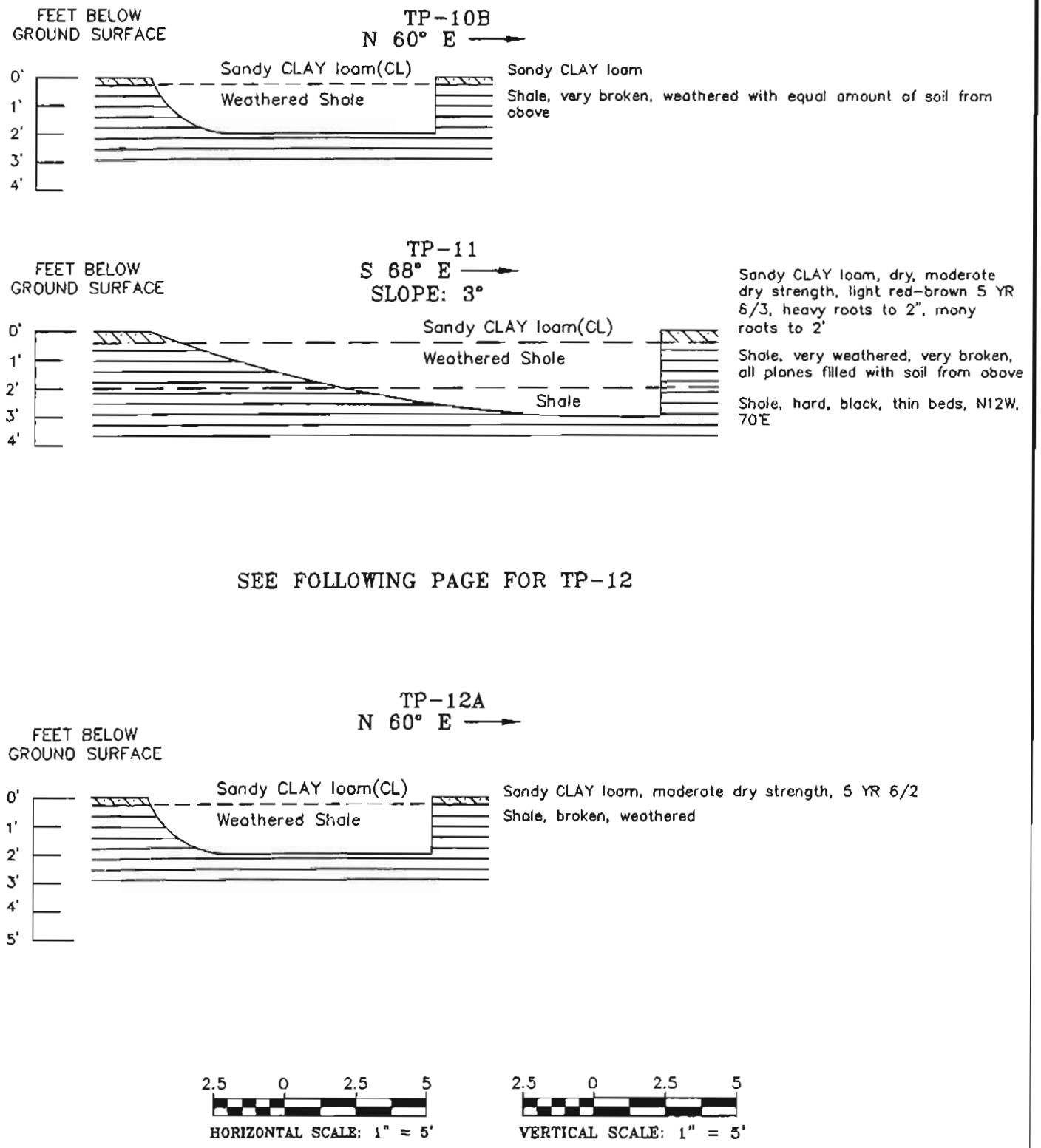
PROFILES OF TEST PITS TP-9 - TP-10A
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-4



SEE FOLLOWING PAGE FOR TP-12

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PROFILES OF TEST PITS TP-10B – TP-12A

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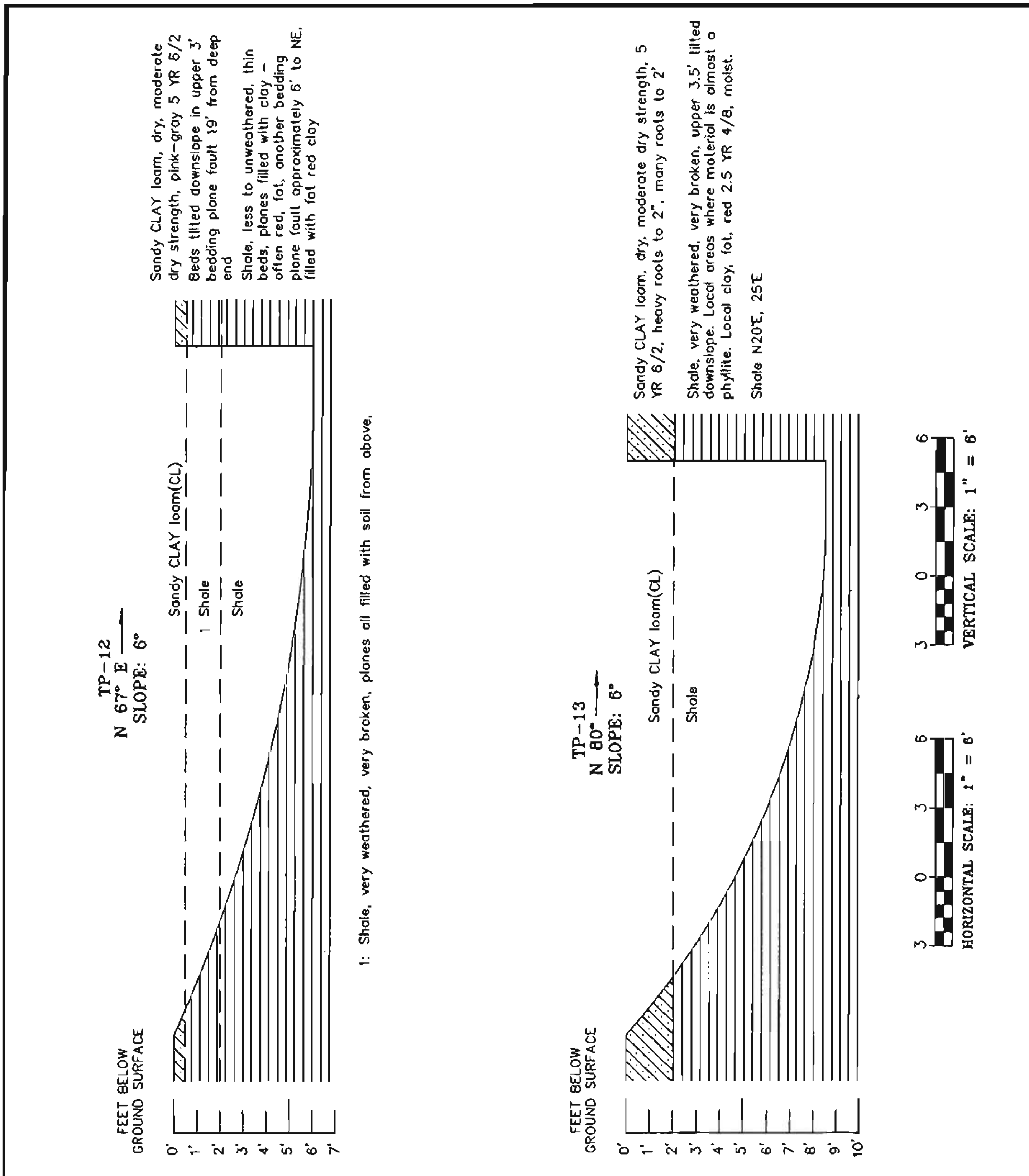
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-5



