APPENDIX G

GEOTECHNICAL REPORT

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT for IDAHO-MARYLAND MINING CORPORATION PROPERTY
Nevada County, California

Prepared for:
Idaho-Maryland Mining Corp.
179 Clydesdale Court
Grass Valley, California 95945

Prepared by:
Holdrege & Kull
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Project No. 2416-03
October 25, 2004

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

Project No. 2416-03
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Idaho-Maryland Mining Corp.
179 Clydesdale Court
Grass Valley, California 95945

Attention: Ross Guenther

Reference: ***Idaho-Maryland Mining Corporation Property***
Idaho-Maryland Mine, New Brunswick, and Roundhole Easement Sites
Nevada County, California

Subject: ***Preliminary Geotechnical Engineering Report***

Dear Mr. Guenther:

This report presents the results of our preliminary geotechnical engineering investigation for three sites on Idaho-Maryland Mining Corporation property. The Idaho-Maryland site encompasses 101 acres and is located south of Whispering Pines Lane and north of East Bennett Road near Grass Valley, California. The 37-acre New Brunswick site is located southwest of the intersection of Brunswick Road and East Bennett Road. The one-acre Roundhole Easement site is located north of Whispering Pines Lane near its intersection with Brunswick Road. We understand that, as currently proposed, the project will include the construction of industrial facilities associated with proposed mining on the Idaho-Maryland Site.

The preliminary findings presented in this report are based on a cursory surface reconnaissance at the site; review of selected geologic, soil survey and historical references; review of previous reports for the property; and our experience with subsurface conditions in the area. Based on our preliminary findings, the project as currently proposed appears to be feasible from a geotechnical engineering standpoint. We should be allowed to perform a subsurface investigation to confirm our preliminary recommendations as part of a design-level geotechnical engineering report. Furthermore, we should be allowed to perform testing and observation services during grading to confirm our design-level recommendations.

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Please contact us if you have any questions regarding our observations or the preliminary recommendations presented in this report.

Sincerely,

HOLDREGE & KULL

Prepared by:	Reviewed by:
Zack Washburn Staff Geologist	Jason W. Muir C.E. 60167

copies: 6 to Idaho-Maryland Mining Corp. (one unbound)

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SHEETS

Sheet 1 Approximate Site Map

APPENDIX

Important Information About Your Geotechnical Engineering Report (included with permission of ASFE, Copyright 2004)

1 INTRODUCTION

At the request of Idaho-Maryland Mining Corporation (IMMC), Holdrege & Kull (H&K) performed a preliminary geotechnical engineering investigation of Idaho-Maryland Mining Corporation property in Nevada County, California. For your review, the Appendix contains a document prepared by ASFE entitled *Important Information About Your Geotechnical Engineering Report*, which summarizes the general limitations, responsibilities, and use of geotechnical reports.

1.1 SITE DESCRIPTION

The project includes three sites on IMMC property. The Idaho-Maryland site encompasses 101 acres and is located south of Whispering Pines Lane and north of East Bennett Road near Grass Valley, California. The 37-acre New Brunswick site is located southwest of the intersection of Brunswick Road and East Bennett Road. The one-acre Roundhole Easement site is located north of Whispering Pines Lane near its intersection with Brunswick Road. The sites are currently in an unincorporated portion of Nevada County adjacent to the city limits of Grass Valley, California. Site boundaries are shown on the attached Sheet 1.

1.2 PROPOSED IMPROVEMENTS

Our understanding of the project as currently proposed is based on our conversation with Mr. Ross Guenther and our review of a conceptual site plans prepared by IMMC dated May 2004. We understand that, as currently proposed, the project will include the construction of industrial facilities associated with proposed mining on the Idaho-Maryland site. A grading plan for the project was not available for our review.

1.3 PURPOSE

The purpose of our preliminary geotechnical investigation was to review pertinent geologic, soil survey and historical information; to review a report previously prepared by H&K; and to observe the site to assess the feasibility of development from a geotechnical engineering standpoint.

1.4 SCOPE OF SERVICES

To prepare this report, we performed the following scope of services:

- We performed a cursory reconnaissance of the site.
- We reviewed selected geologic and soil survey literature.
- We reviewed selected historical maps and literature pertinent to historic mining activity in the vicinity of the site.
- We reviewed our *Preliminary Geotechnical Engineering Report for Milco and Platner Property*, dated April 22, 2003, that pertains to a portion of the subject property.
- Based on observations made during our site reconnaissance, the results of our literature review and our experience with soil conditions in the area, we prepared this report, which provides preliminary geotechnical engineering recommendations for the proposed improvements.

