INTRODUCTION

The Linden Road landfill has been used as a dump site for various industrial wastes and refuse during the period of 1931 to 1971. Since that time the site has remained relatively inactive. General Motors - Chevrolet - Motor Division has expressed their desire to evaluate the potential hazardous nature of the buried wastes on the surrounding environment. In addition, it is their objective to establish a practical approach to renovating this parcel of land, making it safe and potentially useful.

Chevrolet Motor Division has retained the services of Keck Consulting Services, Inc. to investigate the landfill. Specifically, the hydrogeologic investigation was to determine:

1. The direction and rate of groundwater flow.
2. Detailed studies of the subsurface geology necessary to establish the effect upon the surrounding area, in or near the landfill site.
3. Net effect upon the groundwater quality due to existing waste deposits.
4. Representative sampling of subsurface waste deposits.
5. Interpretation of data obtained from the above.
6. Provide a professional design concept for the purpose of future containment of all wastes on the site. In addition,

such a concept shall include consideration for use of the land for recreational and/or any other use compatible with the nature of the landfill material.

The investigation has been completed and the results are presented in this report.

LOCATION AND HISTORY

The Linden Road landfill is located in the SE 1/4, NE 1/4, Section 17, T. 7 N., R. 6 E., Flint Township, Genessee County, Michigan. The site is located on the map in Exhibit (a) and encompasses 40 acres.

Reports indicate that prior to use as a landfill the site was a sand and gravel pit. We presume that the major portion of the sand and gravel had been removed before 1931. The filling operation began with General Motor's purchase of the site in 1931 and continued for approximately 40 years. The present land surface condition reflects the past practices.

TOPOGRAPHY

The present topography of the site is extremely varied due to the landfilling operations. Elevations range from 740 ft. in the northeast corner to 760 ft. in the southwest corner. Exhibit (d) is an enlargement of the topographic map for the area. In general, the land surface slopes to the northeast with the exception of the fill areas.

SURFACE DRAINAGE

The surface drainage in the study area has also been disrupted by the filling operation. Evident on the site is ponded water in the depressions. No defined drainage ways are present, although north of the site a ditch has been installed. Based on the general contours for the area, we feel that the natural surface water runoff would be to the northeast.

SOILS

A soils map of the study area is presented in Exhibit (e). Essentially the area has been mapped as gravel, although it is actually fill material at present. Soils to the north and west of the site consist of well drained sands and loamy, sand underlain by sand and gravel. Permeability is rapid and the depth to water table is greater than five feet. These soils are the Boyer Loamy Sand, The Perrim Loamy Sand, and the Croswell Sand. South and west of the site are the Gilford Sandy Loam, Miami-Metca complex, and the Conover Series. These soils are composed mostly of poorly drained materials with seasonally high water table and slow permeability.

GEOLOGY

Logs for private wells in the area show that the glacial drift ranges in thickness from 62 to 145 ft. The drift is predominantly clay/till with some lenses of sand and/or gravel. Underlying the drift is the Saginaw Formation. The well logs show the Saginaw Formation to consist of interbedded sandstone and shale.

The majority of the private wells in the study area are completed in the Saginaw Formation; it is the principal aquifer used. Three well logs however, showed that sand and/or gravel lenses were used as sources of domestic water supply. The locations of the private wells are shown on the map in Exhibit (d) and the logs are presented in Appendix (3).

AUGER BORINGS/MONITOR WELLS

Eleven soil borings were made during the investigation. The locations of these borings are shown on the map in Exhibit (b). The logs for the soil borings are presented in Appendix (1). All borings were made with six-inch solid stem continuous flight augers. Six of the borings were between 28 and 50 ft. deep, of which three were converted to monitoring wells. These are designated as OW-1s, OW-2s and OW-3s. An additional six deep borings, ranging in depth from 76 to 89 ft., were also drilled. All six of the deep borings were converted to monitor wells.

Each monitor well was installed using two-inch galvanized pipe with two-inch by 24-inch, #7 slot, stainless steel, well screens. All wells were set in clay out of necessity and were developed with air to assure the screen openings were clear from obstructions.

HYDROGEOLOGY

The auger boring logs show that the predominant material encountered in the glacial drift was clay/till. A few sand lenses were encountered in some borings near ground level. The cross-sections in Exhibit (c) were drawn to show the conditions around the perimeter of the site. Again note the predominance of clay/till. Also, we call attention to the static water levels in both the shallow and deep monitor wells. There is an apparent head differential between the static water levels in the shallow and deep wells. We use the term "apparent" since the nature of the material, i.e., clay/till in which the deep wells were set, may require a considerable period of time (weeks/months) for the water levels to truly reflect equilibrium conditions.

Aside from this possibility, the present levels show the upper water table to be in perched condition. The general direction of groundwater movement is to the northeast, as was expected. The water level elevations in the deep wells are varied and do not, in our opinion, represent true conditions. This is due to the time it may take for the water levels to reach equilibruim conditions. They do show however, that the general direction of groundwater movement is to the north-northeast.

WATER QUALITY

Upon completion and development of each observation well, all of the water in the casing was voided and the well allowed to recover. Groundwater samples were then collected from each well using a bailer. The bailer was cleaned and rinsed between use in each well to prevent cross contamination. Due to the nature of the materials in which the well screens were set, the entry of groundwater into the well was very slow. While this situation presents some problems for sampling, it also verifies the slow movement of groundwater through the clay/tills.

The groundwater samples were submitted to Chevrolet Motor Division's laboratory for analyses. The results are presented in Appendix (4). A review of the data shows that many of the concentrations exceed National Primary and Secondary Drinking Water Regulations (zinc, lead, iron, copper, chromium, cadmium, aresnic, fluoride, and pH). Not all of these parameters exceed the standards in all wells. Wells 1-shallow, 4-deep and 8-deep had the highest concentrations.

Putting these results into perspective, we find that the subsurface material from which the groundwater samples were collected does not constitute a usable aquifer. Further, the monitor wells are all relatively close to the filled area which could contribute to the elevated levels. Our main concern is

with the potential for off-site migration of any contaminants which could enter a usable aquifer. In that regard we feel the potential is minimal however, additional work to support our opinion is warranted.

The three wells, 1-shallow, 4-deep, and 8-deep which were referred to previously as having the highest levels of contaminants, are all located on the west side of the property. This is the area which was noted during the on-site inspection as having been used as a dump site. Thus, the potential exists for the migration of contaminated groundwater into the site from the west.