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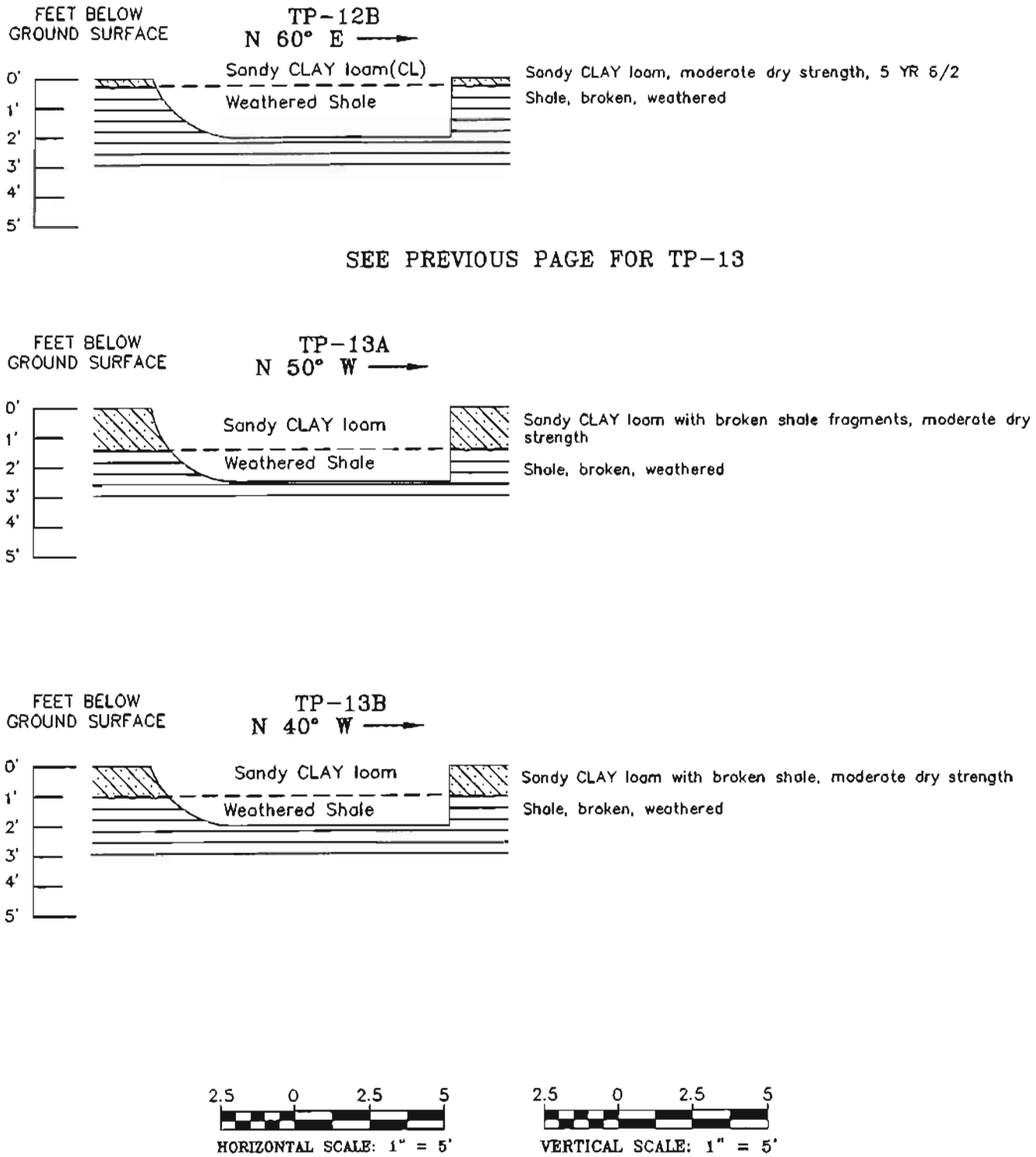
PROFILES OF TEST PITS TP-12 - TP-13

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-6



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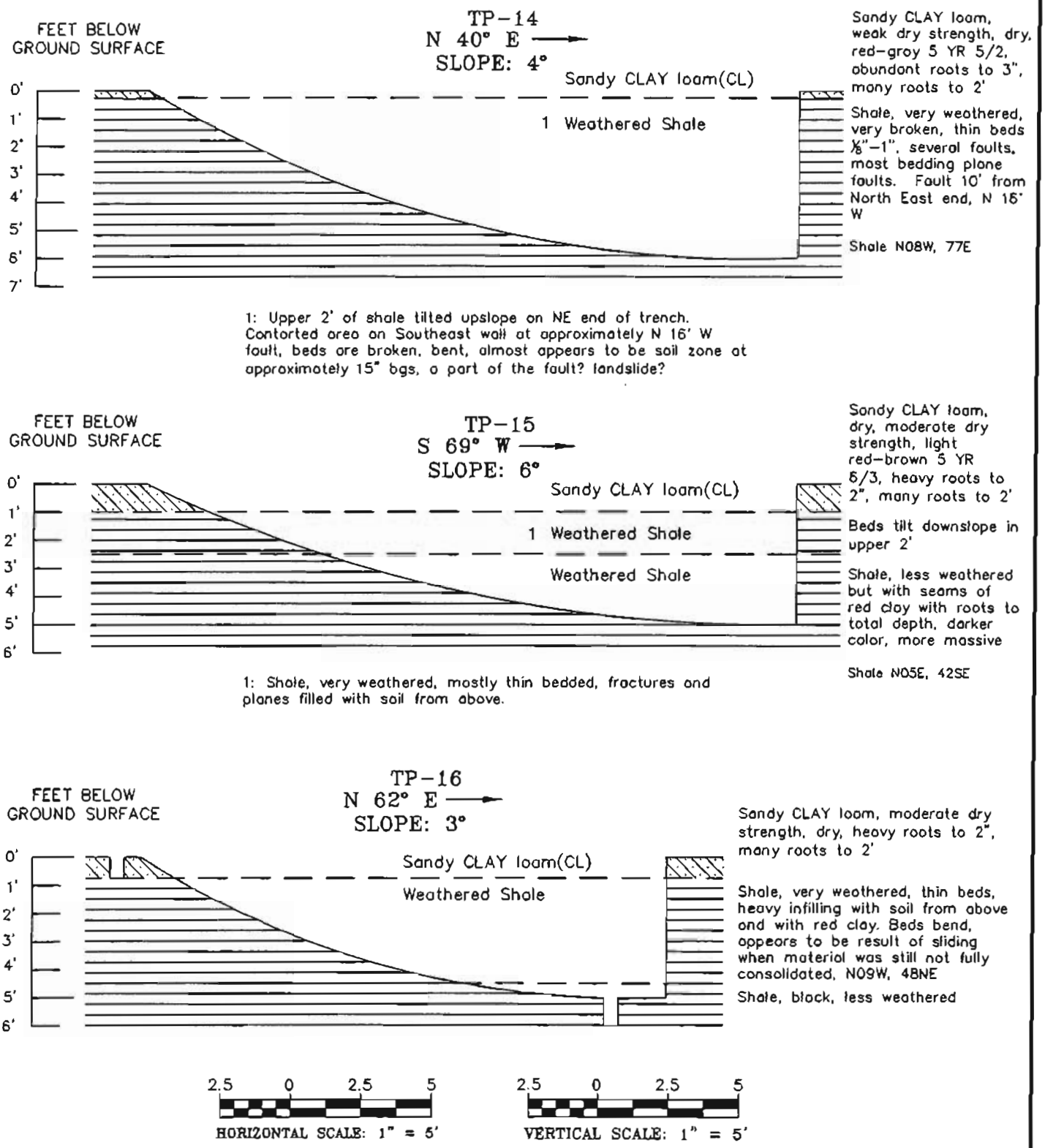
PROFILES OF TEST PITS TP-12B - TP-13B

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-7



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PROFILES OF TEST PITS TP-14 - TP-16

