



February 26, 2008
7-917-16181-0

Iron Mountain Quarry
c/o Layton & Sell Inc PS
12515 Willows Road NE, Suite 205
Kirkland, Washington 98034

Attention: John D. (Jack) Sell, P.E

Subject: Geologic and Geohazard Assessment
Shine Area Quarry
Jefferson County, Washington

Dear Jack:

AMEC Earth & Environmental, Inc. (AMEC) is pleased to submit this report describing our geotechnical and geologic assessment for the above-referenced site. The purpose of our evaluation was to provide information for the determination of the suitability of designating the area as a Jefferson County mineral resource land, and to evaluate the geologic hazards which may impact the proposed development.

As outlined in our proposal memorandum dated September 26, 2007, our scope of work was limited to a field reconnaissance, review of available documents and results of drilling and lab testing by others, and report preparation; no field explorations or laboratory testing were included. We received your written authorization for our evaluation on October 4, 2007. This report has been prepared for the exclusive use of Iron Mountain Quarry and their consultants, for specific application to this project, in accordance with generally accepted geologic and geotechnical engineering practice.

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SITE CONDITIONS

Location

The site is west of Hood Canal, in the Port Ludlow area of Jefferson County, Washington (see Figure 1, Location Map). The site is located on the north side of SR 104 between Beaver Valley Road and Teal Lake Road. The site is mainly located in the southeast quarter of Section 29, and partially in the southeast quarter of Section 30, the northeast quarter of Section 31, and the northwest quarter of Section 32, Township 28N, Range 1E, Willamette Meridian.

Project Description

Plans call for development of the site as a quarry for crushed rock aggregate. The phased mining proposed generally occurs in the central portions of the site. We understand maximum excavation depths will be on the order of 150 feet. The staging, processing and stockpile areas are to be located on the southwestern portion of the site. The drainage control pond is to be located in the southeast portion of the site.

Topography

The existing site topography is undulating, and includes a north-south trending ridge (see Figure 2). Maximum topographic relief is on the order of 300 feet, from elevation 340 feet atop the highest ridge on the north-central portion of the site, sloping to a low point next to an unnamed creek in the southeast corner of the site where the elevation is approximately 60 feet. Based on topographic mapping of the site, grades generally are in the range of 5 to 15 percent. Grades surrounding the ridges were measured to be on the order of 50 percent.

Surface Vegetation

Site vegetation consisted of second or third growth mixed deciduous and evergreen forest. In areas of thinner forest cover, we observed an understory of ferns, salal, wild grasses and scattered blackberry bushes.

Surface Water

South of the old quarry, standing water was observed. An un-named creek (tributary to Squamish Bay) was noted at the far southeast corner of the site. No other surface water or springs was noted at the time of our site visit in October 2007.

Soil Conditions

According to Soil Conservation Service mapping, the site is mantled by a thin layer of soils over basalt bedrock. The soil types are as follows:

- Mukilteo peat (Mu), a fibrous peat deposit occurring in basins and depressions (the mapped locations correspond to mapped wetland and seismic hazard areas, see Figure 3);
- Olete very gravelly silt loam, 0 to 30 percent slopes (OeD), described as a moderately permeable soil that is 20 to 30 inches thick, underlain by basalt bedrock;
- Olete very gravelly silt loam, 30 to 50 percent slopes (OeE), described as a steep soil on upland slopes in rough, broken country that has basalt outcrops and escarpments present in places; and
- Olete-Alderwood complex, 0 to 30 percent slopes (OID), described as 60 percent OeD and 40 percent Alderwood gravelly sandy loam, on gently rolling to hilly terrain.

Bedrock Conditions

According to geologic mapping in *Geology and Ground-Water Resources of Eastern Jefferson County, Washington Water Supply Bulletin 54 (1981)*, the site is underlain by Tertiary Eocene Volcanic basalt bedrock deposits, exposed in road cuts and rock cuts from Port Discovery southeastward to Squamish Bay. Geologic mapping shows a continuous deposit of the Tertiary Volcanic bedrock extending from the subject site (and the adjacent Shine Quarry) on the south to the Port Ludlow area approximately 3 miles to the northeast. This same deposit is described as comprising the rock at the Mats Mats quarry approximately 4 miles northeast of the subject site.

The Washington State Department of Natural Resources (DNR) on-line database describes the site geology as tholeiitic basalt flows, basaltic flow breccia, filled tubes, and volcanoclastic conglomerate; gabbro dikes and sills; locally contains thin interbeds of basaltic tuff, chert, red argillite, limestone and siltstone; rare andesite, dacite, and rhyolite; marine, pillow-dominated lower part grades into flow-dominated, partially non-marine near top with local columnar jointing; altered to palagonite, chlorite, zeolite, or epidote.