ADJACENT LAND USE

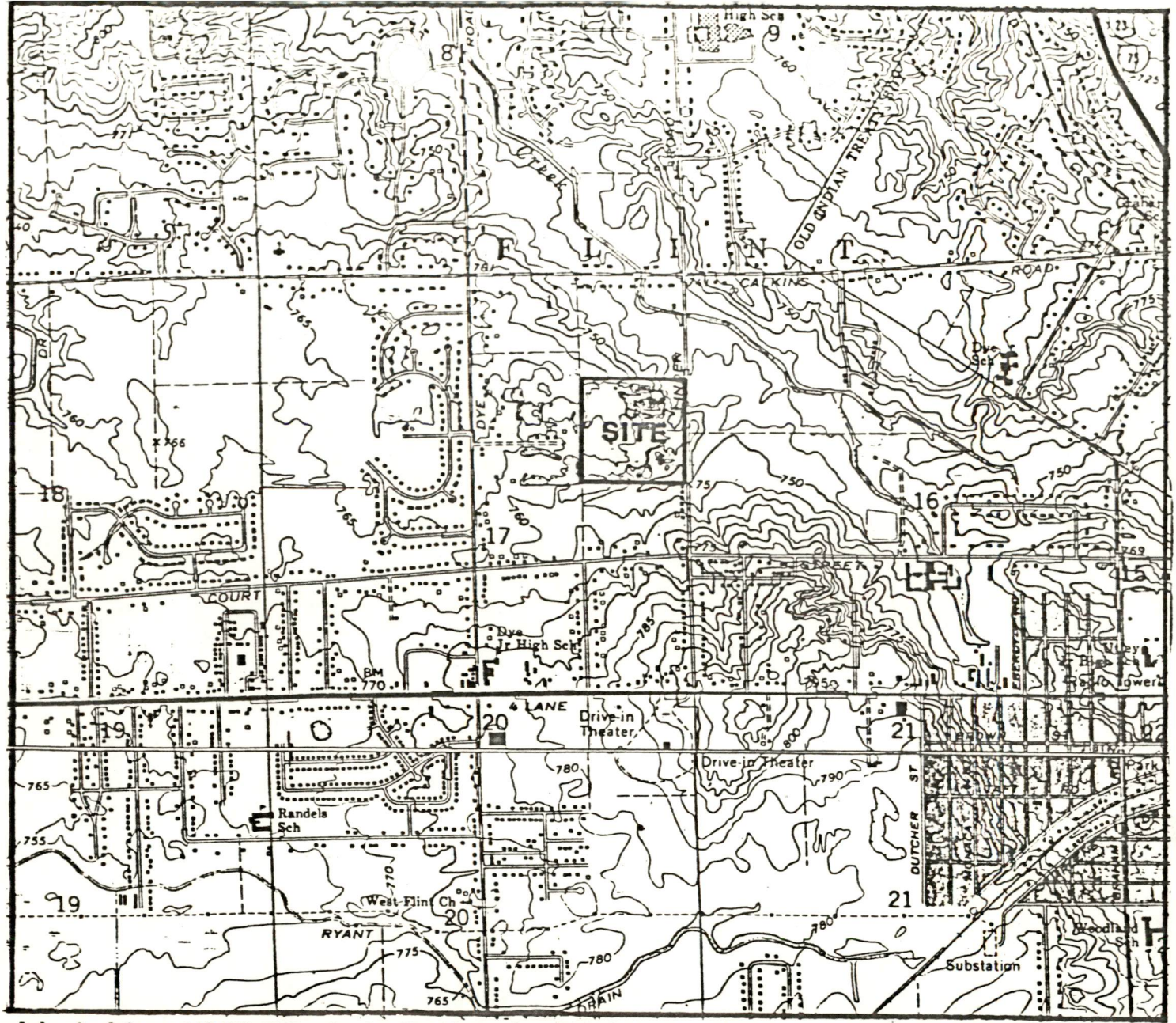
North of the site is an open field and a relatively new office complex. On the east side the site is bordered by Linden Road and crop land. South of the site are some private homes along Linden Road along with crop land and open field. The area west of the site contains surface ponds and remnants of the former sand and gravel operation. Based on the appearance of the area to the west, it too was used as a dump site. We have no information on the nature of the materials placed there or during what period the area was in use. A few private residences are also located to the west.

CONCLUSIONS

The main purpose of the study was to determine the effects of the past filling operations on groundwater quality. In that regard we draw the following conclusions:

1. The predominant subsurface material around the perimeter of the site is clay/till.
2. Conversation with former landfill workers indicate that the depth of the fill is about 40 ft. Assuming this to be true, there is between 30 and 50 ft. of clay/till between the bottom the fill and the Saginaw Formation.
3. Groundwater samples from the observation wells showed the concentrations of zinc, lead, iron, copper, chromium, cadmium, arsenic, fluoride, and pH to be above the Primary and Secondary Drinking Water Regulations.
4. The nature of the clay/till material found surrounding and underlying the site is such that it precludes any rapid migration of liquids from the fill to the surrounding areas. We feel that the rate of groundwater movement would be in the range of hundredths of a foot per day. Further, fine grained materials such as clays/tills have some ability to attenuate certain potential contaminants. Thus, the potential for off-site contamination of groundwater is minimal.

5. Although several soil borings were attempted within the fill area proper, the nature of the material, i.e., metal, concrete, etc., prevented any meaningful samples from being collected. Give the nature of the subsurface materials surrounding and underlying the fill area, we do not feel that the information is essential.



Adapted from USGS 7.5 minute Quadrangles FLUSHING - 1969 and SWARTZ CREEK - 1969

TOPOGRAPHIC SITE LOCATION MAP

GENERAL MOTORS

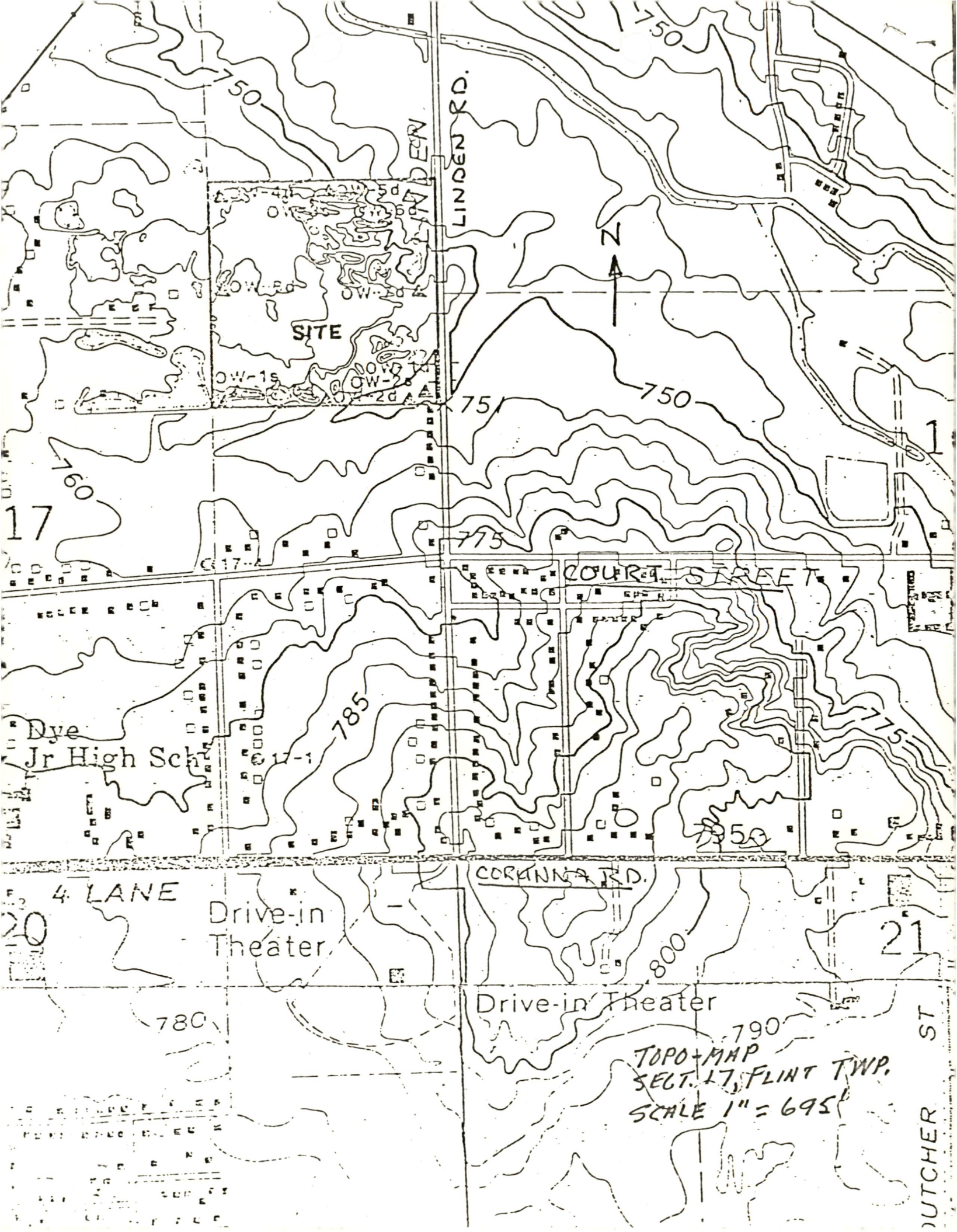
SECTION 17, FLINT TWP.