2 SITE INVESTIGATION

The following sections summarize our literature review and field reconnaissance.

2.1 GEOLOGIC SETTING

We reviewed the Geologic Map of the Grass Valley - Colfax Area (A. Tuminas, 1983). According to this map, the Idaho-Maryland site is underlain by early Mesozoic rock associated with the Lake Combie complex. The geology of the western portion of the site is characterized by serpentinized rock. The central portion of the site is underlain by gabbro and diorite and the eastern portion is characterized by massive diabase. The Mesozoic era occurred between approximately 245 and 65 million years before present (MYBP).

The central portion of the New Brunswick site lies on Quaternary alluvium (i.e., water lain sediments deposited in the past 2 million years); the flanks of the site are underlain by massive diabase of the Lake Combie complex.

The northern portion of the Roundhole Easement site is underlain by massive diabase, and the southern portion is characterized by serpentinized rock.

2.2 SITE SOIL CONDITIONS

2.2.1 Idaho-Maryland Site

We reviewed the *Soil Survey of the Nevada County Area, California* (USDA Soil Conservation Service, reissued August 1993). The soil survey indicates that the undisturbed portions of the southwestern part of the Idaho-Maryland site are located in an area typified by Secca-Rock outcrop complex. The soil survey describes the Secca soil type as moderately well drained soil underlain by metabasic or basic rock. Permeability is slow, and partly weathered basic rock is typically encountered at a depth of approximately 45 inches below the ground surface (bgs). Rock outcrop typically comprises 10 to 40 percent of the surface area typified by this complex. The undisturbed portions of the eastern side of the site are located in an area typified by Sites loam. The soil survey describes the Sites soil type as well drained soil underlain by tilted metasedimentary and metabasic rock. Weathered metasedimentary and basic rock is typically encountered at a depth of approximately 78 inches bgs. Permeability is moderately slow. The southern central portion of the site is classified by the soil survey as cut and fill land, which has been altered by methods other than mining. The survey states that deep accumulations of bark may be present at locations previously used as logging deck yards or lumber stack yards. The northwestern portion of the site is underlain by Placer diggings, according to the survey. This soil type occurs along drainage ways that have been placer mined and is typically comprised of gravel with little fines.

2.2.2 New Brunswick Site

The southwestern part of the New Brunswick is underlain by Aiken Loam according to the soil survey. The soil survey describes the Aiken Loam as a well-drained soil that forms on the sides of andesitic flows. According to the survey, permeability of the Aiken Loam soil type is moderately slow and weathered andesite is commonly encountered at about 64 inches bgs. The central portion of the site is characterized by Placer diggings while the northeastern portion is classified as clayey Alluvial Land. The soil survey describes clayey Alluvial Land as a miscellaneous land type consisting of narrow areas of alluvial deposits. These soils are moderately well drained to poorly drained and permeability is moderately slow to very slow.

2.2.3 Roundhole Easement Site

The Roundhole Easement site lies entirely on Secca-Rock outcrop complex according to the soil survey. The properties of this soil type are described above.

2.3 HISTORICAL RESEARCH

We reviewed portions of the following documents pertaining to historic mining activities in the immediate vicinity of the subject property.

2.3.1 Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California

2.3.1.1 Idaho-Maryland Site

The Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California (1939) contained in *The Gold Quartz Veins of Grass Valley, California* (W.D. Johnston, Jr., Geological Survey Professional Paper 194, U.S. Department of the Interior, 1940) depicted the Maryland Mine north of the subject property on the Eureka-Idaho-Maryland vein. The vein strikes west-northwest and dips 50 to 70 degrees to the south-southwest. An underground inclined shaft extended south and southeast from the Maryland Mine. This shaft lies north of the northern boundary of the site, according to the map.

The Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California (1939) shows the South Idaho vein striking west-northwest across the central portion of the site. The vein dips 60 degrees to the south. The South Idaho shaft is shown in the alignment of the vein. A horizontal or inclined tunnel is shown striking east along the vein within the southeast portion of the site.