GEOLOGIC HAZARDS

We reviewed the Jefferson County Critical Areas ordinance mapping, and compared it to features we observed on the site at the time of our site reconnaissance. We have the following comments.

Seismic Hazard Areas

See Figure 3, Seismic Hazard Map. It appears that the north-south trending mapped seismic hazard corresponds to a topographically low area on the northwestern portion of the site. This roughly corresponds to Soil Conservation Service mapping for Mukilteo Peat deposits, and Jefferson County mapping of wetland areas. It appears the topographic closed depression, wetland, peat soils and seismic hazard area all describing the same site feature, however, the location is offset due to the precision of the mapping.

Based on our review, it appears this portion of the site is considered a seismic hazard due to the potential for liquefaction of the 20 to 30-inch thick peat soils. In our opinion, there is no other risk of seismic hazard on the site.

Mitigating Measures: Based on the phasing plans, we understand this topographic low wetland area would not be disturbed as part of site development. In our opinion, no further mitigating measures are required for this seismic hazard.

Unstable Slopes

See Figure 4, Landslide Hazard Map. A slight slope hazard is mapped for the north, central and southeastern margins of the site. A moderate slope hazard is shown to intersect a very small area on the southeastern edge of the subject property.

Based on our review, the slope hazard on the site is generally low. We understand site development would require removal of the soil overburden from the area to be mined for bedrock. This site grading would include cut and fill slopes in soil around the perimeter of the developed area.

Mitigating Measures: To preserve stability, site grading in soil will need to limit the inclination of temporary and permanent cut and fill slopes and control drainage. Cuts and fills in bedrock will be controlled as part of site quarrying operations.

Erosion Hazard Areas

See Figure 5, Erosion Hazard Map. No erosion hazards are mapped to intersect this property.

Mitigating Measures: To reduce the risk of future erosion hazards, exposed soils will need to be revegetated as soon as is practical. Sources of surface water run-on and run-off will also need to be controlled.

Groundwater Recharge Areas

See Figure 6, Critical Aquifer Recharge Areas. Based on mapping a critical aquifer recharge area is located at the extreme southeast corner of the property. Based on our review, no other aquifer recharge areas intersect the site.

Mitigating Measures: Surface water runoff from the site development should be directed away from the aquifer recharge area on the southeastern portion of the site. Phasing plans indicate this area will remain undisturbed.

MINERAL RESOURCE EVALUATION

Quality of Deposit

Geologic mapping indicates the site is underlain by Tertiary Eocene Volcanic deposits and rocks, of the Lower-middle Eocene Crescent Formation. The geology is described as tholeiitic basalt flows, basaltic flow breccia, filled tubes, and volcanoclastic conglomerate; gabbro dikes and sills; locally contains thin interbeds of basaltic tuff, chert, red argillite, limestone and siltstone; rare andesite, dacite, and rhyolite; marine, pillow-dominated lower part grades into flow-dominated, partially non-marine near top with local columnar jointing; altered to palagonite, chlorite, zeolite, or epidote. During our site visit, we observed bedrock outcrops and exposures (three large excavations, and cuttings around five test borings) consistent with the mapped bedrock description.

According to the WSDOT State Materials Laboratory Aggregate Source Database, the existing Shine Quarry (Site 164) is classified as variable, "due to the variability of the quality of material at this aggregate source, it can be approved ONLY on a project-by-project basis." This is also the designation for the existing Mats Mats Quarry (Site Y44) roughly 4 miles to the northeast of the site.

Engineering Properties of Deposit

There is one test result from 2002 posted for the Shine Quarry (Site 164): Compared to WSDOT specifications for Quarry Spalls and Riprap, (and other WSDOT Mineral Aggregate and Surfacing specifications), the properties are as follows:

- Specific gravity is 2.7 (greater than the specified 2.55 minimum) (pass);
- LA wear is 24 (less than 50% maximum)(other materials specs range from 30 to 50) (pass);
- Degradation Factor is 2 (less than 15 minimum)(other materials specs range from 15 to 30) (fail).

There is one test result from 2003 posted for the Mats Mats Quarry (Site Y44): Compared to WSDOT specifications for Quarry Spalls and Riprap, (and other WSDOT Mineral Aggregate and Surfacing specifications), the properties are as follows:

- Specific gravity is 2.789 (greater than the specified 2.55 minimum) (pass);
- LA wear is 19 (less than 50% maximum)(other materials specs range from 30 to 50) (pass);
- Degradation Factor is 5 (less than 15 minimum)(other materials specs range from 15 to 30) (fail).

It cannot be determined from the available information if these are single tests on a discrete sample, or the average of many tests.

Suitability as a Mineral Resource Land

In our opinion, the site is suitable as a non-metallic mineral resource deposit. The basalt bedrock deposits would be a suitable source for crushed aggregate, which can be screened to provide a wide variety of pit run products. The suitability as a WSDOT source for higher quality riprap, quarry spall and crushed aggregate will need to be determined on a case by case basis. This same bedrock deposit has been documented to provide such high quality materials on nearby sites, but will require selective mining, segregation and testing to demonstrate its suitability.