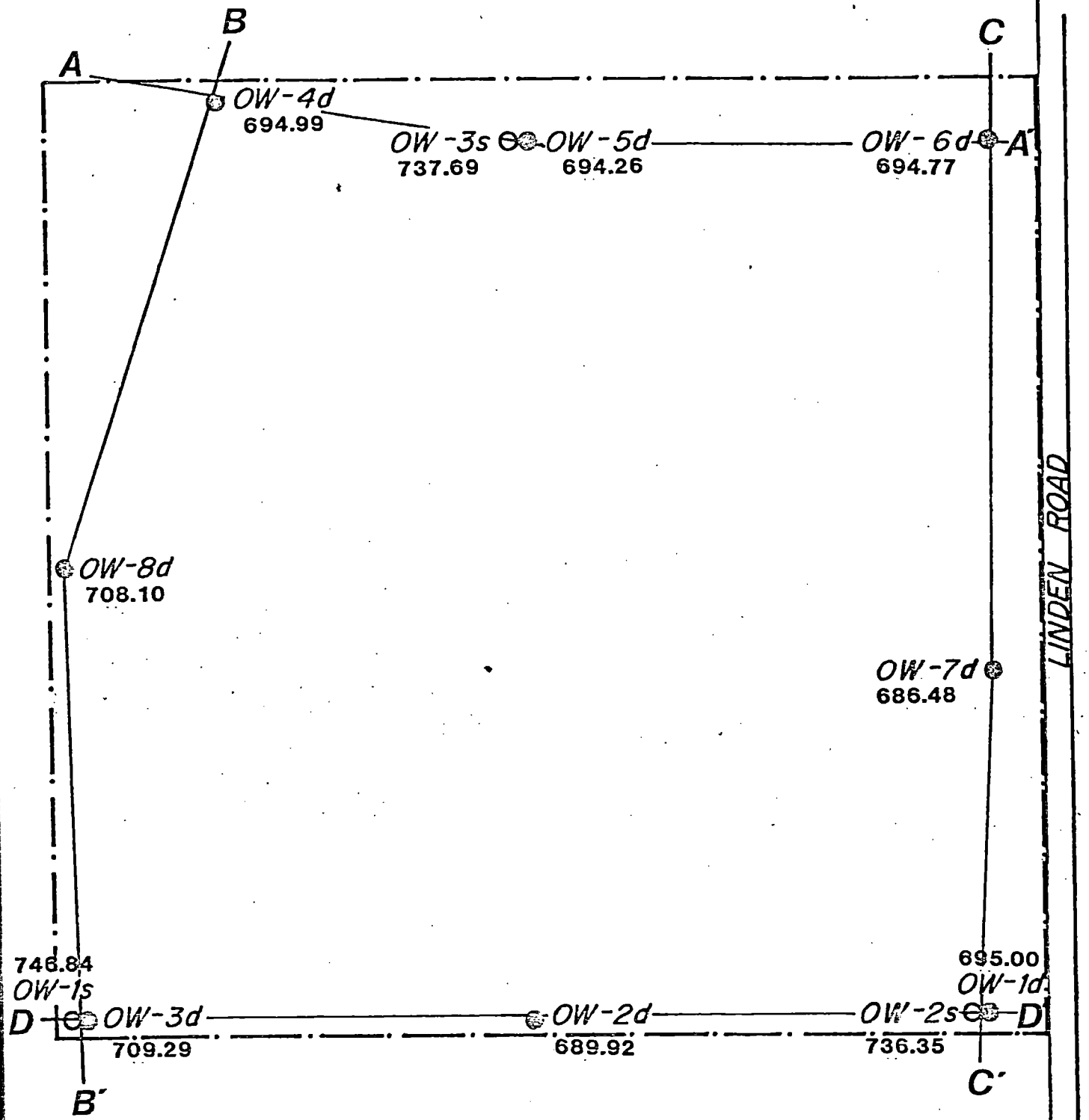
GENESEE CO., MICHIGAN

SCALE: 1" = 2000'

NORTH

KECK consulting services, inc.


LINDEN RD.
N
SITE
OW-1s
OW-2d
OW-2s
OW-1d
750
760
775
785
800
790
780
17
20
21
COURT STREET
CORUNNA RD.
Dye
Jr High Sch
4 LANE
Drive-in
Theater
Drive-in Theater
TOPO MAP
SECT. 17, FLINT TWP.
SCALE 1" = 695'
ST
UTCHER