According to *The Gold Quartz Veins of Grass Valley, California* (W.D. Johnston, Jr., Geological Survey Professional Paper 194, U.S. Department of the Interior, 1940), the Idaho-Maryland shaft inclined to the 1000-foot level at an angle of 70 degrees. The Canyon (or Cañon) shaft, an inclined winze raking to the east from the 1000-foot level, was advanced as far as the 1900-foot level to a depth greater than 2,500 feet bgs. The Eureka-Idaho-Maryland vein strikes north 77 degrees west and has an average dip of 70 degrees southwest, ranging between 50 and 80 degrees. The hanging wall is composed of diabase and gabbro and the footwall is composed of serpentine.

2.3.1.2 New Brunswick Site

The Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California (1939) shows Union Hill Mine in the western part of the site on the Union Hill vein. The vein strikes northwest and dips between 50 and 90 degrees to the southwest. An underground inclined shaft extended south-southwest from the Union Hill Mine beneath the site. The Union Hill shaft was advanced to about 1050 feet bgs, according to the researched documents.

The Lucky and Cambridge shafts lie a few hundred feet west of the site. These shafts are vertical and intersect the Lucky Cambridge vein, which parallels the Union Hill vein. The Lucky shaft was apparently advanced to the 300-foot level, but the depth of the Cambridge shaft is not stated in the *The Gold Quartz Veins of Grass Valley, California* report. The New Brunswick (shown as Brunswick on the map) vertical shaft was included on the 1939 map, but no description of the shaft dimensions was included in the report.

2.3.1.3 Roundhole Easement Site

No information on the Roundhole shaft is provided in the *The Gold Quartz Veins of Grass Valley, California* or shown on the Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California (1939). The approximate location of the Roundhole shaft, as shown on Sheet 1, was provided by IMMC.

2.3.2 Mines and Mineral Resources of Nevada County

We reviewed the *Mines and Mineral Resources of Nevada County* (Errol MacBoyle, California State Mining Bureau, December 1918). This publication contained information regarding the Eureka-Idaho-Maryland vein that was discussed above, and contained additional information regarding the South Idaho Mine. The South Idaho vein is located approximately 1500 feet south of and parallel to the Eureka-Idaho-Maryland vein. The vein is located in diabase and gabbro, strikes north 85 degrees west, and dips 70 degrees to the south. The lode was developed by inclined shaft only to a depth of 155 feet at the time of the 1918 publication. A crosscut was driven south for a distance of 12 feet at a depth of 60 feet, and drifting was performed at the 100-foot level for a distance of 25 feet to the south. A tunnel was driven a distance of 800 feet on the vein east of the shaft location.

This publication also contained information regarding the Union Hill vein and shaft that was discussed above, but did not provide any information on the New Brunswick, Lucky, or Cambridge shafts.

2.3.3 Map of the Grass Valley Quadrangle included in the Nevada City Special Folio, California

The Map of the Grass Valley Quadrangle included *Nevada City Special Folio, California* (United States Geologic Survey, 1896) depicted the features described above that were shown on the 1939 Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California.

2.3.4 Map Showing Mining Properties of the Grass Valley Mining District, Nevada County, California

2.3.4.1 Idaho-Maryland Site

The Map Showing Mining Properties of the Grass Valley Mining District, Nevada County, California (Division of Mines, 1930) showed the Idaho-Maryland site as being located within the Idaho-Maryland Mining Company claim. The map also depicted the Idaho-Maryland vein and shaft, as well as the South Idaho vein and shaft, as discussed above for the 1939 Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California.

2.3.4.2 New Brunswick Site

The Map Showing Mining Properties of the Grass Valley Mining District, Nevada County, California (Division of Mines, 1930) showed the New Brunswick site as being located within the Idaho-Maryland Mining Company claim. The map also depicted the Union Hill vein and shaft, as well as the New Brunswick shaft, as discussed above for the 1939 Geologic Map of the Grass Valley Quadrangle and Adjacent Area, Nevada County, California.

2.3.4.3 Roundhole Easement site

The Map Showing Mining Properties of the Grass Valley Mining District, Nevada County, California (Division of Mines, 1930) did not show the Roundhole shaft, but did depict the area of the Roundhole shaft as being within the Idaho-Maryland Mining Company claim.

2.4 REVIEW OF OTHER REPORTS

In our 2003 *Preliminary Geotechnical Engineering Report for Milco and Platner Property*, we reviewed a report prepared by Neil O. Anderson and Associates, Inc. entitled *Preliminary Geotechnical Investigation, Grass Valley Business and Professional Park Between Idaho Maryland and East Bennett Rd, Grass Valley, California* (August 15, 1991). The 1991 investigation included the excavation of 22 exploratory trenches on portions of the Idaho-Maryland site. The trenches ranged from 2.5 to 13.5 feet deep.