IONE CASINO SITE

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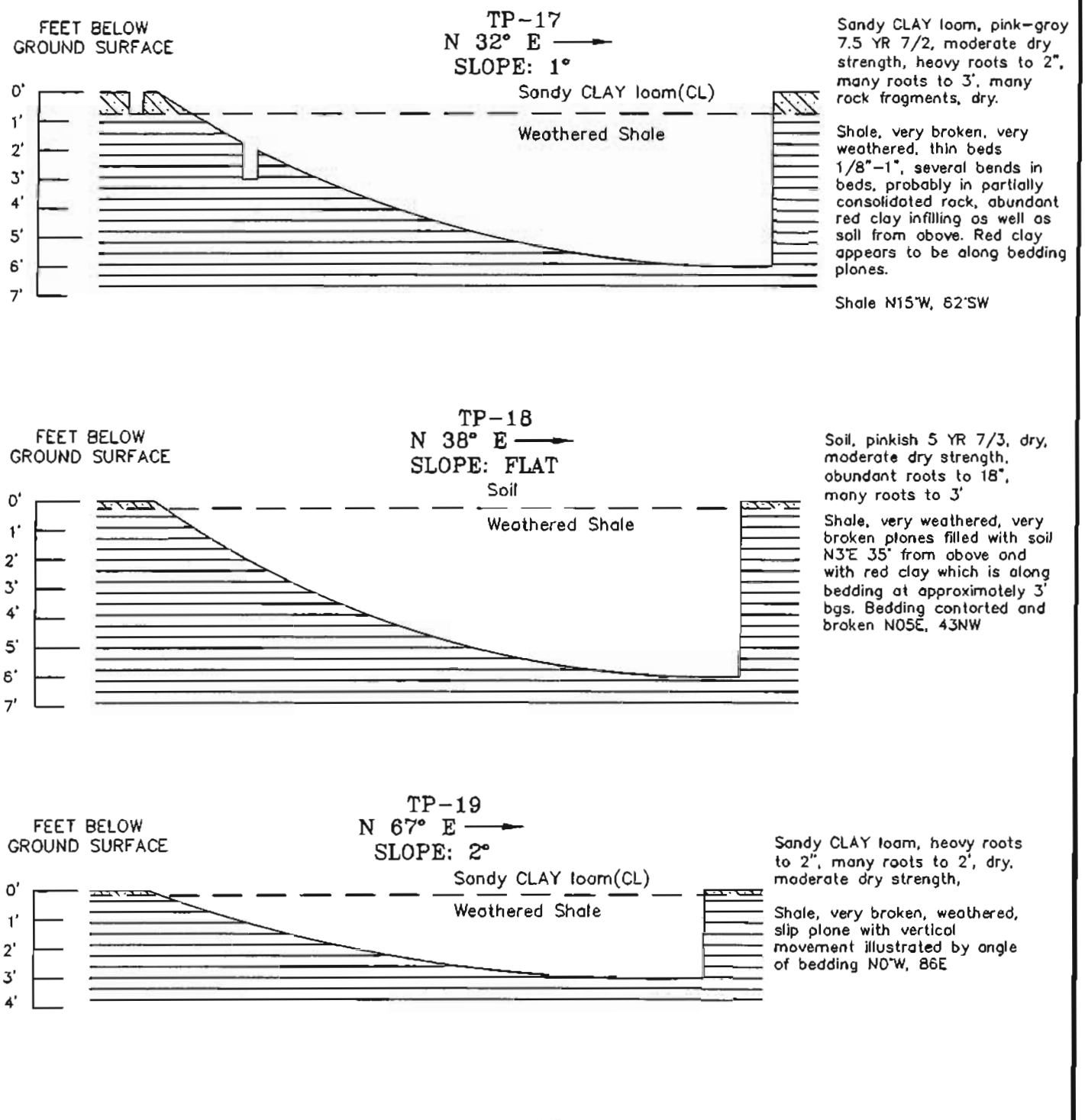
FIGURE A-8



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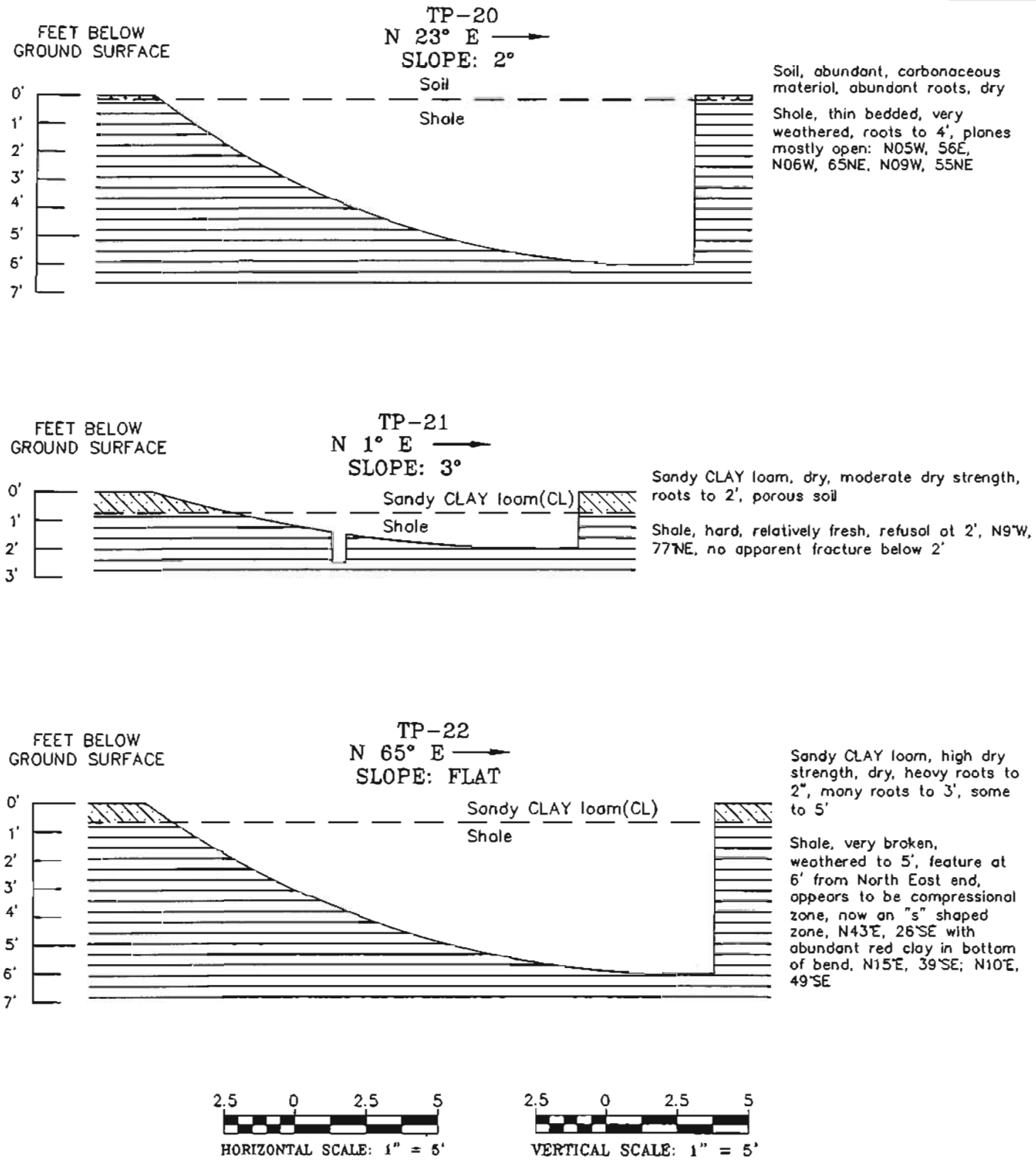
PROFILES OF TEST PITS TP-17 - TP-19
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-9



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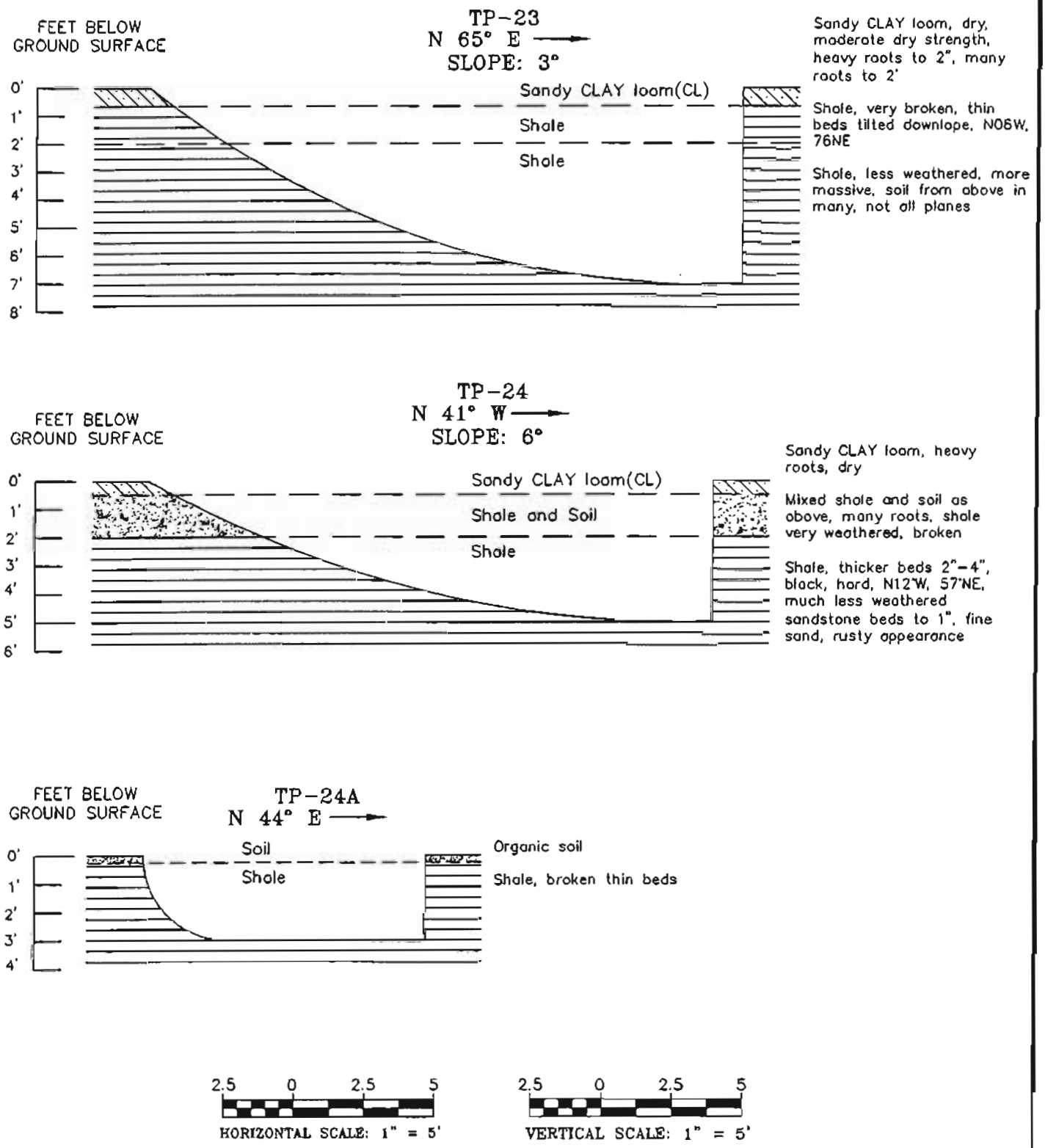
PROFILES OF TEST PITS TP-20 – TP-22