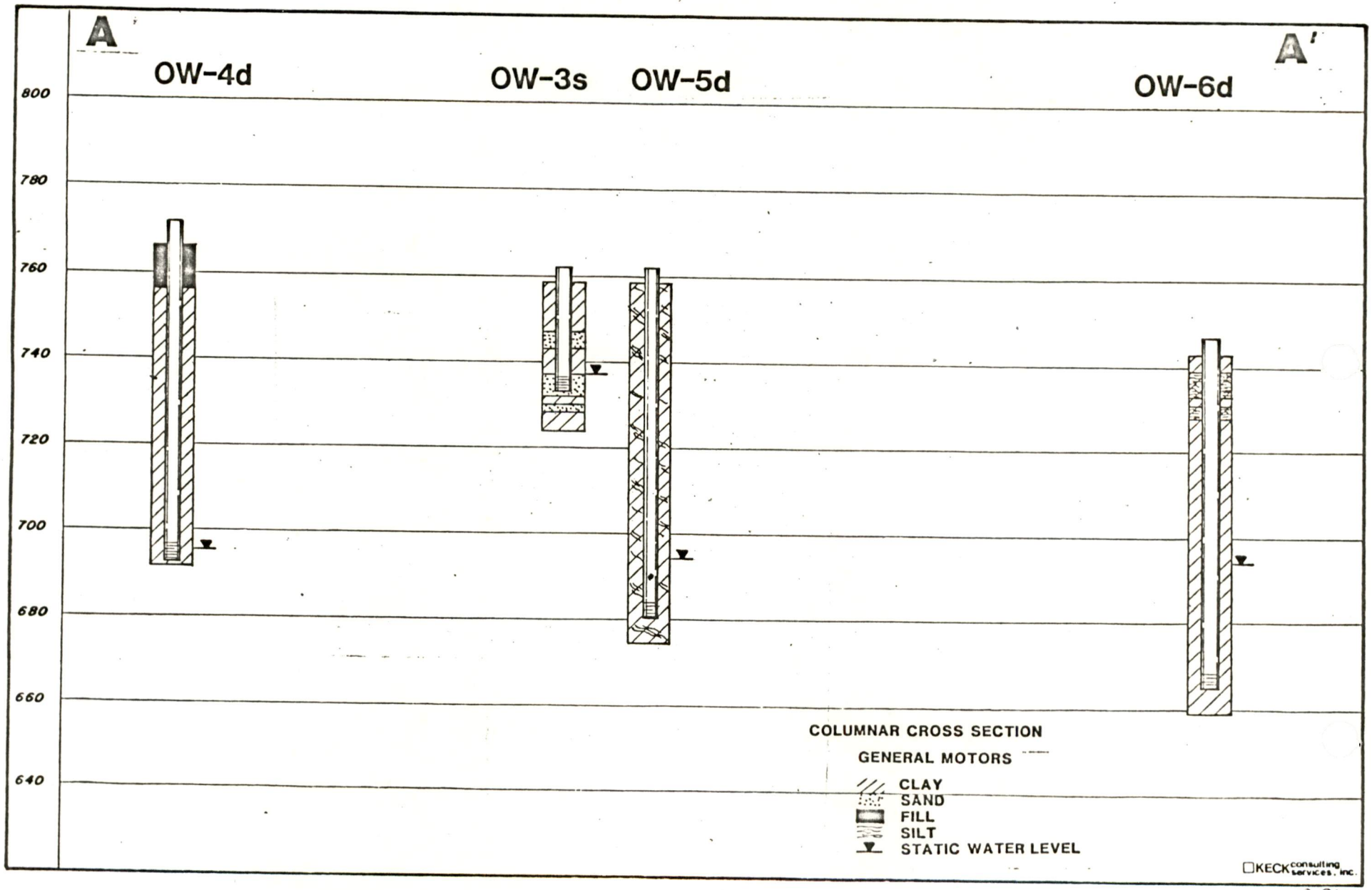


SITE MAP SHOWING WELL LOCATIONS
GENERAL MOTORS
SECTION 17, FLINT Twp.
GENESEE Co., MICHIGAN

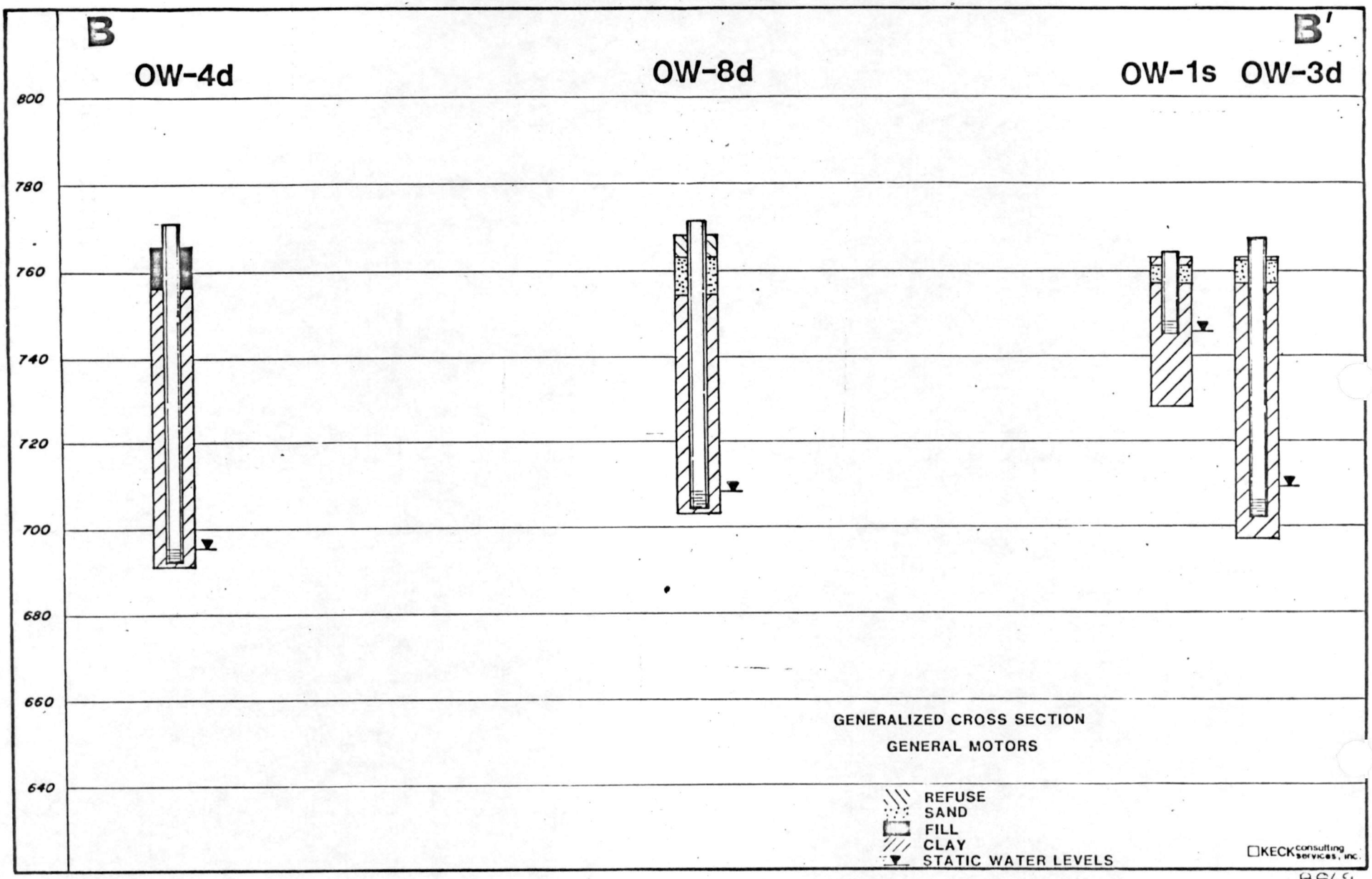
SCALE: 1" = 200'