The Anderson and Associates report described two previously graded areas on the Idaho-Maryland site that have loose, organic fill. One previously graded area lies in southeastern part of the site at the base of a cut slope. Fill up to 3.5 feet deep was encountered in the exploratory trenches excavated on the northern portion of this previously graded area. The fill was generally described as sand and gravel with organic material and occasional larger rock. Fill deeper than 13.5 feet was encountered in the exploratory trenches excavated on the southern end of this area. The fill was generally described as clay with abundant wood debris, as well as sand and gravel. There are no proposed structures shown on the site plan in the vicinity of the eastern previously graded area.

The other previously graded area lies in the southern part of the Idaho-Maryland site beneath the proposed employee parking area. Fill up to 4 feet deep was encountered in the exploratory trenches excavated on the perimeter of this area. The fill was generally described as sawdust, wood chips, clay, sand and gravel.

Atterberg Limits testing was performed using five bulk samples of clay soil obtained from depths ranging from 2.5 to 5.5 feet bgs in the exploratory trenches. Plasticity Indices ranged from 13 to 32, and Liquid Limits ranged from 37 to 57.

The Anderson and Associates report concluded that the relatively loose, organic fill onsite would not be suitable to support structural improvements.

We did not review any reports that pertain to the New Brunswick or Roundhole Easement sites.

2.5 FIELD INVESTIGATION

We performed a surface reconnaissance of the project sites on October 15 and 18, 2004 to observe near surface soil conditions and visible evidence of potential geologic hazards that may be present.

2.5.1 Surface Conditions

2.5.1.1 Idaho-Maryland Site

We have subdivided the Idaho-Maryland site into three sections to clarify discussion of the surface conditions at this site. We define the main area, southern area, and the southeastern area based on proposed use and topography.

The main area occupies the largest portion of the site and will include the ceramics plant and the majority of the other proposed improvements. The main area is located in the northwest part of the Idaho-Maryland site and had topography that slopes gently to the northwest. The slopes ranged from less than 5 percent along the perimeter of the main area to about 25 percent beneath the ceramics plant. The gently sloping areas (<5%) appeared to have been previously graded and much of their surfaces were covered with waste rock, presumably associated with past hard rock mining. The steeper slope in the vicinity of the proposed ceramics plant was covered with piles of waste rock up to 10-feet in height. A ditch also crossed this slope in the vicinity of the proposed ceramics plant. The western part of the central area was relatively flat lying and had patchy areas of sandy material on the surface. Two approximately 40-foot high reinforced concrete towers were seen in the northwestern portion of the main area. Site elevations ranged from approximately 2490 feet above mean sea level (MSL) near the concrete towers to 2560 feet above MSL in the northeastern part of the main area.

Topography of the southern area was dominated by the western end of a small, west-trending ridge and the land that sloped away from the ridge to the north, south and west. The native soil had been cut from the ridge top and deposited along the edges of the resulting flat-lying area. A short, timber crib wall retained less than 5 feet of fill on the southern edge of the previously graded area, immediately north of a dirt access road. The remainder of the property appeared to consist primarily of undisturbed native soil. Elevations ranged from approximately 2620 feet above MSL on the ridge near the eastern property boundary to approximately 2530 feet above MSL near the southwest property corner. Slope gradients ranged from approximately 2 to 8 percent on the previously graded ridge top and from approximately 2:1, horizontal to vertical (H:V) on the land sloping away from the ridge.

The southeastern area contains the previously graded area, cut slopes, and a steep natural slope along the eastern boundary. The southeastern area was relatively flat-lying and characterized by extensive cut and fill associated with past lumber milling activities. Several relic foundations, apparently associated with the past lumber mill, as well as a concrete slab-on-grade and a pile of large concrete fragments, were observed within the previously graded area. Cut slopes on the east side of the graded area were up to 30 feet in height, and slope gradients ranged from approximately 1:1, horizontal to vertical (H:V), to near vertical. Significant residual rock structure was observed in the soil exposed in the cut slope faces. Elevations in this area ranged from approximately 2590 feet above MSL on the graded area at the toe of the cut slope to approximately 2730 feet above MSL near the eastern site boundary. Slope gradients were generally less than 10 percent, excluding the natural slope, the cut slope, and a relatively steep fill slope located on the southern end of the historic mill area.