The only unsuitable portions of the deposit are the surficial peat deposits, and possibly the silty loam deposits. The peat deposits would be of limited extent, and only suitable for re-use as topsoil. The surficial loam deposits would also be suitable for re-use in landscaping and non-structural areas, and possibly in pond embankments. More granular portions of these upper soils could be considered for use in roadway, pond or other embankments.

CLOSURE

The conclusions and recommendations presented in this report are based, in part, on the reconnaissance and review that we performed for this study. AMEC would be pleased to submit a proposal for a design-phase evaluation after site grading and development plans have been established.

We appreciate the opportunity to be of service. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

Sincerely,

AMEC Earth & Environmental, Inc.

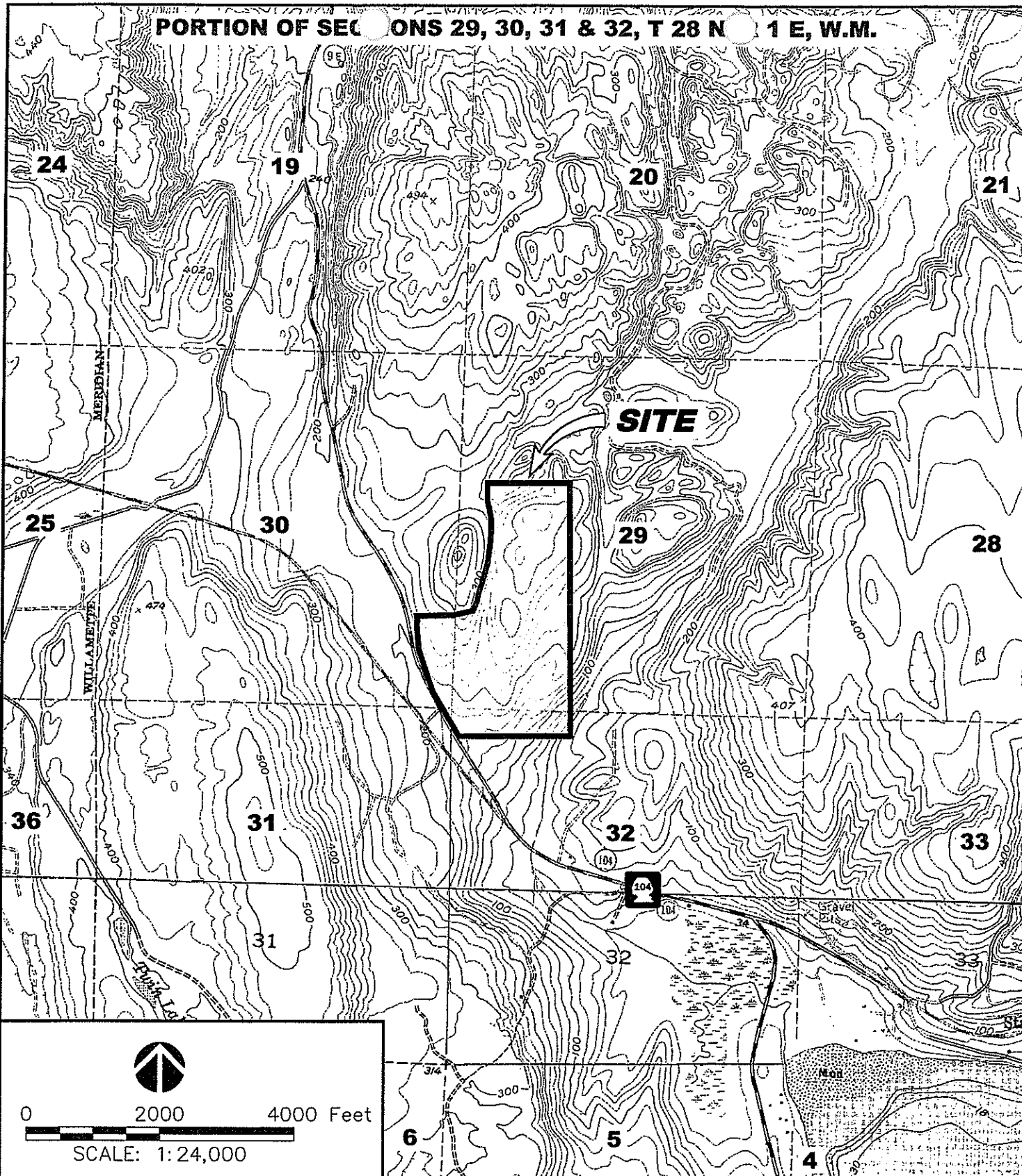
Henry W. Brenniman, L.G.
Senior Engineering Geologist

James S. Dransfield, P.E.
Principal Geotechnical Engineer

Attachments – Figures 1 to 6

JSD/HWB/clt

PORTION OF SECTIONS 29, 30, 31 & 32, T 28 N R 1 E, W.M.