NORTH

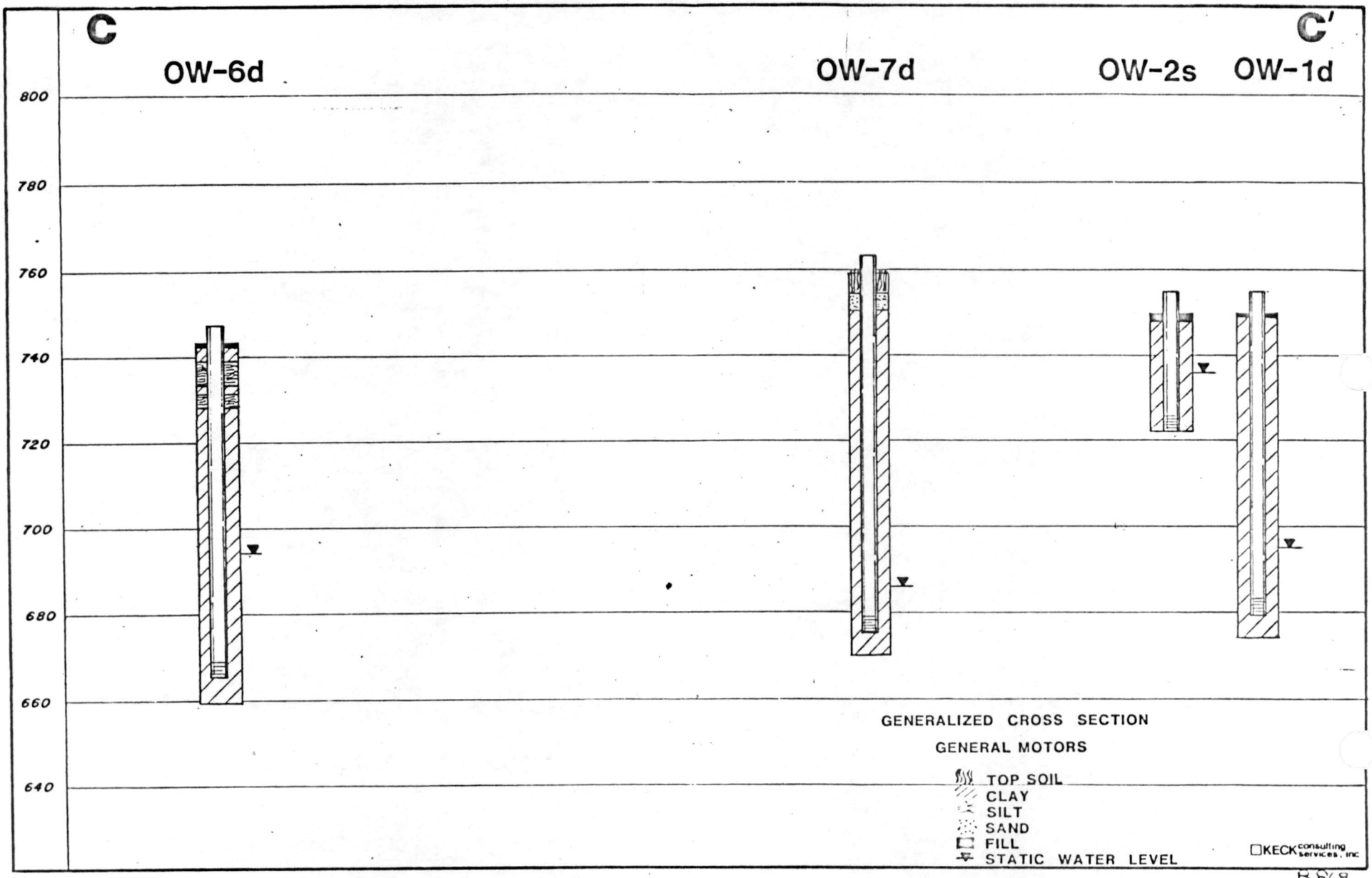
KECK consulting services, inc.
DRAWN: PM9/14/79


A
A'
OW-4d
OW-3s
OW-5d
OW-6d
800
780
760
740
720
700
680
660
640
COLUMNAR CROSS SECTION
GENERAL MOTORS
CLAY
SAND
FILL
SILT
STATIC WATER LEVEL
KECK consulting services, inc.

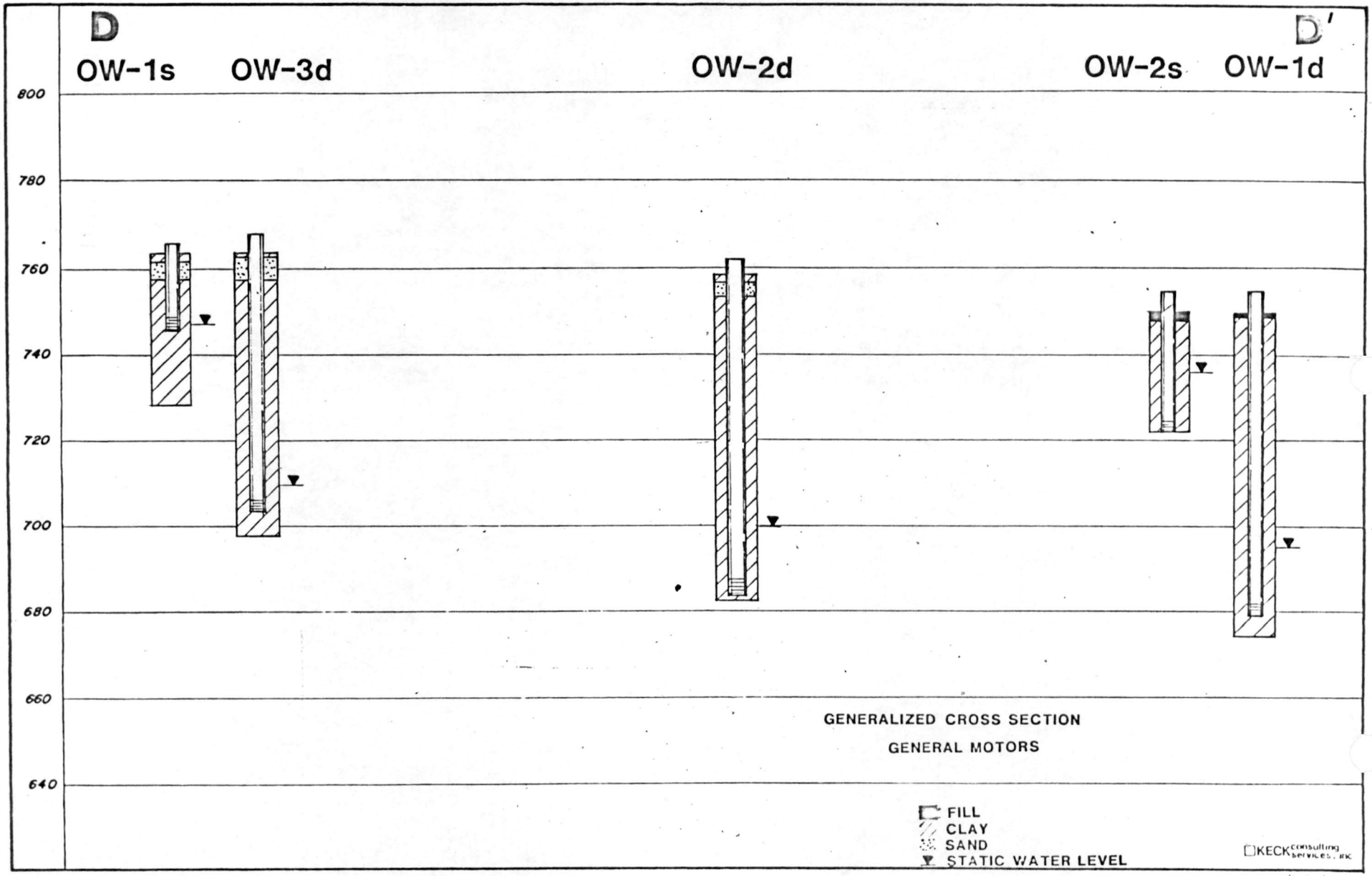
B870


B
B'
OW-4d
OW-8d
OW-1s
OW-3d
800
780
760
740
720
700
680
660
640
GENERALIZED CROSS SECTION
GENERAL MOTORS
REFUSE
SAND
FILL
CLAY
STATIC WATER LEVELS
KECK consulting services, inc.