2.5.1.2 New Brunswick Site

The New Brunswick site sits in a valley created by the South Fork of Wolf Creek. The site is bounded by Bennett Road to the north, a pond and associated dam to the east, and a steep slope (60%) to the south. Elevations across the site ranged from 2540 feet above MSL at the western site boundary to roughly 2750 feet above MSL around the New Brunswick Mine area. The site consisted of the generally flat lying surfaces around the New Brunswick Mine, gently sloping open fields and tree covered areas extending downstream of the dam, and steep slopes along the southern part of the site.

Deep fill was apparent in the vicinity of the New Brunswick Mine workings. We also observed the mine silo, concrete slabs-on-grade, and the covered New Brunswick shaft in this area.

The gently sloping surfaces along the valley floor were covered with thick vegetation and we could not evaluate the nature of the material in this area.

We observed concrete walls and waste rock piles associated with the Union Hill shaft in the northwestern part of the site. We also observed numerous waste rock piles on the northeast facing slopes across from the Union Hill shaft. These piles were up to 10 feet in height and were likely associated with mining from the Cambridge shaft and nearby exploration.

2.5.1.3 Roundhole Easement Site

The Roundhole Easement site lies on the slope immediately north of Whispering Pines Lane. The proposed site consists of a 300-foot long access road and 300-foot diameter circular area according the site plan. We observed a north facing 25 percent slope along the access road and a shallower northeast facing 15 percent slope in the circular area. Elevations across the site ranged from 2705 feet above MSL at the top of the access road to 2640 feet above MSL at the lowest part of the site. We observed the remains of a concrete structure and waste rocks piles in the northern part of the site. These features were likely associated with the Roundhole shaft.

2.5.2 Surface and Groundwater Conditions

We did not observe standing water at either the Idaho-Maryland site or the Roundhole Easement site. However, the ground surface of the flat lying portions of both sites were saturated from recent rain.

The South Fork of Wolf Creek trends northwest through the center of the New Brunswick site. The low-lying areas downstream of the dam were covered with marsh vegetation, but we did not observe standing water in these areas at the time of our site visit, which was performed at the end of the dry season. However, we observed flowing water in the South Fork of Wolf Creek.

3 LABORATORY TESTING

Laboratory testing was not included in the scope of our preliminary geotechnical engineering investigation. Laboratory testing would be required as part of a design-level geotechnical engineering investigation for the project.

4 CONCLUSIONS

The following conclusions are based on our field observations and our experience in the area.

- Based on the results of our preliminary geotechnical investigation, our opinion is that the project is feasible from a geotechnical standpoint. The recommendations contained in this report are preliminary in nature and should not be used for construction.

- Based on our review of geologic maps pertaining to the subject sites, we do not anticipate that naturally occurring asbestiform minerals will be encountered in the native soil/rock encountered in the majority of the three sites. However, the western edge of the Idaho-Maryland site was mapped as serpentine and may contain natural asbestiform minerals. In addition, material that may have been imported to the sites may contain asbestiform minerals, although we did not encounter evidence of asbestiform minerals during our site reconnaissance. The State of California Environmental Protection Agency and Air Resources Board have recognized asbestos as a carcinogen. Grading in areas of fibrous serpentinite rock typically requires an asbestos dust mitigation plan. The plan would address engineering controls, air monitoring, laboratory testing, special handling and input from local regulatory agencies.

- Our primary concern, from a geotechnical standpoint, is the presence of relic mine features at the three sites and the presence of fill in portions of the previously graded areas of the Idaho-Maryland site and New Brunswick site. We observed and performed field density testing during fill placement in the area of the New Brunswick shaft, as summarized in our letter dated February 5, 1997. Much of the fill encountered during a previous subsurface investigation performed by others at the Idaho-Maryland site reportedly contained organic material that would not be suitable to support structural improvements. We anticipate that the relatively shallow fill across much of the southern area would be able to be removed or, if deemed suitable for the purpose, used for compacted fill. However, the deeper fill encountered by others in the southeastern area would likely require extensive excavation and would not likely be able to be reused due the reported abundance of organic materials.

- The disturbed material and waste rock identified in the northwestern part of the Idaho-Maryland site and at the New Brunswick site may not be suitable to support structural improvements.

- Waste rock piles cover portions of the Idaho-Maryland, New Brunswick, and Roundhole Easement sites. In general, these piles are not suitable to support structural improvements. The waste rock piles in the area of the proposed ceramic plant would likely have to be removed prior to construction.