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-10



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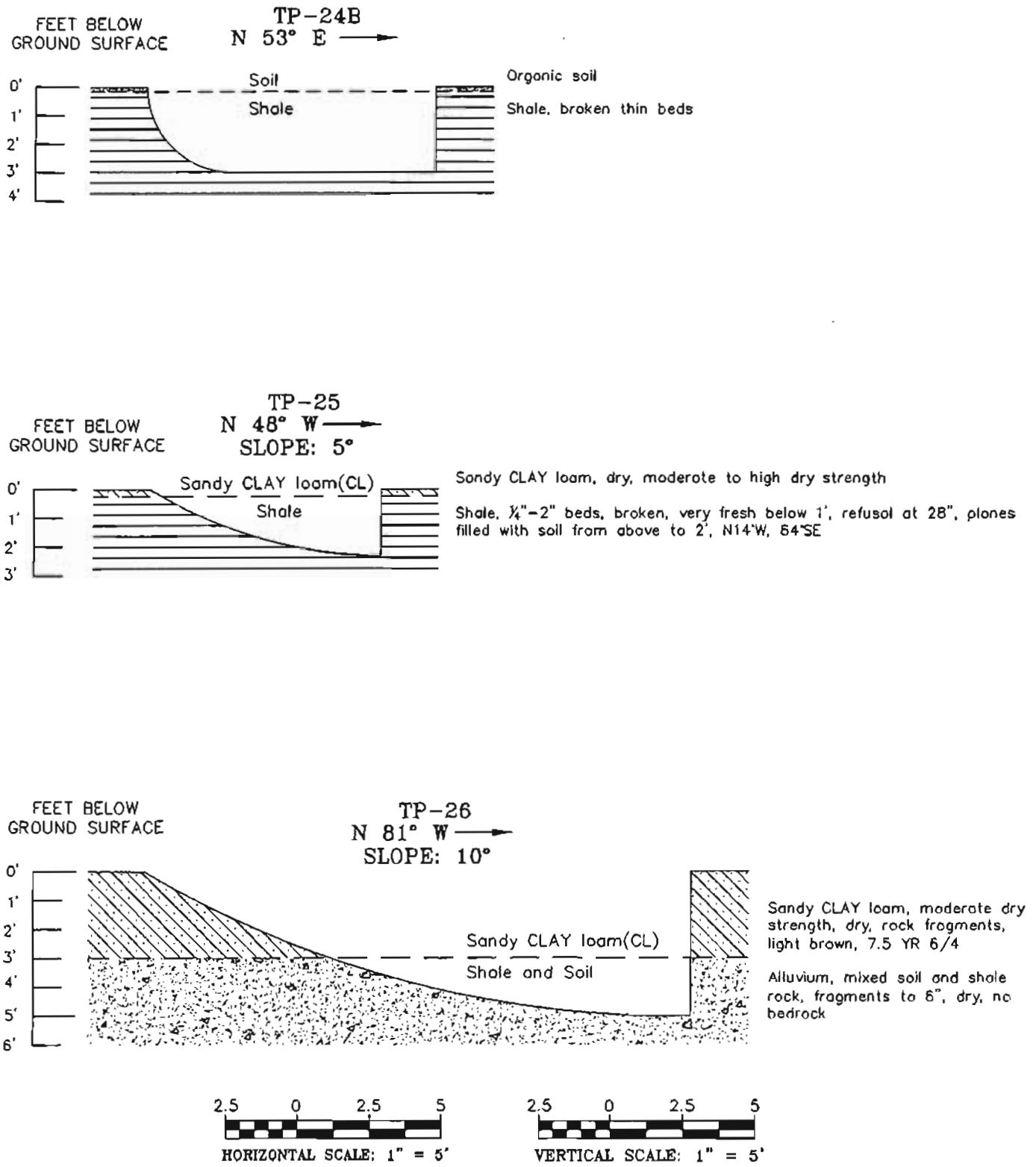
PROFILES OF TEST PITS TP-23 - TP-24A
IONE CASINO SITE
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-11



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PROFILES OF TEST PITS TP-24B - TP-26
IONE CASINO SITE
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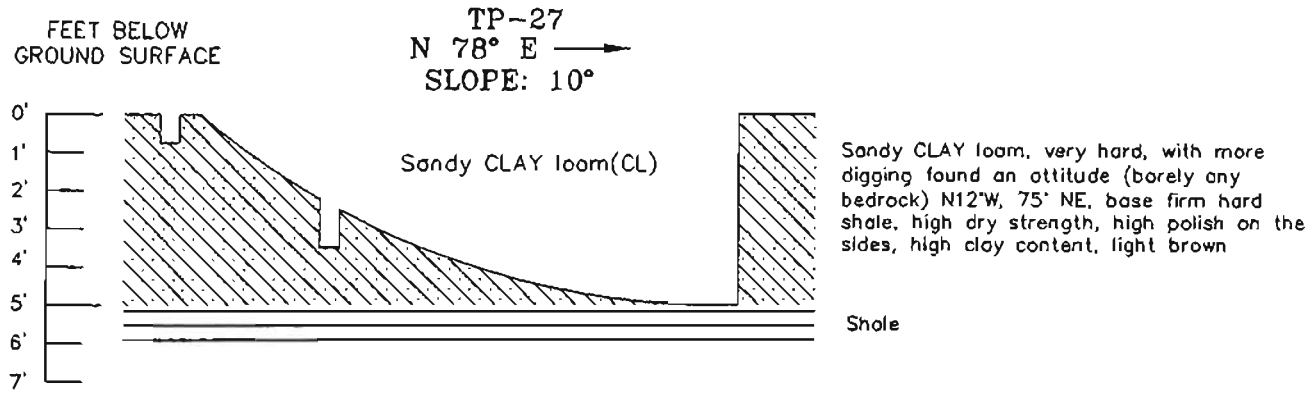
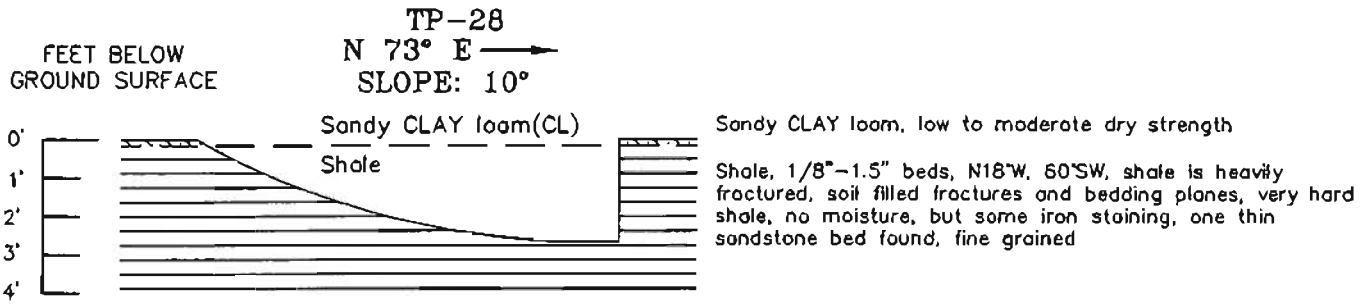
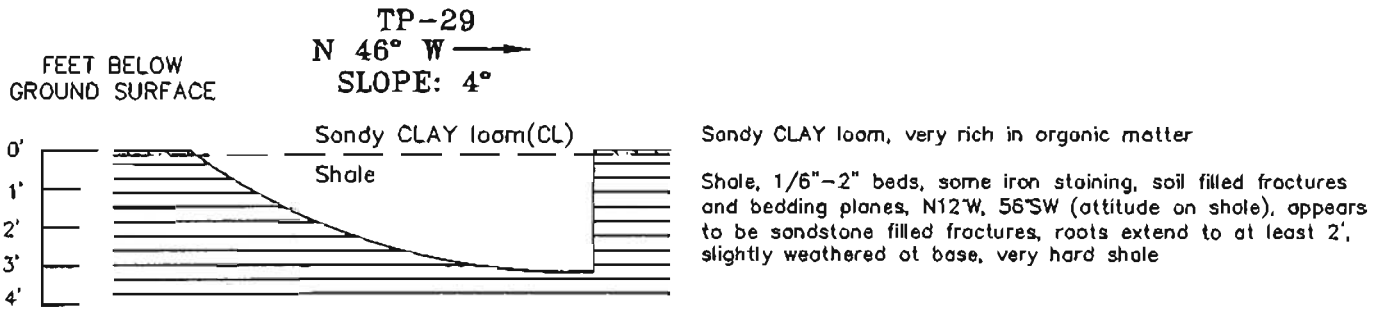
FIGURE A-12