B861


C
C'
OW-6d
OW-7d
OW-2s
OW-1d
800
780
760
740
720
700
680
660
640
GENERALIZED CROSS SECTION
GENERAL MOTORS
TOP SOIL
CLAY
SILT
SAND
FILL
STATIC WATER LEVEL
KECK consulting services, inc

B868


D
D'
OW-1s
OW-3d
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OW-2s
OW-1d
800
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760
740
720
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680
660
640
GENERALIZED CROSS SECTION
GENERAL MOTORS
FILL
CLAY
SAND
STATIC WATER LEVEL
KECK consulting services, inc

KECK CONSULTING SERVICES, INC.
"Ground Water Specialists"
4903 Dawn Avenue • East Lansing, Michigan 48823 • (517) 332-8623

SOIL BORING DATA

JOB NUMBER 898 DATE 8/14/79
OWNER General Motors - Chevrolet
LOCATION: State Michigan County Genessee Twp. Flint
Section 17 T. 7 N.S.; R. 6 E.W.

MINERAL WELL PERMIT NUMBER:

AUGER: 4-inch ☐ 6-inch ☒ Profile ☐ Split-spoon ☐

PLUGGING METHOD: ☒ Natural Materials
☒ Bentonite
☐ Cement

Geologist C. Stagg Field Ass't M. Petrie

BORING NUMBER B-1 TOTAL DEPTH 34' S.W.L.(BGL) 17.70

Sample Number	From 0 to 34 Feet	Lithologic Description
1	0 - 2	CLAY; black, high oil content
2	2 - 5	SAND; unsorted, dry, brown w/some clay, gray
3	5 - 7	CLAY; gray, w/fine gravel, dry, oil odor
4	7 - 17	CLAY; gray, tighter, w/silt, minor fine gravel
5	17 - 19	CLAY; gray w/trace fine gravel, dry, w/some silt
6	19 - 25	CLAY; gray, collars
7	25 - 31	CLAY; gray, moist, w/minor very fine sand & silt
8	31 - 32	CLAY; gray, v. moist, w/silt, w/hard lenses of
		clay, trace fine gravel
9	32 - 34	CLAY; red-brown, very tight, dry, w/fine gravel
		Refusal at 34'

Piezometer: ☐ Screen_____ Pipe_____ Total Depth (BGL)_____

BORING NUMBER B-2/OW 1s TOTAL DEPTH 35' S.W.L.(BGL) 16.64

Sample Number	From 0 to 35 Feet	Lithologic Description
1	0 - 2	CLAY; brown, w/some fine gravel & some silt
2	2 - 5	SAND; saturated, unsorted w/fines
3	5 - 6	SAND; saturated, unsorted w/high clay content, gray
4	6 - 8	CLAY; gray, w/minor pieces of gravel, wet
5	8 - 15	CLAY; gray, tight, w/minor gravel, saturated
6	15 - 21	CLAY; gray, v. tight, collars, trace of gravel
7	21 - 29	CLAY; gray, soupy, w/some v. fine sand, saturated
8	29 - 33	CLAY; gray, sticky
9	33 - 35	CLAY; gray, v. tight, w/silt, dry
		Refusal at 35'

Piezometer: ☒ Screen 924 - 7 Pipe 20' Total Depth (BGL) 18'

BORING NUMBER B-3/OW 2s TOTAL DEPTH 28' S.W.L.(BGL) 14.27

Sample Number	From 0 to 28 Feet	Lithologic Description
1	0 - 2	FLY ASH
2	2 - 4	CLAY; brown, w/some fly ash
3	4 - 8	CLAY; brown, soupy w/unsorted sand & fine gravel, sat.
4	8 - 13	CLAY; gray, tight, dry, w/minor fine gravel
5	13 - 15	CLAY; gray, (in balls) dry
6	15 - 22	CLAY; gray, soupy, w/silt & very fine sand
7	22 - 25	CLAY; gray, v. tight, dry, w/trace fine gravel
8	25 - 28	CLAY; gray, v. tight, dry, w/some fine gravel
		Refusal at 28'
		Gravel packed

Piezometer: ☒ Screen 924 - 7 Pipe 30' Total Depth (BGL) 28'

BORING NUMBER B-4 TAL DEPTH 45' S.W. BGL) 9.84

Sample Number	From 0 to 45 Feet	Lithologic Description
	0 - .5	TOPSOIL
1	.5 - 9	FLY ASH; w/organics, black, w/some fine gravel, dry
2	9 - 11	CLAY; brown, wet, w/silt, trace fine gravel
3	11 - 16	CLAY; gray, moist, w/trace fine gravel, some silt
4	16 - 20	CLAY; gray, moist, (in balls)
5	20 - 27	SILT; and very fine sand, saturated
6	27 - 35	CLAY; gray, collars, stiff, wet
7	25 - 38	CLAY; gray, wet, w/trace fine gravel
8	38 - 42	CLAY; gray, tight, dry, w/fine gravel
9	42 - 45	CLAY; gray, very tight, dry, w/some fine gravel
		Refusal at 45'

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER B-5/OW 3s TOTAL DEPTH 35' S.W.L.(BGL) 10.40

Sample Number	From 0 to 35 Feet	Lithologic Description
1	0 - 1	TOPSOIL
2	1 - 3	CLAY; black-brown, w/minor fine gravel
3	3 - 6	CLAY; black, w/fly ash and oil
4	6 - 9	CLAY; brown, w/some fly ash and oil
5	9 - 11	CLAY; gray, in balls
6	11 - 14	SAND; lt. brown, moist, fine
7	14 - 15	CLAY; gray, w/silt, some fine sand, saturated
8	15 - 20	CLAY; gray, stiff (collars)
9	20 - 25	SAND; saturated, very fine, w/silt
10	25 - 27	CLAY; gray, stiff, collars
11	27 - 29	SAND; saturated, very fine, w/silt
12	29 - 33	CLAY; gray, stiff, w/minor fine gravel
13	33 - 35	CLAY; gray, very tight, dry, w/some fine gravel
		Refusal at 35'

Piezometer: ☒ Screen 924 - 7 Pipe 26.3 Total Depth (BGL) 25.3

JOB NUMBER 898 DATE 6/17/[illegible] PAGE _____

BORING NUMBER B-6 TOTAL DEPTH 50 S.W.L (BGL) 5.64

Sample Number	From ___ to ___ Feet	Lithologic Description
1	0- 3	FLY ASH
2	3- 5	SAND: light br., moist, fine
3	5- 7	SAND: saturated, fine w/high clay content, brown
4	7- 9	CLAY: gray, tight (collars) trace fine gravel
5	9-11	CLAY: gray, stiff w/ sand fine
6	11-13	CLAY: gray, stiff
7	13-17	CLAY: gray, sticky
8	17-24	CLAY: gray saturated w/some sand, unsorted
9	24-33	CLAY: gray, stiff, wet
10	33-47	CLAY: gray, saturated-sticky w/minor fine gravel
11	47-50	CLAY: gray, very tight
		Refusal at 50'

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER _____ TOTAL DEPTH _____ S.W.L.(BGL) _____