- The most notable historic mining features documented on the site were the New Brunswick shaft; the Roundhole shaft; the South Idaho shaft; and a horizontal tunnel that extends east along the South Idaho vein in the southeastern part of the site. If improvements are planned in the immediate recorded mining features, the features should be identified, if possible, and closed per the recommendations of H&K or another qualified engineer. We would be able to provide closure recommendations as part of a design-level geotechnical engineering report.

- Based on our experience in the area, relatively shallow, resistant rock may be encountered in portions of the site during grading or excavation for utilities. Preliminary recommendations for resistant rock are presented in the following section. Subsurface soil and existing fill may also contain significant oversized rock and other large material that would require specific recommendations for use as fill. General recommendations for placement of oversized rock are also presented in the following section.

- Based on our experience in the area and our review of laboratory test results prepared by others, we anticipate that potentially expansive clay soil may be encountered in some portions of the site above relatively shallow, weathered rock. Expansive clay soil is typically encountered in this area in thin layers that require relatively modest design modification. General recommendations pertaining to expansive soil are presented in the following section.

- If the proposed improvements are to be located immediately above or below the relatively high cut slopes on the southeastern area of the Idaho-Maryland site, we anticipate that the slopes would require further evaluation.

- Other mine features may be present on or extending beneath the subject properties which were not identified during this preliminary investigation.

5 PRELIMINARY RECOMMENDATIONS

The following preliminary geotechnical engineering recommendations are based on our understanding of the project as currently proposed, our field observations, and our experience in the area. The recommendations are preliminary and should be verified by a design-level geotechnical engineering investigation.

5.1 GRADING

5.1.1 Clearing and Grubbing

Subgrade for fill placement, paved areas, and building pads should be cleared and grubbed of vegetation and other deleterious materials as described below.

1. Strip and remove organic surface soil (typically 0 to 2 inches in undisturbed areas) containing shallow vegetation and any other deleterious materials. Topsoil can be stockpiled onsite and used in landscape areas, but is not suitable for use as fill. The actual depth of stripping may vary across the site. We anticipate that deeper fill with organics will be encountered in portions of the previously graded areas.

2. Overexcavate loose fill, debris and/or other onsite excavations to underlying, competent material. Possible excavations include exploratory trenches excavated by others, mantles or soil test pits, mining features, and tree stump holes.

3. Remove all rocks greater than 8 inches in greatest dimension (oversized rock) from the top 12 inches of soil. Oversized rock should be placed in deep fill per the recommendations of the project geotechnical engineer, stockpiled for later use in landscape areas or stacked rock walls, or removed from the site.

4. Vegetation, tree stumps and exposed root systems, any other deleterious materials and oversized rocks not used in landscape areas should be removed from the site.

5.1.2 Preparation for Fill Placement

Upon completion of site clearing, grubbing and overexcavation, the exposed native soil should be observed by a representative of our firm prior to placement of fill at the project site. Fill placed on slopes steeper than 5:1, horizontal:vertical (H:V), should be benched into the existing slope to allow placement of fill in horizontal lifts.

5.1.3 Fill Placement

Fill should be placed according to the following guidelines:

1. Material used for fill construction should consist of uncontaminated, predominantly granular, non-expansive native soil or approved import soil. Rock used in fill should be no larger than 8 inches in diameter. Rocks larger than 8 inches are considered oversized material and should be placed in deep fill per the recommendations of the project geotechnical engineer, stockpiled for use in landscape areas or rock walls, or removed from the site.

2. Oversized material may be windrowed in deeper fill under the observation of a representative of the project geotechnical engineer. The windrows should be separated by at least one equipment width. Compacted fill should be worked into the sides of each windrow, and remaining voids should be filled with smaller rock. If the oversized material is to be incorporated into a rock fill that does not permit density testing by nuclear methods, the contractor should prepare a test fill during initial fill placement for observation and testing. The means and methods of subsequent fill placement will be evaluated for conformance with the approved test fill. Subsurface seepage should be addressed in areas of oversized rock placement and rock fill to reduce the chance of soil migration in the fill associated with groundwater seepage through the oversized material or rock fill.

3. Imported fill material should be predominantly granular, non-expansive and free of deleterious or organic material. If imported material is required to grade the site, it should be submitted to H&K for approval and laboratory analysis at least 72 hours prior to use as fill.