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PROFILES OF TEST PITS TP-27 - TP-29

IONE CASINO SITE

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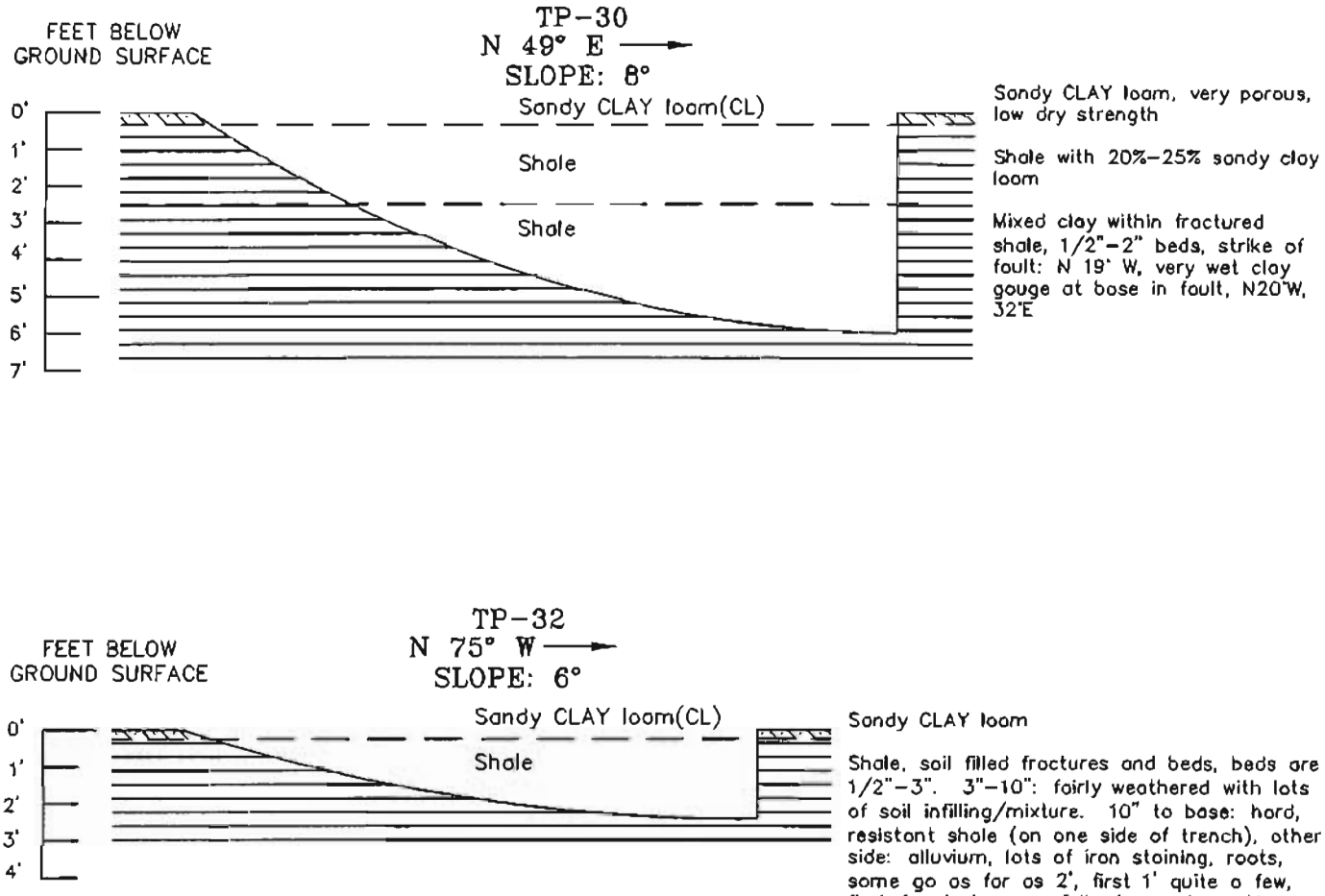
FIGURE A-13



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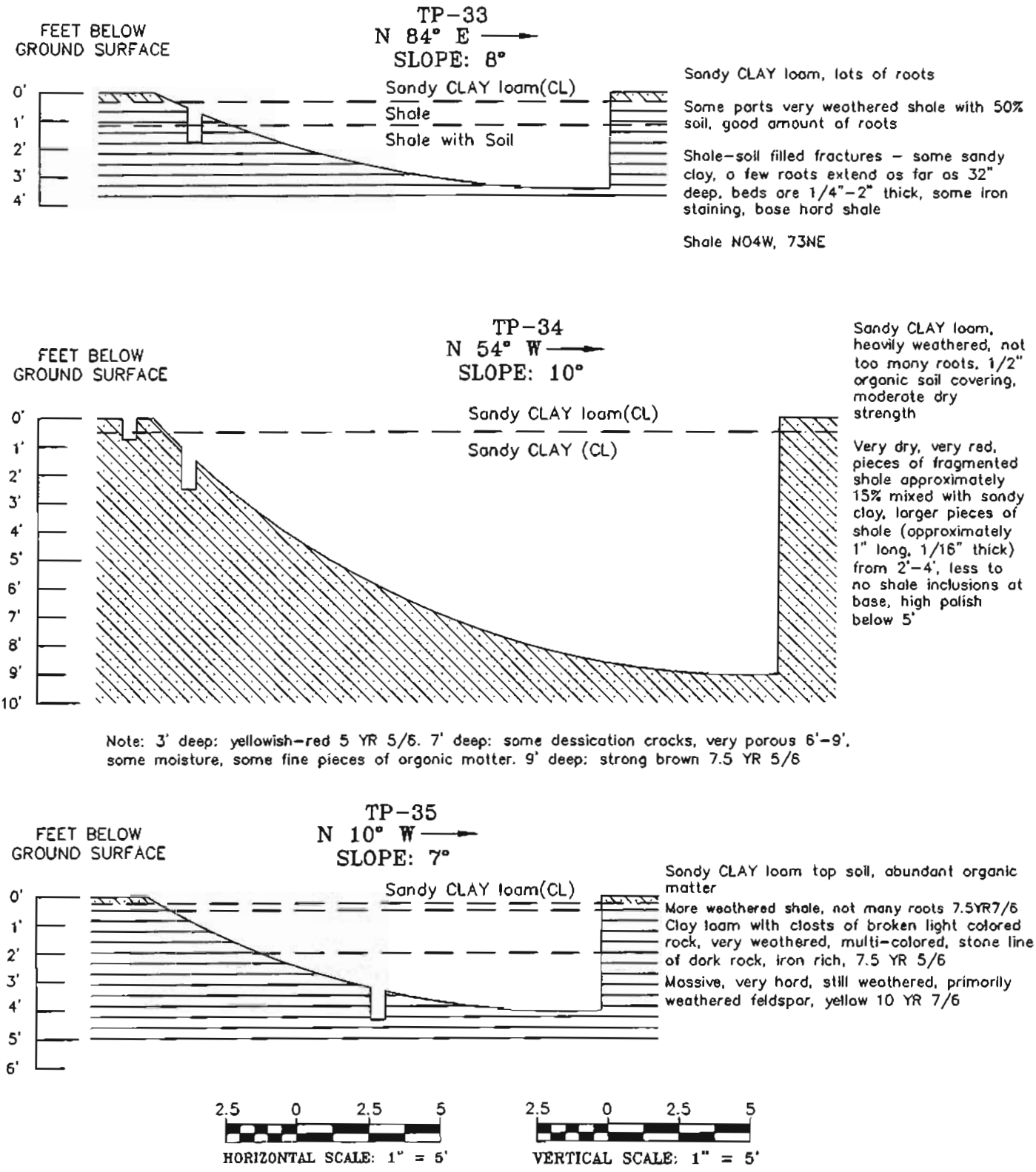
PROFILES OF TEST PITS TP-30 - TP-32