Sample Number	From ___ to ___ Feet	Lithologic Description

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

JOB NUMBER 898 DATE 8/22/91 PAGE

BORING NUMBER OW#1 DEEP TOTAL DEPTH 76 S.W.I BGL) 55.71

Sample Number	From to Feet	Lithologic Description
1	0- 1	FLY ASH
2	1- 3	CLAY: brown, dry w/some fly ash-silt
3	3- 7	CLAY: gray, dry, trace fine gravel w/silt
4	7-10	CLAY: brown, saturated w/silt + fine gravel
5	10-14	CLAY: gray, dry (in balls)
6	14-19	CLAY: gray, moist w/silt
7	19-22	CLAY: gray, stiff (collars) w/some gravel, wet
8	22-28	CLAY: gray soupy w/silt + minor fine gravel, satirated
9	28-30	CLAY: gray, tight w/some fine gravel, dry
10	30-45	CLAY: gray wet w/silt stiff w/minor fine gravel
11	45-48	CLAY: gray, wet-soupy w/ silt + minor fine gravel
12	48-65	CLAY: gray, moist w/silt, trace fine gravel
13	65-70	CLAY: gray soupy w/ silt, trace very fine sand
14	70-71	CLAY: gray w/fine to med. gravel, saturated

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER con't TOTAL DEPTH _____ S.W.L.(BGL) _____

Sample Number	From to Feet	Lithologic Description
15	71- 76	SUSPECT VERY TIGHT CLAY- no sample
		Refusal at 76'

Piezometer: ☒ Screen 924-7 Pipe 73.1 Total Depth (BGL) 71

JOB NUMBER _____ DATE _____ PAGE _____

BORING NUMBER OW#2 DE TOTAL DEPTH 76' W.L.(BGL) 68.62

Sample Number	From ___ to ___ Feet	Lithologic Description
1	0- 1	CLAY: black w/ high oil content
2	1- 2	SAND: very fine, dry w/some clay
3	2- 5	SAND: very fine w/ clay + oil dry
4	5-13	CLAY: gray, dry (in balls) minor fine gravel w/some oil
5	13-23	CLAY: light grey, dry w/ silt (in balls)
6	23-30	CLAY: gray in balls, moist w/ silt
7	30-32	CLAY: gray w/silt moist trace fine gravel
8	32-34	CLAY: gray, dry,tight w/silt trace fine gravel
9	34-36	CLAY: gray, dry tight (collars) trace of red color
10	36-40	CLAY: gray, saturated w/silt trace fine gravel
11	40-42	CLAY: gray stiff w/silt +fine gravel saturated
12	42-50	CLAY: gray, tighter, dry w/silt + some gravel
13	50-63	CLAY: gray soupy w/silt trace, very fine sand saturated
	63-76	SUSPECT CLAY- tight, no sample

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER con't TOTAL DEPTH _____ S.W.L.(BGL) _____

Sample Number	From ___ to ___ Feet	Lithologic Description
	76'	Refusal- suspect rock

Piezometer: ☒ Screen 924-7 Pipe 76.55 Total Depth (BGL) 75.55

JOB NUMBER _____ DATE _____ PAGE _____

BORING NUMBER OW#3 DEEP TOTAL DEPTH 66' S.W.L. BGL) 53.92

Sample Number	From ___ to ___ Feet	Lithologic Description
1	0- 1	CLAY: brown w/some fly ash, dry w/some organics
2	1- 5	SAND: unsorted w/ gravel + clay, brown
3	5- 6	SAND: saturated, unsorted w/high clay content w/some gravel
4	6-10	CLAY: gray, tight, dry w/fine to med. gravel
5	10-14	CLAY: brown, soupy w/silt + some very fine sand, saturated
6	14-21	CLAY: gray tight w/minor fine gravel
7	21-29	CLAY: gray, soupy, w/silt + very fine sand, saturated
8	29-35	CLAY; gray (collars) w/some gravel sticky wet
9	35-40	CLAY: gray tight, dry
10	40-53	CLAY: gray, dry, w/silt
11	53-65	CLAY: grey w/silt dry, trace fine gravel
	65-66	SUSPECT VERY TIGHT CLAY: no sample
		Refusal at 66'

Piezometer: [X] Screen 924-7 Pipe 62.9 Total Depth (BGL) 60.9

BORING NUMBER OW#4 DEEP TOTAL DEPTH 75' S.W.L.(BGL) 71.72

Sample Number	From ___ to ___ Feet	Lithologic Description
1	0-2	FLY ASH
	2-10	SUSPECT FILL MATERIAL: no sample
	10-24	SUSPECT CLAY: tight drilling- no sample
2	24-40	CLAY: gray, soupy w/silt + some very fine sand, saturated
	40-59	SUSPECT CLAY: tight drilling, no sample
3	59-68	CLAY: gray soupy w/large pieces of gravel
4	68-76	CLAY: gray w/gravel wet +silt
	76'	Refusal suspect rock

Piezometer: [X] Screen 924-7 Pipe 78' Total Depth (BGL) 74

JOB NUMBER 898 DATE 08/28-79 PAGE

BORING NUMBER OW #5 DEEP TOTAL DEPTH 84' S.W. BGL) 64.41

Sample Number	From to Feet	Lithologic Description
1	0- 3	TOP SOIL: brown dry
2	3- 8	CLAY: brown (in balls) dry w/silt, occasional sm. pebble
3	8-11	CLAY: gray (in balls) w/brown clay +silt
4	11-15	CLAY: gray w/silt saturated
5	15-20	CLAY: gray w/high silt content, saturated w/ pieces of tight clay, gray
6	20-28	SILT: saturated w/ clay, gray
7	28-30	CLAY: gray, stiff (collars)
8	30-33	CLAY: gray, soupy w/silt + some very fine sand, saturated
9	33-42	CLAY: gray saturated w/ silt + occasional large gravel
10	42-45	CLAY: gray saturated w/silt trace fine gravel
11	45-50	CLAY: gray tighter w/silt saturated w/minor fine gravel
	50-58	SUSPECT CLAY, soupy, easy drilling-no sample
	58-84	SUSPECT TIGHT CLAY: hard drilling-no sample
	84'	Refusal suspect rock

Piezometer: [X] Screen 924-7 Pipe 80' Total Depth (BGL) 78.5

BORING NUMBER OW #6 DEEP TOTAL DEPTH 84' S.W.L.(BGL) 48.70

Sample Number	From to Feet	Lithologic Description
1	0- 1	FLY ASH
2	1- 4	CLAY: brown dry w/ some fly ash
3	4-10	SILT: saturated, brown w/clay content
4	10-12	CLAY: gray tight collars dry
5	12-15	SILT: saturated, gray w/high clay content
6	15-28	CLAY: gray stiff (collars)
7	28-33	CLAY: gray saturated not as stiff (collars)
8	33-38	CLAY: gray saturated collars, trace gravel
9	38-48	CLAY: gray saturated stiff
	48-70	SUSPECT TIGHT CLAY: no sample
10	70-84	SLAY: blue-gray, saturated w/some gravel
	84'	Refusal- suspect very tight clay

Piezometer: [X] Screen 924-7 Pipe 80' Total Depth (BGL) 78

BORING NUMBER OW #7 TOTAL DEPTH 89' S.W.L.(BGL) 72.63

Sample Number	From to Feet	Lithologic Description
1	0- 2	TOP SOIL: black
2	2- 3	TOP SOIL: w/some gravel, dry
3	3- 7	SAND: unsorted w/gravel, saturated w/high clay content, br.
4	7-10	CLAY: brown (collars) w/ gravel
5	10-13	CLAY: gray saturated w/minor gravel
6	13-14	CLAY: gray (in balls) dry, w/silt
7	14-19	CLAY: gray, dry
8	19-23	CLAY: gray stiff (collars) dry
9	23-28	CLAY: gray, moist
10	28-33	CLAY: gray very moist, w/minor fine gravel
11	33-39	CLAY: gray soupy w/silt + some very fine sand, saturated
12	39-68	CLAY: gray, saturated w/fine gravel
13	68-78	CLAY: gray, saturated w/ some gravel
	78-88	SUSPECT VERY TIGHT CLAY: no sample