4. Clay soil, if encountered, may be used as fill if mixed with granular soil at a ratio determined by the project geotechnical engineer. A typical mixing ratio for granular soil to clay soil is four to one.

5. Fill should be uniformly moisture conditioned and placed in maximum 8-inch thick loose lifts (layers) prior to compacting.

6. All fill should be compacted to at least 90 percent of the maximum dry density per ASTM D1557. The upper 8 inches of fill in building footprints and paved areas should be compacted to a minimum of 95 percent of the maximum dry density per ASTM D1557.

7. The moisture content, density and relative compaction of all fill should be evaluated by our firm during construction.

5.1.4 Differential Fill Depth

To reduce the magnitude of differential settlement associated with variable fill depth beneath structures, we recommend that differential fill depths beneath structures should not exceed 5 feet. For example, if the maximum fill depth is 8 feet across a building pad, the minimum fill depth beneath that pad should not be less than 3 feet. If a cut-fill building pad is used in this example, the cut portion would need to be overexcavated 3 feet and replaced with compacted fill. As part of a design-level geotechnical investigation, we would be able to provide additional recommendations to reduce differential settlement for structures, such as the proposed ceramics plant, which are to be located in moderately sloping portions of the site.

5.1.5 Cut/Fill Slope Grading

1. Cut and fill slopes should generally be no steeper than 2:1, H:V. Based on our experience in the area, 1½:1, H:V, or steeper cut slope gradients may be possible in some areas that have significant rock structure. Allowable slope gradients must be verified based on the results of laboratory testing performed as part of a design-level geotechnical investigation.

2. Fill slopes should be constructed by overbuilding the slope face and then cutting it back to the design slope gradient. Fill slopes should not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

3. Benching during placement of fill on an existing slope must extend through loose surface soil into firm material, and be performed at intervals such that

no loose soil is left beneath the fill. An equipment width bench should be made at least every 5 vertical feet.

4. Our observation of rock outcrop and our experience in the area has shown that isolated areas of moderately or slightly weathered rock that is difficult to trench with conventional trenching equipment may be encountered in some portions of the site during grading or trenching. Pre-ripping, blasting, or splitting may be required in these isolated areas.

5.1.6 Erosion Control

Graded portions of the site should be seeded as soon as possible following grading to allow vegetation to become established prior to the rainy season. The following erosion control measures should be implemented for cut and fill slopes to reduce erosion.

1. Slopes should be hydroseeded or hand seeded/strawed with an appropriate seed mixture compatible with the soil and climate conditions of the site as recommended by the local Resource Conservation District office.

2. Following seeding, jute netting should be placed and secured over the slopes to keep seeds and straw from being washed or blown away. Tackifiers or binding agents may be used in lieu of jute netting. Surface water drainage ditches should be established at the top of all graded slopes to intercept and redirect surface water away from the slope face.

3. Under no circumstances should surface water be allowed to run over slope faces. The intercepted water should be discharged into natural drainage courses or into the on site storm water drainage system.

5.1.7 Subsurface Drainage

If grading is performed during or immediately following the rainy season, seepage may be encountered, particularly in the low-lying portions of the New Brunswick and Idaho-Maryland sites. If groundwater or saturated soil conditions are encountered during grading, we anticipate that dewatering may be possible by gravity or by installation of sump pumps in the excavation. Control of subsurface seepage at the base of fill areas can typically be accomplished by placement of an area drain or a strip drain. Underlying, saturated soil is typically removed and replaced with free draining, granular drain rock enveloped in geotextile fabric. Fill soil can be placed after placing the granular rock to an elevation that is higher than the encountered groundwater. Rock drains typically consist of open graded rock enveloped in a non-woven geotextile filter fabric such as Amoco 4546™ or equivalent. Drains should have a minimum 4-inch diameter, perforated, schedule 40, PVC pipe placed at the low point of the drain, inside the drainrock, with the perforations placed down. The PVC pipe should be sloped so that water is directed away from the fill placement area by gravity. Site specific subsurface drainage recommendations can be provided as part of a design-level geotechnical report.

5.1.8 Surface Water Drainage

Proper surface water drainage is important to the successful development of the project. We recommend the following measures to help mitigate surface water drainage problems:

1. Slope final grade in structural areas so that surface water drains away from buildings at a minimum 2 percent slope for a minimum distance of 10 feet.

2. Compact and slope all soil placed adjacent to building foundations such that water is not allowed to pond or infiltrate. Backfill should be free of deleterious material.