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-14



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PROFILES OF TEST PITS TP-33 - TP-35

IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE A-15

Appendix B

Percolation Hole Data

TABLE B-1
Percolation Hole Data

TP1S		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
0842	Dry: START	6.0 inches
0852	Dry	6.0 inches
0902	0.05 inches	5.95 inches
0912	0.1 inches	5.9 inches
0922	0.1 inches	5.9 inches
0924	4.1 inches	None
0926	2.6 inches	None
0928	1.5 inches	None
0930	0.7 inches	None
0931	0.4 inches	None
0932	0.1 inches	5.9 inches
0942	0.1 inches	5.9 inches
0952	0.05 inches	5.95 inches
1002	0.05 inches	5.95 inches
1004	4.1 inches	None
1006	2.6 inches	None
1008	1.5 inches	None
1010	0.7 inches	None
1011	0.4 inches	None
1012	0.05 inches	5.95 inches
1016	2.6 inches	None

TABLE B-1
Percolation Hole Data

TP1S (continued)		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1018	1.6 inches	None
1020	0.6 inches	None
1021	0.4 inches	None
1022	0.05 inches	5.95 inches
1024	4.25 inches	None
1026	2.7 inches	None
1028	1.6 inches	None
1030	0.7 inches	None
1031	0.4 inches	None
1032	0.1 inches	5.9 inches
1034	4.15 inches	None
1036	2.6 inches	None
1038	1.5 inches	None
1040	0.7 inches	None
1041	0.4 inches	None
1042	0.1 inches	5.9 inches
1044	4.1 inches	None
1046	2.55 inches	None
1048	1.5 inches	None
1050	0.7 inches	None
1051	0.4 inches	None

TABLE B-1
Percolation Hole Data

TP1S (continued)		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1052	0.1 inches	END
TP8S		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1119	Dry: START	6.0 inches
1139	1.8 inches	4.2 inches
1149	2.5 inches	3.5 inches
1159	2.6 inches	3.4 inches
1209	2.0 inches	4.0 inches
1219	2.7 inches	3.3 inches
1229	2.7 inches	3.3 inches
1239	1.5 inches	4.5 inches
1249	2.3 inches	3.7 inches
1259	2.9 inches	3.1 inches
1309	3.1 inches	2.9 inches
1329	3.0 inches	3.0 inches
1339	2.7 inches	3.3 inches
1340	2.7 inches	3.3 inches
1350	2.8 inches	END

TABLE B-1
Percolation Hole Data

TP9S		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1450	Dry: START	6.0 inches: Dry at 1455
1500	Dry	6.0 inches: Dry at 1505
1510	Dry	6.0 inches
1520	Dry	6.0 inches
1530	Dry	6.0 inches
1540	Dry	6.0 inches
1550	Dry	END
TP9D		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1451	Dry: Start	6.0 inches
1501	1.4 inches	4.6 inches
1511	2.1 inches	3.9 inches
1521	1.9 inches	4.1 inches
1531	2.6 inches	3.4 inches
1541	2.8 inches	3.2 inches
1554	1.3 inches	4.7 inches
1601	2.9 inches	3.1 inches
1611	2.2 inches	3.8 inches
1621	2.6 inches	3.4 inches
1631	2.5 inches	3.5 inches

TABLE B-1 Percolation Hole Data		
TP9D (continued)		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1641	2.4 inches	END
TP16S		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
0937	Dry: START	6.0 inches
1007	4.5 inches	None
1037	3.5 inches	None
1109	2.0 inches	4.0 inches
1137	4.8 inches	None
1210	3.4 inches	None
1239	2.3 inches	None
1309	1.9 inches	5.1 inches
1339	4.2 inches	END
TP16D		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
0939	Dry: START	6.0 inches
1009	4.7 inches	None
1039	3.5 inches	None
1111	2.0 inches	4.0 inches
1139	3.8 inches	None

TABLE B-1
Percolation Hole Data

TP16D (continued)		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
1211	2.8 inches	None
1240	2.4 inches	None
1310	2.1 inches	None
1340	1.7 inches	END
TP17S		
Test Operator: Ernie	**Comments: Water drained faster than could be added**	
Time	**Water Depth**	**Water Added**
0947	Dry: START	6.0 inches
1017	Dry	END 6.0 inches drained in 65 sec
TP17D		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
0945	Dry: START	6.0 inches
1015	3.0 inches	None
1025	1.7 inches	4.3 inches
1035	2.4 inches	None
1045	1.7 inches	4.3 inches
1055	2.4 inches	None
1105	1.6 inches	4.4 inches
1115	2.6 inches	None

TABLE B-1
Percolation Hole Data

TP17D (continued)		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
1125	1.8 inches	4.2 inches
1135	2.4 inches	None
1145	1.7 inches	4.3 inches
1155	2.3 inches	None
1205	1.8 inches	4.2 inches
1215	2.4 inches	None
1225	1.8 inches	END
TP21S		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
1207	Dry:START	6.0 inches
1235	Dry	6.0 inches
1245	0.1 inches	5.9 inches
1255	2.1 inches	None
1305	0.3 inches	5.7 inches
1315	1.6 inches	4.4 inches
1325	1.8 inches	4.2 inches
1335	2.1 inches	None
1345	1.0 inches	5.0 inches
1355	2.2 inches	3.8 inches
1405	0.8 inches	5.2 inches

TABLE B-1
Percolation Hole Data

TP21S (continued)		
Test Operator: Ernie	**Comments: None**	
Time	**Water Depth**	**Water Added**
1445	0.7 inches	5.3 inches
1455	2.5 inches	None
1505	1.0 inches	END
TP21D		
Test Operator: Ernie	**Comments: Top of hole drained quickly horizontally.**	
Time	**Water Depth**	**Water Added**
0950	Dry: START	6.0 inches
1208	.3 inches	5.7 inches
1237	4 inches	None
1257	3.9 inches	None
1317	2.0 inches	4.0 inches
1347	3.4 inches	None
1417	3.0 inches	None
1447	2.8 inches	None
1517	1.9 inches	4.1 inches
1547	3.5 inches	None
1617	3.8 inches	END

TABLE B-1
Percolation Hole Data

TP27S		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1126	Dry: START	6.0 inches
1146	5.2 inches	None
1216	5.0 inches	None
1247	4.0 inches	None
1316	3.6 inches	2.4 inches
1346	5.1 inches	None
1415	4.2 inches	None
1446	3.8 inches	2.2 inches
1516	5.4 inches	None
1546	4.7 inches	END
TP27D		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1124	Dry: START	6.0 inches
1145	5.2 inches	None
1215	5.1 inches	None
1246	4.4 inches	None
1315	3.8 inches	2.2 inches
1345	5.1 inches	None
1415	4.9 inches	None
1445	4.6 inches	None

TABLE B-1
Percolation Hole Data

TP27D (continued)		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1515	4.4 inches	None
1545	4.1 inches	END
PH31S'		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1137	Dry: START	6.0 inches
1203	Dry	6.0 inches
1213	1.2 inches	4.8 inches
1223	1.6 inches	4.4 inches
1233	1.9 inches	4.1 inches
1244	1.6 inches	4.4 inches
1255	1.6 inches	4.4 inches
1304	1.8 inches	4.2 inches
1313	2.0 inches	4.0 inches
1325	1.3 inches	4.7 inches
1336	1.8 inches	4.2 inches
1343	2.3 inches	3.7 inches
1354	1.7 inches	4.3 inches
1403	2.0 inches	4.0 inches
1415	2.0 inches	END

TABLE B-1
Percolation Hole Data

PH31D[1]		
Test Operator: Earl	**Comments: None**	
Time	**Water Depth**	**Water Added**
1132	Dry: START	6.5 inches
1202	Dry	6.0 inches
1212	0.6 inches	5.4 inches
1222	1.3 inches	4.7 inches
1232	1.6 inches	4.4 inches
1243	1.0 inches	5.0 inches
1254	1.3 inches	4.7 inches
1302	1.6 inches	4.4 inches
1312	2.0 inches	4.0 inches
1324	1.5 inches	4.5 inches
1335	1.8 inches	4.2 inches
1342	2.0 inches	4.0 inches
1353	1.8 inches	4.2 inches
1402	1.8 inches	4.2 inches
1412	1.7 inches	END

[1]No Test Pit at this Location- Only a Percolation Hole (PH)

TABLE B-1 Percolation Hole Data		
TP33S		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1558	Dry: START	6.0 inches
1608	0.2 inches	5.8 inches
1618	1.55 inches	4.45 inches
1628	2.25 inches	3.75 inches
1638	2.25 inches	3.75 inches
1648	2.20 inches	3.80 inches
1658	2.15 inches	3.85 inches
1708	2.2 inches	3.8 inches
1718	2.15 inches	3.85 inches
1728	2.7 inches	3.3 inches
1738	2.5 inches	3.5 inches
1748	2.7 inches	3.3 inches
1758	2.6 inches	3.4 inches
1808	2.5 inches	3.5 inches
1818	2.4 inches	3.6 inches
1828	2.5 inches	END