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CLIENT LOGO

CLIENT

LAYTON & SELL, INC. P.S.
 IRON MOUNTAIN QUARRY

PROJECT IMQ-SHINE AREA PROJECT - JEFFERSON COUNTY, WA

DWN BY: JRS

DATUM: NAD83

DATE: FEBRUARY 2008

TITLE LOCATION MAP

CHK'D BY: HB

REV. NO.:

PROJECT NO: 7-917-16181-0

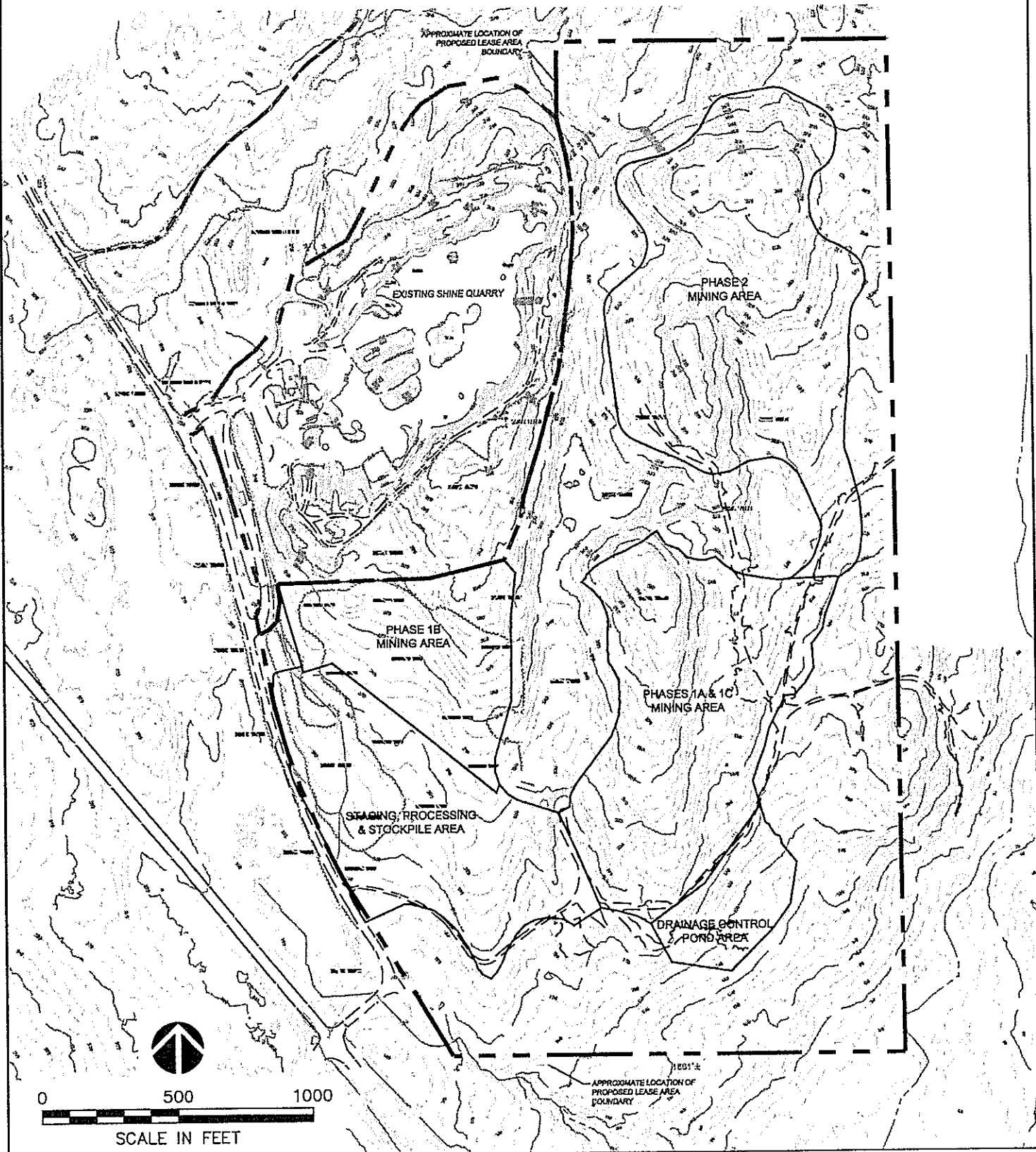
PROJECTION: WA STATE PLANE

SCALE: AS SHOWN

FIGURE No. 1

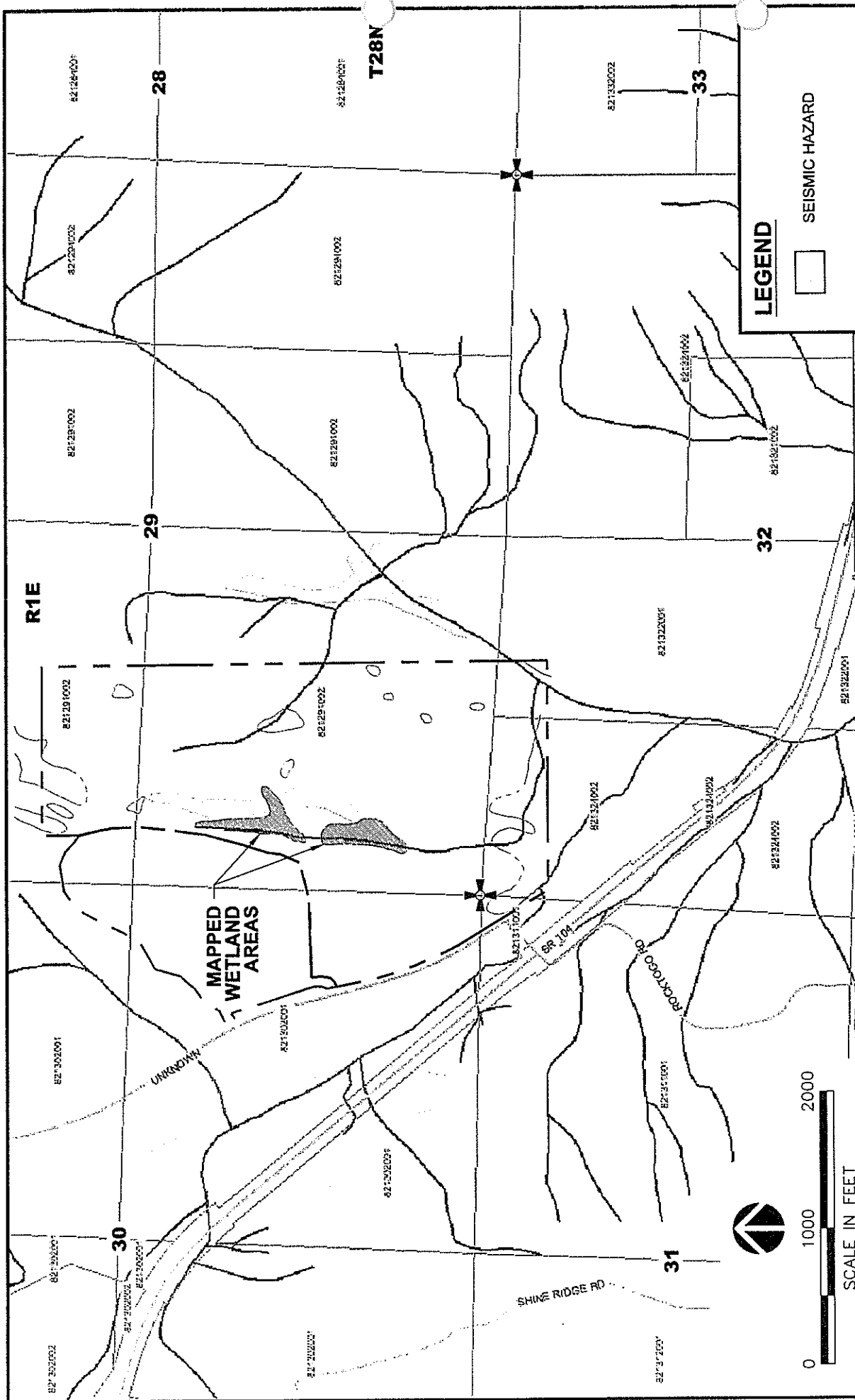
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PORTION OF SECTIONS 29, 30, 31 & 32, T 28 N, R 1 E, W.M.