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER con't TOTAL DEPTH _____ S.W.L.(BGL) _____

Sample Number	From to Feet	Lithologic Description
	88-89	SUSPECT VERY TIGHT CLAY: no sample
		Refusal at 89'

Piezometer: ☒ Screen 924-7 Pipe 86'10" Total Depth (BGL) 84'10"

JOB NUMBER 898 DATE 08/30/79 PAGE 1

BORING NUMBER OW#8 DEEP TOTAL DEPTH 65' S.W.L. (BGL) 60.06

Sample Number	From to Feet	Lithologic Description
1	0- 5	REFUSE W/ TOP SOIL BLACK: strong chemical odor
2	5- 9	SAND: unsorted black, dry, chemical odor
3	9-14	SAND: unsorted + gravel dry, clemical odor
4	14-26	CLAY: brown soupy w/high sand content, unsorted, saturated
5	26-30	CLAY: brown stiff (collars) w/some gravel, saturated
6	30-38	CLAY: gray w/ steaks of brown, saturated w/ some gravel
7	38- 44	CLAY: gray soupy w/ silt +some very fine gravel, saturated
8	44-48	CLAY: gray stiff, saturated w/ some gravel
9	48-65	CLAY: gray, tight dry, w/minor fine gravel
	65	SUSPECT ROCK: Refusal at 65'

Piezometer: ☒ Screen 924-7 Pipe 65' Total Depth (BGL) _____

BORING NUMBER _____ TOTAL DEPTH _____ S.W.L. (BGL) _____

Sample Number	From to Feet	Lithologic Description

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

Date 9/10/79 Project GM-Chevrolet - Flint

Well No.	Ground Elevation	Casing Height	Casing Elevation	Depth to Water (TOC)	Water-Table Elevation
OW 1 shallow	763.48	1.16	764.64	17.80	746.84
OW 2 shallow	750.62	4.73	755.35	19.00	736.35
OW 3 shallow	758.60	3.64	762.24	24.55	737.69
OW 1 deep	750.71	4.35	755.06	60.06	695.00
OW 2 deep	758.54	3.51	762.05	72.13	689.92
OW 3 deep	763.21	4.24	767.45	58.16	709.29
OW 4 deep	766.64	4.35	770.99	76.00	694.99
OW 5 deep	758.60	3.83	762.43	68.17	694.26
OW 6 deep	743.49	4.03	747.52	52.75	694.77
OW 7 deep	759.11	4.20	763.31	76.83	686.48
OW 8 deep	768.16	3.19	771.35	63.25	708.10

◆◆◆ MI0010 ◆◆◆ FACILITIES
LINDEN ROAD DUMP SITE SAMPLES TAKEN BY KECK CQ.COD AND TOC WERE NOT REPORTED DUE TO ACETONE CONTAMINATION.

TEST	9- 5-1979 1DEEP	9- 5-1979 1SHALLOW	9- 5-1979 2DEEP	9- 5-1979 2SHALLOW
PH ( )	10.25000	-	10.69000	9.91000
TDS (PPM)	132.00000	-	178.00000	181.00000
OIL (PPM)	7.00000	5.00000	8.00000	(5.00000)
PHEN(PPB)	158.00000	47.00000	432.00000	60.00000
PCB (PPB)	(.05000)	(.01000)	(.15000)	(.01000)
NO3 (PPM)	(.20000)	-	(.20000)	-
CL (PPM)	21.00000	-	8.00000	7.00000
CN (PPB)	(20.00000)	(20.00000)	(20.00000)	(20.00000)
F (PPM)	2.60000	-	2.50000	.75000
SO4 (PPM)	22.00000	-	30.00000	50.00000
AS (PPM)	(.01000)	.31800	(.01000)	(.01000)
CD (PPM)	(.04000)	(.04000)	(.04000)	(.04000)
CR (PPM)	.19000	1.02000	.10000	.09000
CU (PPM)	.06000	.19000	(.02000)	.03000
FE (PPM)	11.00000	221.00000	8.40000	10.45000
PB (PPM)	.71000	.95000	.17000	.37000
NI (PPM)	.10000	.77000	.17000	.08000
ZN (PPM)	31.00000	22.50000	2.85000	14.00000

◆◆◆ MI0010 ◆◆◆ FACILITIES

TEST	9- 5-1979 3DEEP	9- 5-1979 3SHALLOW	9- 5-1979 4DEEP	9- 5-1979 5DEEP
PH ( )	10.28000	9.60000	10.11000	10.26000
TDS (PPM)	174.00000	259.00000	156.0000 = No Sample	230.00000
OIL (PPM)	(5.00000)	(5.00000)		(5.00000)
PHEN(PPB)	148.00000	46.00000	158.00000	200.00000
PCB (PPB)	(.10000)	(.07000)	(.18000)	(.50000)
NO3 (PPM)	(.20000)	-	(.20000)	(.20000)
CL (PPM)	24.50000	70.00000	62.00000	9.50000
CN (PPB)	(20.00000)	(20.00000)	(20.00000)	(20.00000)
F (PPM)	2.50000	.23000	2.30000	1.75000
SO4 (PPM)	73.00000	(10.00000)	(25.00000)	30.00000
AS (PPM)	(.01000)	.07300	.41900	.03500
CD (PPM)	(.04000)	(.04000)	.07000	(.04000)
CR (PPM)	.07000	.56000	3.51000	.29000
CU (PPM)	.03000	.12000	1.20000	.07000
FE (PPM)	15.95000	71.00000	349.00000	29.60000
PB (PPM)	.19200	.29400	1.59000	.12000
NI (PPM)	.09000	.42000	1.98000	.13000
ZN (PPM)	4.40000	14.50000	31.50000	2.60000

◆◆◆ MI0010 ◆◆◆ FACILITIES

TEST	9- 5-1979 6DEEP	9- 5-1979 7DEEP	9- 5-1979 8DEEP
PH ( )	8.94000	10.30000	10.58000
TDS (PPM)	26.00000	101.00000	99.00000
OIL (PPM)	(5.00000)	10.00000	8.00000
PHEN(PPB)	91.00000	290.00000	150.00000
PCB (PPB)	(.01000)	(.10000)	(.50000)
NO3 (PPM)	(.20000)	(.20000)	(.20000)
CL (PPM)	21.00000	11.00000	12.00000
CN (PPB)	(20.00000)	(20.00000)	(20.00000)
F (PPM)	2.50000	4.00000	2.50000
SO4 (PPM)	37.00000	(5.00000)	(20.00000)
AS (PPM)	.02000	(.01000)	.42500
CD (PPM)	(.04000)	(.04000)	.05000
CR (PPM)	.22000	(.05000)	2.90000
CU (PPM)	.04000	(.02000)	.65000
FE (PPM)	20.85000	2.44000	493.00000
PB (PPM)	.15700	.13600	1.79000
NI (PPM)	.19000	.05000	1.98000
ZN (PPM)	5.70000	.94000	59.00000

PPM = MG/L FOR WATER - MG/KG FOR SLUDGE
PPB = UG/L FOR WATER - UG/KG FOR SLUDGE
NOTE: RESULTS FOR OILS AND SLUDGES ANALYZED BEFORE 9-1-79 ARE ALL MG/KG
NOT DETECTED = ( )