TABLE B-1
Percolation Hole Data

TP34S		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1430	Dry: START	6.0 inches
1440	3.8 inches	2.2 inches
1450	4.1 inches	None
1500	2.85 inches	3.15 inches
1510	4.3 inches	None
1520	2.8 inches	3.2 inches
1530	4.3 inches	None
1540	2.95 inches	3.05 inches
1550	4.3 inches	None
1600	3.0 inches	3.0 inches
1605	5.1 inches	None
1610	4.15 inches	None
1620	2.9 inches	3.1 inches
1630	4.5 inches	None
1640	2.9 inches	3.1 inches
1650	4.85 inches	None
1652	4.30 inches	None
1654	4.00 inches	None
1656	3.9 inches	None
1700	3.2 inches	None
1702	3.1 inches	None

TABLE B-1
Percolation Hole Data

TP34S (continued)		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1704	2.8 inches	None
1706	2.5 inches	None
1710	2.1 inches	None
1712	2.0 inches	None
1716	1.6 inches	None
1722	1.05 inches	None
1724	0.9 inches	None
1726	0.6 inches	END
TP34D		
Test Operator: Bob	**Comments: Final draw down of 3 minute 22 seconds**	
Time	**Water Depth**	**Water Added**
0937	Dry: START	6.0 inches
1005	Dry	6.0 inches
1015	Dry	6.0 inches
1026	Dry	6.0 inches
1037	Dry	6.0 inches
1047	Dry	6.0 inches
1100	Dry	6.0 inches
1111	Dry	6.0 inches
1125	Dry	6.0 inches
1134	Dry	6.0 inches

TABLE B-1
Percolation Hole Data

TP34D (continued)		
Test Operator: Bob	**Comments: Final draw down of 3 minute 22 seconds**	
Time	**Water Depth**	**Water Added**
1135.5	2.0 inches	None
1137.5	Dry	None
1201	Dry	6.0 Inches
1204:22	Dry	END
TP35S		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1302	Dry: START	6.0 inches
1314	0.2 inches	5.8 inches
1324	0.7 inches	5.3 inches
1334	1.05 inches	4.95 inches
1344	0.9 inches	5.1 inches
1354	0.6 inches	5.4 inches
1404	0.7 inches	5.3 inches
1414	0.6 inches	5.4 inches
1424	0.7 inches	5.3 inches
1434	0.7 inches	5.3 inches
1444	0.6 inches	5.4 inches
1454	0.7 inches	5.3 inches
1504	0.7 inches	5.3 inches
1514	0.75 inches	5.25 inches

TABLE B-1
Percolation Hole Data

TP35S (continued)		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1524	0.7 inches	5.3 inches
1534	0.75 inches	END
TP35D		
Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
0944	Dry: START	6.0 inches
1010	5.5 inches	None
1020	5.3 inches	None
1032	4.8 inches	None
1042	4.8 inches	None
1052	4.8 inches	None
1104	4.8 inches	None
1119	4.5 inches	None
1132	4.5 Inches	None
1151	4.4 inches	None
1221	4.1 inches	None
1303	3.2 inches	2.8 inches
1333	5.8 inches	None
1345	5.7 inches	None

TABLE B-1
Percolation Hole Data

TP35D (continued)

Test Operator: Bob	**Comments: None**	
Time	**Water Depth**	**Water Added**
1415	5.1 inches	None
1445	4.7 inches	None
1515	4.3 inches	None
1545	3.7 inches	2.3 inches
1615	5.5 inches	None
1645	5.05 inches	None
1715	4.65 inches	END