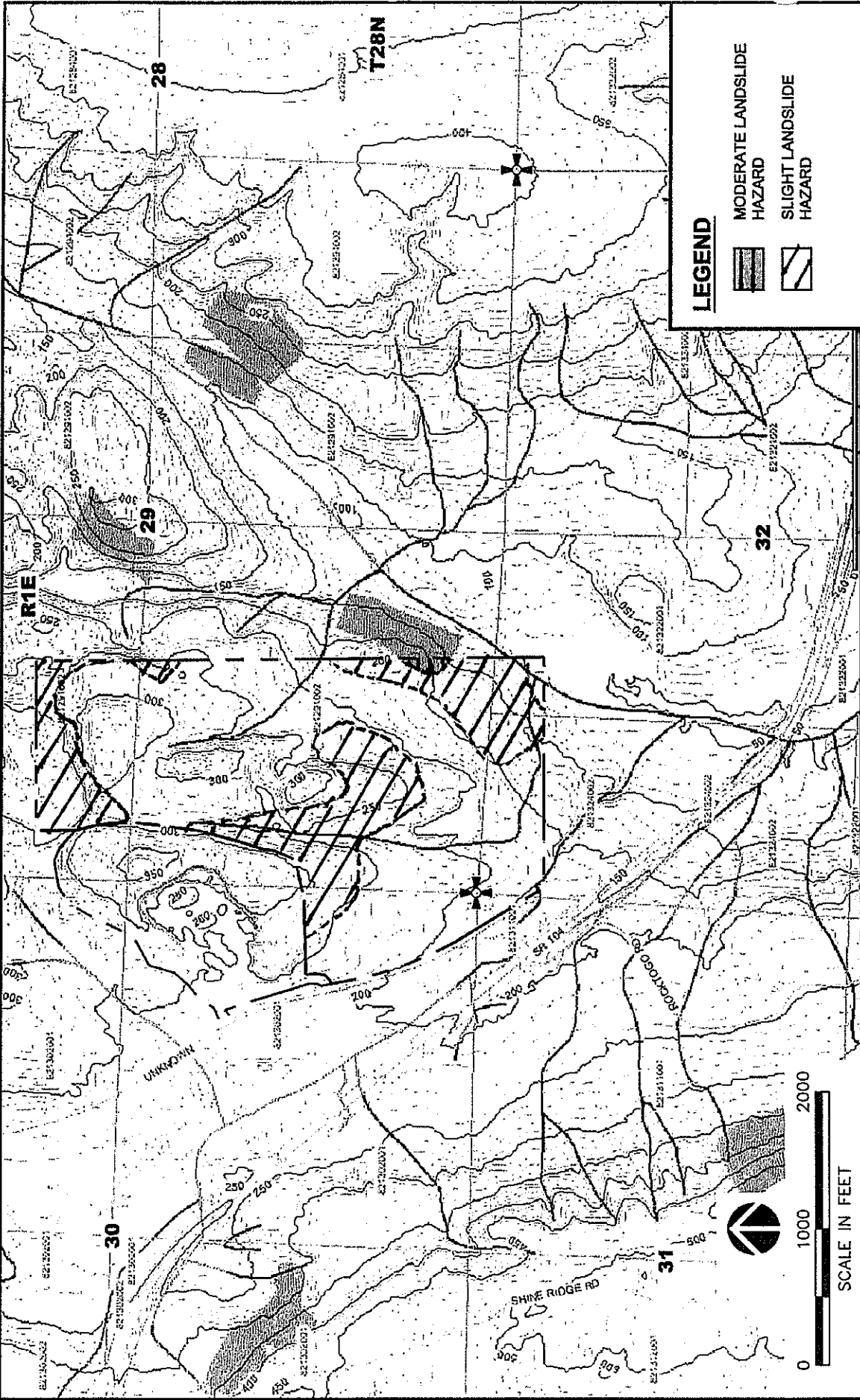


AMEC Earth & Environmental 11335 N.E. 122nd Way, Suite 100 Kirkland, WA, U.S.A. 98034-6918				CLIENT LOGO	CLIENT LAYTON & SELL, INC, P.S. IRON MOUNTAIN QUARRY
PROJECT IMQ-SHINE AREA PROJECT - JEFFERSON COUNTY, WA		DWN BY: JRS	DATUM: NAD83	DATE: FEBRUARY 2008	
TITLE CONCEPTUAL SITE PLAN		CHK'D BY: HB	REV. NO.:	PROJECT NO: 7-917-16181-0	
		PROJECTION: WA STATE PLANE	SCALE: AS SHOWN	FIGURE No. 2	



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CLIENT LOGO	CLIENT	PROJECT		REV. NO.:
		IMQ-SHINE AREA PROJECT JEFFERSON COUNTY, WA		DATE: FEBRUARY 2008
AMEC Earth & Environmental 11335 N.E. 122nd Way, Suite 100 Kirkland, WA, U.S.A. 98034-6918	ameco	TITLE		PROJECT NO.:
		JEFFERSON COUNTY CRITICAL AREAS SEISMIC HAZARD MAP		7-917-16181-0
		SCALE: AS SHOWN		FIGURE NO.:
		DWN BY: JRS	CHK'D BY: HB	3
		DATUM: WA STATE PLANE		
		PROJECTION: NAD83		

