GeoEngineers

MEMORANDUM

COPY

Tacoma

TO: [redacted]

FROM: William Halbert, Terry Parks

DATE: March 20, 2000

FILE: 3890-004-00

SUBJECT: Results of Subsurface Explorations, Coski Property

GeoEngineers is pleased to provide this memorandum regarding our subsurface investigation at the former Coski Industrial Landfill located between 19th Street East and 12th Street East, west of 58th Avenue Northeast in Tacoma, Washington. The site is located near the top of a bluff that overlooks Marine View Drive and the eastern portion of Commencement Bay. We understand that the site was used as an unpermitted disposal site for construction and woodwaste debris from approximately 1970 until 1982. We understand that bilge-oil, roofing plant waste and petroleum-treater clay was also dumped at the site. We understand that Pacific Hansa, Inc. is interested in purchasing the site for development into residential homesites. The general outline of the proposed development is shown in the Site Map, Figure 1.

Our services were performed in general accordance with our proposal dated January 21, 2000. The chemical analytical portion of our services was suspended following the discovery of large amounts of wood waste in the fill soil on the site.

GeoEngineers excavated 14 test pits on the subject property using a Case 690 hydraulic excavator. The locations of the test pits are shown in the Site Map, Figure 1. Test pits were excavated to depths ranging from 7 to 19 feet below ground surface. Our staff geologist was present to log the materials encountered in the test pits, obtain representative soil samples for possible chemical testing, and monitor organic and combustible vapors encountered in the test pits.

Fill, consisting of soil and debris, was encountered in 11 test pits and ranged in thickness from 5 to 17 feet. The fill contained a mixture of debris including car parts, drywall and construction debris, rubber hoses, metal and pipes, tires, drums, and asphalt and concrete pieces. The fill also contained from 10- to over 30-percent organic debris consisting of wood waste and stumps. The fill material appeared to be relatively loose to moderately dense and did not appear to have been compacted during placement. Combustible vapors were encountered in the test pits at concentrations as great as 1,000 parts per million. Our test pit logs are included as attachments to this memorandum.

The presence of debris, primarily organic debris, in the fill soil will require extensive over excavation, segregation and disposal of unsuitable material, and replacement with structural fill to make suitable homesites and roadways. Organic debris should be expected to decompose over time and soil containing organic debris should be expected to settle over time. Soil settlement may cause failure of typical spread-footing foundations, cracking and warping of roadways, possible rupture of utilities and changes in the site drainage. Combustible organic vapors from the decomposing soil may collect in crawlspaces or

basements of houses, or utility vaults and create a safety hazard. Based on the soil conditions observed by GeoEngineers in our exploratory test pits, it would appear that the costs associated with developing the site as a residential subdivision would be much higher than for other properties in the Tacoma area.

Project	Job Number	Location
Coski Landfill	3890-004-00	Tacoma, Washington

LOG OF TEST PIT 01

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SOD	Brown silty fine to medium sand			OVM/TLV=0/<100	0
				SM					
				SP/SM	Blue and gray fine to medium sand with silt			OVM/TLV=0/<100	
				SM	Brown fine to medium sand				
5					Debris encountered include:			OVM/TLV=15.1/400	5
					Plastic hoses <1% by volume				
					Metal parts ~3% by volume				
					Organic debris >30% by volume				
10								OVM/TLV=0/600	10
								OVM/TLV=0/1000	
15								OVM/TLV=0/400	15
	1							OVM/TLV=0/460	
20					Test pit completed at 19.0 feet due to practical refusal on large trees/stumps on 02/17/00.				20
					No ground water seepage observed.				
					No caving observed.				

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 02

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SOD	Brown silty fine to medium sand			OVM/TLV=11.1/<100	0
				SM	Brown silty fine to medium sand with gravel		NS	OVM/TLV=0/100	
				SP/SM	Blue and gray fine to medium sand with silt				
				PT	Brown and black silty fine to medium sand and occasional gravel				
5				SP/SM	Organic debris/stumps ~15% by volume			OVM/TLV=0/200	5
				SM	Organic debris/stumps >30% by volume				
10							SS	OVM/TLV=0/400	10
	1				Organic debris/stumps ~20% by volume				
15					Test pit completed at 14.0 feet due to practical refusal on large trees/stumps on 02/17/00.				15
					No ground water seepage observed.				
20					No caving observed.				20