TP = Test Pit
PH = Percolation Hole

Appendix C

Trench Percolation Test Results

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-10A	10/29/03	24.0	80	180	1238	0	1.3	-No seepage into adjacent trenches -Infiltration Rate= (180 gal/80 square feet)/46 minutes x 1440= (70 gal/square feet)/day
TP-10A	10/29/03	24	80	180	1239	1	1.26	
TP-10A	10/29/03	24	80	180	1240	2	1.12	
TP-10A	10/29/03	24	80	180	1241	3	1.06	
TP-10A	10/29/03	24	80	180	1242	4	1.02	
TP-10A	10/29/03	24	80	180	1243	5	0.99	
TP-10A	10/29/03	24	80	180	1244	6	0.95	
TP-10A	10/29/03	24	80	180	1245	7	0.91	
TP-10A	10/29/03	24	80	180	1246	8	0.88	
TP-10A	10/29/03	24	80	180	1247	9	0.855	
TP-10A	10/29/03	24	80	180	1248	10	0.82	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-10A	10/29/03	24	80	180	1249	11	0.795	
TP-10A	10/29/03	24	80	180	1250	12	0.78	
TP-10A	10/29/03	24	80	180	1251	13	0.75	
TP-10A	10/29/03	24	80	180	1252	14	0.735	
TP-10A	10/29/03	24	80	180	1253	15	0.71	
TP-10A	10/29/03	24	80	180	1254	16	0.685	
TP-10A	10/29/03	24	80	180	1255	17	0.665	
TP-10A	10/29/03	24	80	180	1256	18	0.65	
TP-10A	10/29/03	24	80	180	1257	19	0.63	
TP-10A	10/29/03	24	80	180	1258	20	0.605	
TP-10A	10/29/03	24	80	180	1259	21	0.59	
TP-10A	10/29/03	24	80	180	1300	22	0.58	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-10A	10/29/03	24	80	180	1301	23	0.55	
TP-10A	10/29/03	24	80	180	1302	24	0.54	
TP-10A	10/29/03	24	80	180	1303	25	0.52	
TP-10A	10/29/03	24	80	180	1304	26	0.51	
TP-10A	10/29/03	24	80	180	1305	27	0.46	
TP-10A	10/29/03	24	80	180	1306	28	0.475	
TP-10A	10/29/03	24	80	180	1307	29	0.46	
TP-10A	10/29/03	24	80	180	1308	30	0.445	
TP-10A	10/29/03	24	80	180	1309	31	0.43	
TP-10A	10/29/03	24	80	180	1310	32	0.415	
TP-10A	10/29/03	24	80	180	1311	33	0.40	
TP-10A	10/29/03	24	80	180	1312	34	0.385	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-10A	10/29/03	24	80	180	1313	35	0.37	
TP-10A	10/29/03	24	80	180	1314	36	0.355	
TP-10A	10/29/03	24	80	180	1315	37	0.34	
TP-10A	10/29/03	24	80	180	1316	38	0.33	
TP-10A	10/29/03	24	80	180	1317	39	0.315	
TP-10A	10/29/03	24	80	180	1318	40	0.295	
TP-10A	10/29/03	24	80	180	1319	41	0.285	
TP-10A	10/29/03	24	80	180	1320	42	0.27	
TP-10A	10/29/03	24	80	180	1321	43	0.25	
TP-10A	10/29/03	24	80	180	1322	44	0.235	
TP-10A	10/29/03	24	80	180	1323	45	0.22	
TP-10A	10/29/03	24	80	180	1324	46	0.20	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-12A	10/29/03	24	104	180	0715	0	0.58	-Depth of water bgs (below ground surface)- not total depth of water -No seepage into adjacent trenches -Water gone at 0818 -Infiltration Rate= (180 gal/104 square feet)/63 minutes x 1440= (40 gal/square feet)/day
TP-12A	10/29/03	24	104	180	0720	5	0.75	
TP-12A	10/29/03	24	104	180	0725	10	0.79	
TP-12A	10/29/03	24	104	180	0730	15	0.90	
TP-12A	10/29/03	24	104	180	0735	20	1.00	
TP-12A	10/29/03	24	104	180	0740	25	1.08	
TP-12A	10/29/03	24	104	180	0745	30	1.17	
TP-12A	10/29/03	24	104	180	0750	35	1.25	
TP-12A	10/29/03	24	104	180	0755	40	1.33	
TP-12A	10/29/03	24	104	180	0800	45	1.42	
TP-12A	10/29/03	24	104	180	0805	50	1.50	
TP-12A	10/29/03	24	104	180	0810	55	1.63	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-12A	10/29/03	24	104	180	0814	59	1.73	
TP-12A	10/29/03	24	104	180	0815	60	1.81	
TP-12A	10/29/03	24	104	180	0818	63	1.83	
TP-13A	10/29/03	24	104	90	0720	0	0	-Depth to water below ground surface (bgs) -No seepage into adjacent trenches -Infiltration Rate= (90 gal/104 square feet)/180 minutes x 1440= (7 gal/square feet)/day
TP-13A	10/29/03	24	104	90	0722	2	0.67	
TP-13A	10/29/03	24	104	90	0727	7	0.70	
TP-13A	10/29/03	24	104	90	0732	12	0.77	
TP-13A	10/29/03	24	104	90	0737	17	0.81	
TP-13A	10/29/03	24	104	90	0742	22	0.83	
TP-13A	10/29/03	24	104	90	0747	27	0.88	
TP-13A	10/29/03	24	104	90	0752	32	0.90	
TP-13A	10/29/03	24	104	90	0757	37	0.94	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-13A	10/29/03	24	104	90	0802	42	0.96	
TP-13A	10/29/03	24	104	90	0807	47	0.99	
TP-13A	10/29/03	24	104	90	0812	52	1.02	
TP-13A	10/29/03	24	104	90	0817	57	1.06	
TP-13A	10/29/03	24	104	90	0822	62	1.08	
TP-13A	10/29/03	24	104	90	0827	67	1.11	
TP-13A	10/29/03	24	104	90	0832	72	1.15	
TP-13A	10/29/03	24	104	90	0837	77	1.18	
TP-13A	10/29/03	24	104	90	0842	82	1.20	
TP-13A	10/29/03	24	104	90	0847	87	1.23	
TP-13A	10/29/03	24	104	90	0852	92	1.26	
TP-13A	10/29/03	24	104	90	0857	97	1.28	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-13A	10/29/03	24	104	90	0902	102	1.32	
TP-13A	10/29/03	24	104	90	0907	107	1.35	
TP-13A	10/29/03	24	104	90	0912	112	1.38	
TP-13A	10/29/03	24	104	90	0917	117	1.40	
TP-13A	10/29/03	24	104	90	0922	122	1.44	
TP-13A	10/29/03	24	104	90	0927	127	1.47	
TP-13A	10/29/03	24	104	90	0932	132	1.50	
TP-13A	10/29/03	24	104	90	0937	137	1.53	
TP-13A	10/29/03	24	104	90	0942	142	1.55	
TP-13A	10/29/03	24	104	90	0947	147	1.59	
TP-13A	10/29/03	24	104	90	0952	152	1.63	
TP-13A	10/29/03	24	104	90	0957	157	1.67	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-13A	10/29/03	24	104	90	1002	162	1.73	
TP-13A	10/29/03	24	104	90	1007	167	1.77	
TP-13A	10/29/03	24	104	90	1012	172	1.84	
TP-13A	10/29/03	24	104	90	1017	177	1.93	
TP-13A	10/29/03	24	104	90	1019	179	2	
TP-13A	10/29/03	24	104	90	1020	180	2	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-24A	10/29/03	36	95	190	1343	0	0	- Wet in four foot trench, area affected: 4'x 1.8' - Six foot trench dry -Infiltration Rate= (190 gal/95 square feet)/133 minute x 1440= (22 gal/square feet)/day
TP-24A	10/29/03	36	95	190	1345	2	1.55	
TP-24A	10/29/03	36	95	190	1347	4	1.47	
TP-24A	10/29/03	36	95	190	1349	6	1.40	
TP-24A	10/29/03	36	95	190	1351	8	1.36	
TP-24A	10/29/03	36	95	190	1353	10	1.32	
TP-24A	10/29/03	36	95	190	1355	12	1.28	
TP-24A	10/29/03	36	95	190	1357	14	1.25	
TP-24A	10/29/03	36	95	190	1359	16	1.22	
TP-24A	10/29/03	36	95	190	1401	18	1.19	
TP-24A	10/29/03	36	95	190	1403	20	1.16	
TP-24A	10/29/03	36	95	190	1405	22	1.135	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-24A	10/29/03	36	95	190	1407	24	1.10	
TP-24A	10/29/03	36	95	190	1409	26	1.085	
TP-24A	10/29/03	36	95	190	1411	28	1.065	
TP-24A	10/29/03	36	95	190	1413	30	1.04	
TP-24A	10/29/03	36	95	190	1415	32	1.02	
TP-24A	10/29/03	36	95	190	1417	34	1.00	
TP-24A	10/29/03	36	95	190	1419	36	0.98	
TP-24A	10/29/03	36	95	190	1421	38	0.96	
TP-24A	10/29/03	36	95	190	1423	40	0.94	
TP-24A	10/29/03	36	95	190	1425	42	0.92	
TP-24A	10/29/03	36	95	190	1427	44	0.90	
TP-24A	10/29/03	36	95	190	1429	46	0.89	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-24A	10/29/03	36	95	190	1431	48	0.87	
TP-24A	10/29/03	36	95	190	1433	50	0.85	
TP-24A	10/29/03	36	95	190	1435	52	0.84	
TP-24A	10/29/03	36	95	190	1437	54	0.825	
TP-24A	10/29/03	36	95	190	1439	56	0.80	
TP-24A	10/29/03	36	95	190	1441	58	0.79	
TP-24A	10/29/03	36	95	190	1443	60	0.775	
TP-24A	10/29/03	36	95	190	1445	62	0.76	
TP-24A	10/29/03	36	95	190	1447	64	0.74	
TP-24A	10/29/03	36	95	190	1449	66	0.725	
TP-24A	10/29/03	36	95	190	1451	68	0.71	
TP-24A	10/29/03	36	95	190	1453	70	0.695	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-24A	10/29/03	36	95	190	1455	72	0.68	
TP-24A	10/29/03	36	95	190	1457	74	0.665	
TP-24A	10/29/03	36	95	190	1459	76	0.65	
TP-24A	10/29/03	36	95	190	1501	78	0.635	
TP-24A	10/29/03	36	95	190	1503	80	0.615	
TP-24A	10/29/03	36	95	190	1505	82	0.60	
TP-24A	10/29/03	36	95	190	1507	84	0.59	
TP-24A	10/29/03	36	95	190	1509	86	0.575	
TP-24A	10/29/03	36	95	190	1511	88	0.565	
TP-24A	10/29/03	36	95	190	1513	90	0.545	
TP-24A	10/29/03	36	95	190	1515	92	0.535	
TP-24A	10/29/03	36	95	190	1517	94	0.515	

TABLE C-1
Trench Percolation Test Results

Trench	Test Date	Test Pit Depth (inches)	Approximate Surface Area (square feet)	Amount of Water Added (gallons)	Time During test	Elapsed Time (minutes)	Depth to Water (feet)	Results/Notes
TP-24A	10/29/03	36	95	190	1519	96	0.50	
TP-24A	10/29/03	36	95	190	1541	118	0.30	
TP-24A	10/29/03	36	95	190	1546	123	0.24	
TP-24A	10/29/03	36	95	190	1551	128	0.14	
TP-24A	10/29/03	36	95	190	1556	133	0.00	

Appendix D

Spring Locations and Descriptions

Spring Locations and Descriptions

In early December 2003, AEG conducted a walkover inspection of the properties on and adjacent to the Project. The inspection was primarily of the low areas and drainage systems in which springs might be located. The initial inspection was conducted before any winter rains, and at that time springs were easily detected. A later inspection on December 16, 2003 was after the winter rains had started, and low flow had begun to appear in several of the gullies. Spring locations are illustrated by **Figure 3** within the main body of this document. A description of each spring is as follows:

Spring 1 This spring was located at the time the percolation testing was conducted. This spring was essentially a seep at the time it was located. It extends along the base of the gully for a distance of roughly 20 to 30 feet, and appears to be fed primarily from the southeast side of the gully. There is a Home Depot flag at this location.

Spring 2 This is a spring in the steep gully just south of the Haueter residence. It could be related to water being discharged by the Haueter residence including irrigation water used by them.

Spring 3 This spring is in the bottom of the steep gully east of the Haueter residence. It is probably related to the long abandoned London Quartz Mine, which is located in the west side of this same gully.

Springs 4 through 8 were located on December 16, 2003, after the rainy season had started.

Spring 4 Small trickle in bottom of gully that is incised downstream of this point. Spring is at upper end of gully that is southwest of Spring 6. A cutoff trench was placed upslope of the nearby road just north of this location to intercept and divert near surface drainage.

Spring 5 Downstream of Spring 4. Trickle of water coming from side of gully. At a distance of approximately 100 yards downstream of this point there is flow in gully.

Spring 6 This small trickle is from a small side gully within the large gully on the west side of the Pioneer Mine. This small gully is southwest of the mine location.

Spring 7 There is a small area of seepage downslope of Trench TP-26. Vegetation indicates this to be a probable seepage area. There is a Home Depot flag approximately 100 feet downslope. Channel below this point is incised approximately four feet.

Spring 8 There is an area of apparent seepage as indicated by vegetation at a location that is approximately ¼ mile downstream of Spring 7. This appears to be off the Matulich property. There is also another area of seepage approximately another 100 feet downstream.