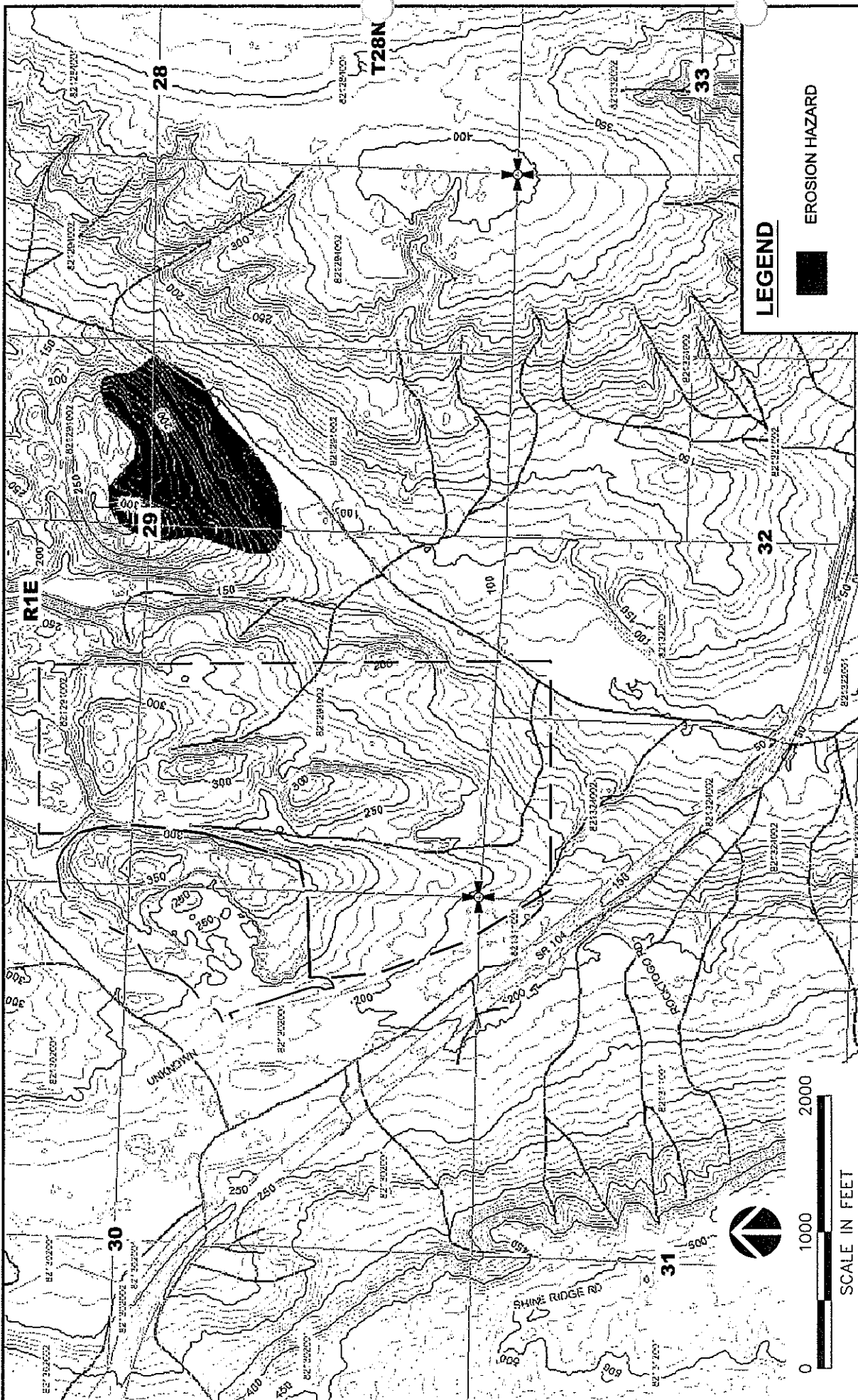


LEGEND

-  MODERATE LANDSLIDE HAZARD
-  SLIGHT LANDSLIDE HAZARD


CLIENT LOGO	CLIENT	LAYTON & SELL, INC, P.S. IRON MOUNTAIN QUARRY		PROJECT	IMQ-SHINE AREA PROJECT JEFFERSON COUNTY, WA		REV. NO.:	
		AMEC Earth & Environmental 11335 N.E. 122nd Way, Suite 100 Kirkland, WA, U.S.A. 98034-6918		DWN BY:	JRS	HB	DATE:	FEBRUARY 2008
CHK'D BY:					PROJECT NO.:	7-917-16181-0		
DATUM:	WA STATE PLANE			FIGURE NO.:	4			
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SCALE:		AS SHOWN						