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

GEI ENV TEST PITS 3890004.GPJ GEI_CORP.GDT 3/14/00 3890-004-00

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LOG OF TEST PIT

FIGURE A-3

Project	Job Number	
Coski Landfill	3890-004-00	Tacoma, Washington

LOG OF TEST PIT 03

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SOD					0
				SM	Gray silty fine to medium sand and occasional gravel (medium dense, wet)		NS	OVM TLV=0/<100	
				SP/SM	Blue and gray fine to medium sand with silt (medium dense, wet)			OVM TLV=0/<100	
5				SM	Black silty fine to medium sand and occasional gravel				5
					Organic debris ~15% by volume				
				SM	Black silty fine to medium sand with gravel				
10	1			SM	Gray silty fine sand with gravel (very dense, moist) (till)		NS		10
					Test pit completed at 11.0 feet on 02/17/00.				
					No ground water seepage observed.				
					No caving observed.				
15									15
20									20

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 04

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SOD					0
				SP/SM	Orange and brown fine to coarse sand with silt, occasional gravel and cobbles (dense, moist) (weathered till)				
5				SM	Gray silty fine to coarse sand, occasional gravel and cobbles (very dense, moist) (till)				5
	1				Test pit completed at 7.0 feet on 02/17/00.				
					No ground water seepage observed.				
10					No caving observed.				10
15									15
20									20

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

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LOG OF TEST PIT

FIGURE A-4

Project	Job Number	Location
Coski Landfill	3890-004-00	Tacoma, Washington

LOG OF TEST PIT 05

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

Depth in Feet	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SP/SM	Brown fine to coarse sand with silt and occasional gravel (medium dense, moist)		NS	OVM/TLV=0/<100
				PT	Orange organic layer (loose, moist)		NS	OVM/TLV=0/<100
				SM	Brown and black silty fine to medium sand (medium dense, moist)		NS	OVM/TLV=0/110
5					Debris encountered include: Tires (3 seen) Metal pipe 10' long			OVM/TLV=0/210
					Organic debris/tree stumps ~30% by volume			
					Plastic Bags/bags (sacks ~concrete size)			
10				PT	Drywall - piece		SS	OVM/TLV=10/<100
				SM	Black organic layer (loose, moist)			
					Brown-black silty fine to medium sand (medium dense, moist)			OVM/TLV=0/<100
					Organic debris ~30% by volume			
15	1			SM	Grades to wet			OVM/TLV=0/<100
					Blue and gray silty fine to coarse sand with gravel (very dense, wet) (weathered till)			
					Test pit completed at 17.0 feet on 02/17/00.			
					No ground water seepage observed.			
20					No caving observed.			

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 06

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

Depth in Feet	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SM	Brown silty fine to coarse sand and occasional gravel (dense, moist)			
				SP/SM	Gray fine to coarse sand with silt (dense, moist)			OVM/TLV=15/<100
					Encountered 55-gallon drum and organic debris <5% by volume			
5					Grades to brown		SS	
					Encountered metal debris (pipe, car door handle, bed springs) ~5% by volume			
					Organic debris ~20% by volume			OVM/TLV=0/340
10					▽			
								OVM/TLV=0/410
15								OVM/TLV=0/160
	1			SM	Brown and gray silty fine to coarse sand and occasional gravel (very dense, wet) (till)			
					Test pit completed at 18.0 feet on 02/17/00.			
20					Rapid ground water seepage observed at approximately 10.0 feet bgs.			
					Moderate caving observed at approximately 9.0 feet.			

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

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LOG OF TEST PIT

FIGURE A-5

LOG OF TEST PIT 07

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SM	Brown silty fine to medium sand and occasional gravel (medium dense, moist)			
				SM	Black silty fine to coarse sand (medium dense, moist)			
5					Organic debris – 15% by volume			OVM/TLV=0/110
								OVM/TLV=0/200
10								OVM/TLV=0/600
				SM	Gray and blue silty fine to coarse sand with gravel (very dense, wet) (till)			OVM/TLV=0/100
15					Test pit completed at 13.0 feet on 02/17/00. Rapid ground water seepage observed at approximately 9.0 feet. Moderate caving observed at approximately 9.0 feet.			
20								

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 08

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SM	Brown silty fine to medium sand (medium dense, moist)			OVM/TLV=0/<100
				SP/SM	Brown and orange fine to coarse sand with silt and occasional gravel (dense, moist) (weathered till)			OVM/TLV=0/<100
5	1			SM	Gray silty fine to coarse sand with gravel (very dense, moist) (till)			OVM/TLV=0/<100
					Test pit completed at 8.0 feet on 02/17/00. No ground water seepage observed. No caving observed			
10								
15								
20								