3. Direct downspouts to a closed collector pipe which discharges flow to positive drainage.

5.1.9 Construction Monitoring

Construction monitoring includes review of plans and specifications and observation of onsite activities during construction as described below.

1. We should be allowed to review the final grading plans prior to construction to determine whether recommendations presented in the design-level

geotechnical report have been implemented, and if necessary, to provide additional and/or modified recommendations.

2. We should be allowed to perform construction monitoring of earthwork grading performed by the contractor to determine whether our recommendations have been implemented, and if necessary, provide additional and/or modified recommendations.

5.2 FOUNDATION SYSTEMS

Our preliminary opinion is that shallow spread footings are suitable for support of structures across much of the subject site. Footings should be founded on native, undisturbed soil/rock or compacted, tested fill. Foundation design criteria and construction recommendations are typically provided as part of a design-level geotechnical engineering report.

If adverse subsurface conditions such as loose fill or expansive soil are encountered, such as the deeper fill documented in the eastern side of the Idaho-Maryland site, a deep foundation or removal and replacement of the fill may be required. Based on the larger material encountered by others in the deep fill, we do not anticipate that drilled piers would be appropriate at that particular location. We understand that improvement of this area is not currently proposed.

Footings should be deepened through expansive clay soil, if encountered at the base of the footing excavations. Expansive clay soil is occasionally encountered in relatively thin layers above the weathered rock in this area.

6 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this report:

1. Our professional services were performed consistent with the generally accepted geotechnical engineering principles and practices employed in northern California. This warranty is in lieu of all other warranties, either expressed or implied.

2. These services were performed consistent with our agreement with our client. We are not responsible for the impacts of any changes in environmental standards, practices or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report. This report is solely for the use of our client. Any reliance on this report by a third party is at the risk of that party.

3. If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in this report should be considered invalid by all parties. Only our firm can determine the validity of the conclusions and recommendations presented in this report. Therefore, we should be allowed to review all project changes and prepare written responses with regards to their impacts on our conclusions and recommendations. Subsurface investigation and laboratory testing will be required to develop design-level recommendations.

4. The analyses, conclusions and recommendations presented in this report are preliminary, based on site conditions as they existed at the time we performed our surface observations. The subsurface conditions should be confirmed by a design-level geotechnical investigation prior to construction.

5. Our scope of services did not include evaluating the project site for the presence of hazardous materials. Waste rock associated with historic mining has the potential to contain elevated metals concentrations which may pose a hazard to human health and water quality. Although we did not identify hazardous materials at the time of our field investigation, we understand that petroleum products have been released at the subject site. Project personnel should be careful and take the necessary precautions should hazardous materials be encountered during construction.

6. The findings of this report are valid as of the present date. Changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or the broadening of knowledge. Therefore, the recommendations presented in this report should not be relied upon after a period of two years from the issue date without our review.

SHEETS

**Sheet 1	Approximate Site Map**

APPENDIX ***IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT***

(included with permission of ASFE, Copyright 2004)

APPROXIMATE SCALE
1 INCH = 300 FEET

CONTOUR INTERVAL
5 FEET

LEGEND

(rock outcrop symbol)	APPROXIMATE LOCATION OF OBSERVED ROCK OUTCROP
LCsp	LAKE COMBIE SERPENTINIZED ROCK
LCmd	LAKE COMBIE MASSIVE DIABASE
LCgb	LAKE COMBIE GABBRO / DIORITE
Qa	QUARTERNARY ALLUVIUM
(adit symbol) Lucky Shaft	HISTORIC ADIT AND WASTE ROCK PILE INFORMATION PROVIDED BY: IDAHO–MARYLAND MINING CORPORATION
(vegetation symbol)	DENSE VEGETATION
(depression symbol)	DEPRESSION

NOTES

BASE MAP PREPARED BY:
IDAHO-MARYLAND MINING CORPORATION

TOPOGRAPHY SHOWN HEREON IS COMPILED FROM AERIAL SURVEY.

DESIGNED BY:	ZW
DRAWN BY:	DFD
DATE:	OCTOBER 2004
DRAWING NAME:	2416-03-FIG1
PROJECT No.:	2416-03

NO.	REVISIONS	DATE

APPROXIMATE SITE MAP FOR IDAHO–MARYLAND, NEW BRUNSWICK AND ROUNDHOLE EASEMENT SITES
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