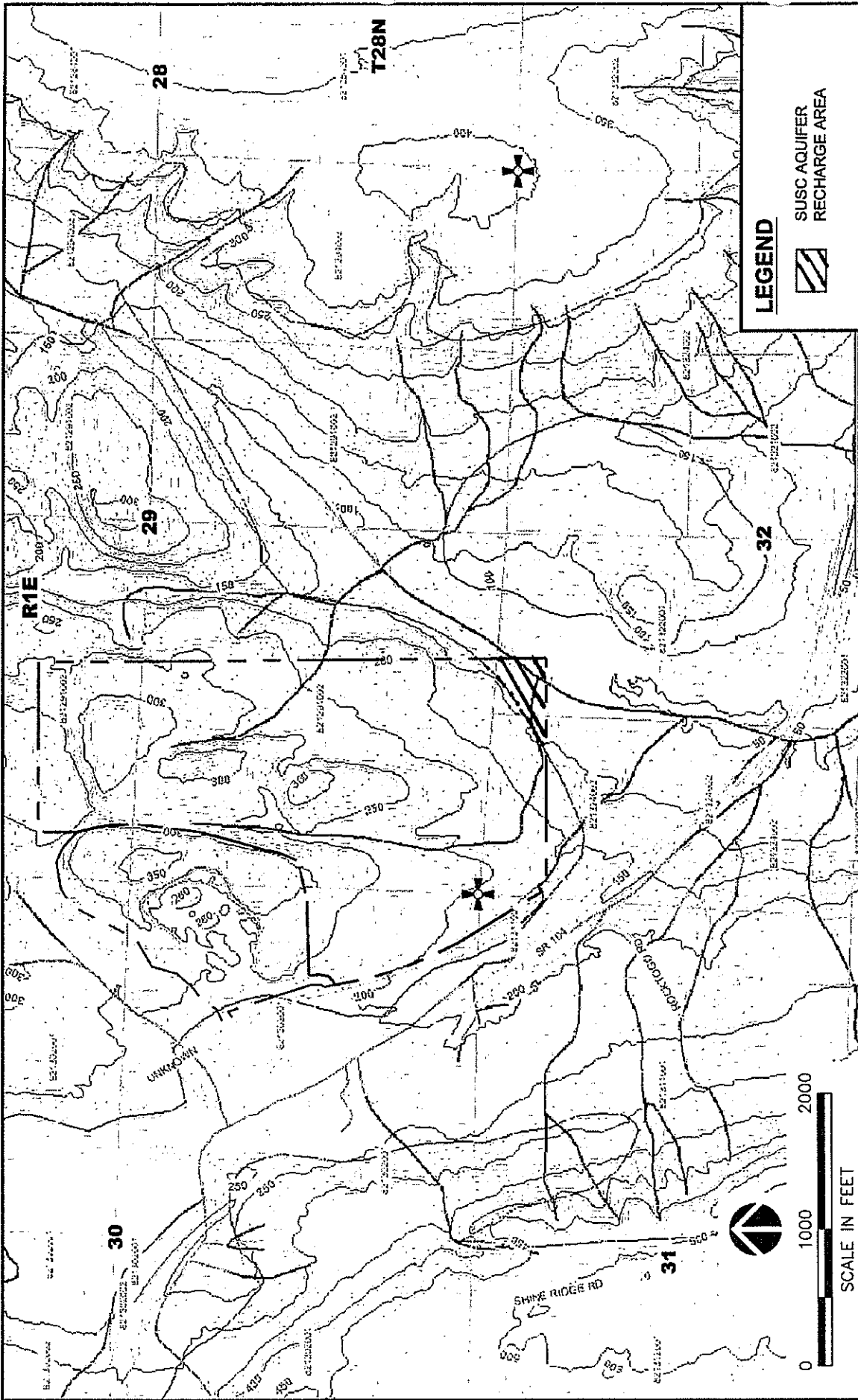
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LEGEND

■ EROSION HAZARD

CLIENT LOGO	CLIENT	LAYTON & SELL, INC, P.S. IRON MOUNTAIN QUARRY		PROJECT	IMQ-SHINE AREA PROJECT JEFFERSON COUNTY, WA		
		AMEC Earth & Environmental 11335 N.E. 122nd Way, Suite 100 Kirkland, WA, U.S.A. 98034-6916		DWN BY:	JRS	PROJECT	REV. NO.:
CHKD BY:	HB				DATE:	FEBRUARY 2008	
DATUM:	WA STATE PLANE			TITLE	PROJECT NO.:	7-917-16181-0	
		PROJECTION:	NAD83	EROSION HAZARD MAP		FIGURE NO.:	5
		SCALE:	AS SHOWN				



LEGEND
 SUSC AQUIFER RECHARGE AREA

CLIENT LOGO AMEC Earth & Environmental 11335 N.E. 122nd Way, Suite 100 Kirkland, WA, U.S.A. 98034-8918	CLIENT LAYTON & SELL, INC. P.S. IRON MOUNTAIN QUARRY	DWN BY: JRS CHK'D BY: HB	PROJECT IMQ-SHINE AREA PROJECT JEFFERSON COUNTY, WA	REV. NO.: DATE: FEBRUARY 2008
		DATE: WA STATE PLANE PROJECTION: NAD83 SCALE: AS SHOWN	TITLE JEFFERSON COUNTY CRITICAL AREAS CRITICAL AQUIFER RECHARGE AREAS	PROJECT NO.: 7-917-16181-0 FIGURE NO. 6

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