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

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LOG OF TEST PIT

FIGURE A-6

Coski Landfill

LOG OF TEST PIT 09

Date Excavated: 2/17/00　　Logged by: SLM

Equipment: 690 Trackhoe　　Surface Elevation(ft): Not Measured

Depth in Feet	Sample No.	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0		SM	Brown silty fine to medium sand (medium dense, moist)			OVM/TLV=0/<100
		SP/SM	Brown fine to medium sand with silt and occasional gravel (medium dense, moist)			OVM/TLV=0/<100
			Encountered boulder at 2.5 feet			
5			Organic debris (including telephone pole) ~20% by volume			OVM/TLV=0/<100
			Organic debris ~5% by volume			
						OVM/TLV=0/<100
		SP/SM	Orange and brown fine to coarse sand with silt and occasional gravel (dense, wet) (weathered till)			OVM/TLV=0/<100
10	1	SM	Gray silty fine to coarse sand and occasional gravel (very dense, moist) (till)			
			Test pit completed at 12.0 feet on 02/17/00.			
			No ground water seepage observed.			
15			No caving observed.			
20						

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 10

Date Excavated: 2/17/00　　Logged by: SLM

Equipment: 690 Trackhoe　　Surface Elevation(ft): Not Measured

Depth in Feet	Sample No.	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0		SM	Brown silty fine to coarse sand (medium dense, moist)			OVM/TLV=0/<100
		SP/SM	Brown and black fine to coarse sand with silt and occasional gravel (medium dense, moist)			
		SP/SM	Blue and gray fine to coarse sand (medium dense, moist)			OVM/TLV=0/150
5		SM	Organic debris ~15% by volume			
			Brown and black silty fine to coarse sand and occasional gravel (medium dense, moist)			
			Debris encountered includes:			
			Asphalt/concrete chunks			OVM/TLV=0/200
10			Organic debris ~15% by volume			
			Concrete block			
			Grades to black			OVM/TLV=0/100
			Organic debris ~20% by volume			
15						OVM/TLV=0/100
	1	SP/SM	Gray and brown fine to medium sand with silt (dense, wet) (weathered till)			
			Test pit completed at 18.0 feet on 02/17/00.			
20			No ground water seepage observed.			
			No caving observed.			

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

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LOG OF TEST PIT

FIGURE A-7

LOG OF TEST PIT 11

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SM	Brown silty fine to medium sand (medium dense, moist)			
				SP/SM	Brown fine to medium sand with silt and occasional gravel (medium dense, moist)			
5					Debris encountered included: Organic debris ~15% by volume Thick nylon polyester rope Metal banding Organic debris ~20% by volume			
10								
15	1			SM	Gray silty fine to coarse sand (very dense, wet) (till)			
					Test pit completed at 16.0 feet on 02/17/00. No ground water seepage observed. No caving observed.			
20								

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 12

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes
0				SM	Brown silty fine to medium sand (medium dense, moist)			
				SP/SM	Brown and black fine to medium sand and occasional gravel (medium dense, moist) Organic debris ~10% by volume			
5	1			SM	Gray silty fine to coarse sand, occasional gravel and orange mottles (very dense, moist) (weathered till)			
					Test pit completed at 9.0 feet on 02/17/00. No ground water seepage observed No caving observed			
10								
15								
20								

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.
Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

GEOENV TEST PITS 3000001.GPJ GEO_COMP.GDT 3/13/00 10:00:00

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LOG OF TEST PIT

FIGURE A-8

LOG OF TEST PIT 13

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SM	Brown silty fine to medium sand (medium dense, moist)				0
				SM	Orange silty fine to medium sand (dense, moist) (weathered till)				
					Grades to gray and very dense (till)				
5	1								5
					Test pit completed at 7.0 feet on 02/17/00. No ground water seepage observed. No caving observed				
10									10
15									15
20									20

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

LOG OF TEST PIT 14

Date Excavated: 2/17/00 Logged by: SLM

Equipment: 690 Trackhoe Surface Elevation(ft): Not Measured

DEPTH IN FEET	Sample No.	Sample	Graphic Log	USCS Group Symbol	Material Description	Headspace Vapor (ppm)	Sheen	Other Tests And Notes	DEPTH IN FEET
0				SOD	Brown silty fine to medium sand and occasional gravel (medium dense, moist)				0
				SM	Orange and brown organic layer (loose, moist)				
				PT	Brown and black silty fine to coarse sand (medium dense, moist)				
				SM	Encountered debris (woody debris, tree stumps, tire, concrete chunks, hoses, belts, electrical wire, construction debris - concrete, roofing material) between 3.0 and 11.0 feet				
5									5
10									10
15	1			SM	Gray and brown silty fine to medium sand with gravel (very dense, moist) (till)				15
					Test pit completed at 15.0 feet on 02/17/00 No ground water seepage observed. No caving observed				
20									20

Notes: The depth of the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot. Headspace vapor readings conducted using a Bacharach TLV Sniffer and organic vapor meter (OVM).

GEOENV TEST PITS 2000001.GPJ GEO_CORP.GDT 3/14/00 7:09:00 AM

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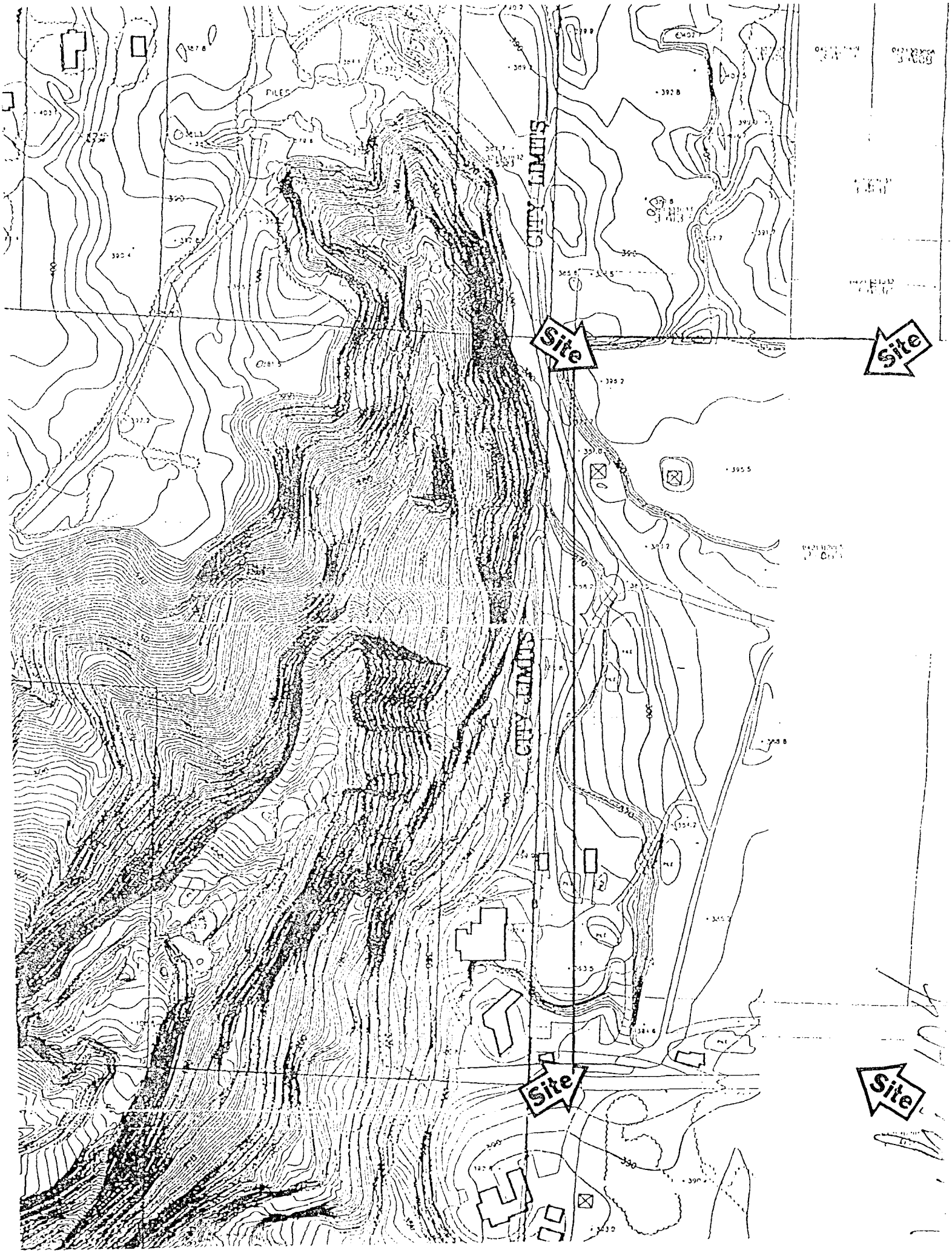
LOG OF TEST PIT

FIGURE A-9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