

**GROUNDWATER
TECHNOLOGY, INC.**

CONSULTING GROUNDWATER GEOLOGISTS

COPY

October 19, 1981

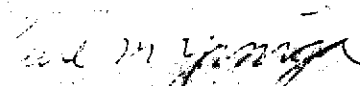
Mr. Ray Newsome
2401 Crow Canyon Road
P.O. Box 250
San Ramon, Calif. 94583

Dear Ray:

When we last spoke I thought we (GTI) had the Bart tube elevation data in our file. I was apparently mistaken and have been trying to make arrangements with Frank Linville of Bart to forward that data. In the interim I'm forwarding the technical data from our investigations for your review.

The letter report of recommendations will follow shortly including a cross-section of water levels vs tube elevations, if we can secure that data from Bart.

Sincerely,


Paul M. Yaniga
General Manager

PMY/mk

Enclosure:

Project: Shell - Bart
 Date: _____

**GROUNDWATER
 TECHNOLOGY, INC.**
 CONSULTING GROUNDWATER GEOLOGISTS

Well: _____

DUCT THICKNESS KEY

- Light odor of Product
- Thin film of product
- Light odor of neither product of sewage
- Sewage odor

Depth to water measured in Monitoring Wells

		1	2	3	4	5	6	7						
ELEV.		33.54'	32.69'	31.94'	31.94'	28.96'	28.10'	20.04'						
		Note: Elev. is street grade							Total Depth Drilled					
		30.45'	30.3'	31.38'	27.55'	20.8'	40.35'	38.55'						
Date	Note													
2-28-81	DTW	23.75'	22.40'	22.72'										
	DTOP	23.75'	22.40'	22.72'										
	Product Thick.	0 ¹	0 ²	0 ²										
	Elev. of water	9.79'	10.3'	9.22'										
9-14	DTW	23.82'	22.58'	22.83'	24.5'	21.01'	21.48'	12.62'						
	DTOP	23.82'	22.58'	22.83'	24.5'	21.01'	21.48'	12.62'						
	Product Thick.	0 ¹	0 ¹	0 ¹	0	0 ¹	0 ³	0 ³						
	Elev. of water	9.72'	10.11'	9.11'	7.44'	7.95'	6.62'	7.42'						
10-2	DTW	23.83'	22.63'	22.75'	24.6'	21.20'	21.51'	14.72'						
	DTOP	23.83'	22.63'	22.75'	24.6'	21.20'	21.51'	14.72'						
	Product Thick.	0 ¹	0 ¹	0 ²	0 ⁴	0 ¹	0	0 ³						
	Elev. of water	9.71'	10.06'	9.16'	7.34'	7.76'	6.59'	5.32'						

DRILLING LOG

 Project: Bart/Shell
 Name: Oakland, California
 Date: 9-10-81

 Well Designation: L-7
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

 Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
	12"			0	5'	2" asphalt - damp, loose light brown sand		
				5'	12'	cont'd loose brown sand		
				12'	16'	gas detector: Nil - moist sand		
				16'	17'	spoon sample - no gasoline smell		#1
				17'	18'	wet sand becoming slightly clayey-mottled		
					18'	top of water table caving sand		
				18'	24'	cont'd caving - placed revert		
					24'	much water - "quicksand"		#2
				24'	34'	cont'd slow drilling with revert		
					34'	sand - brown - some gray revert "weak"		#3
				34'	40'	becoming clayey sand - (no gasoline smell)		
	12"			40'	41'	end hole in clayey sand - gray to brown		
						cased with 20' slotted PVC .020" (4")		
						and 20' regular PVC		
						Gravel packed		

DRILLING LOG

 Project: Bart/Shell
 Name: Oakland, California
 Date: 9-3-81 & 9-8-81

 Well Designation: L-6
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

 Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
10:00	12"			0	2'	Street concrete and old cobblestones		
				2'	4'	mixed fill and cobbles		
					4'	begin brown sand -		
				4'	10'	sand fill some small pieces brick and rock		
				10'	16'	cont'd sand and clayey sand - moist		
					16'	slight gasoline smell ? - stopped		#1
10:00						hole 9-3-81 to prepare revert		
10:00	12"	9-8-81		16'	20'	cont'd sand gas detector reads: 35%		#2
				20'	24'	slightly clayey sand		
					24'	top of water table - caving sand		#3
				24'	30'	revert introduced		
				30'	34'	wet gray-brown clayey sand		#4
				34'	40'	sand to clay - top of bay mud		
				40'	42'	stiff, dense clay - bay mud		
						placed 40' of casing: 20' slotted PVC .020'		
						and 20' reg. PVC - collar of casing 2" below street level		
	12"					Gravel-packed		

DRILLING LOG

 Project: Bart/Shell
 Name: Oakland, California
 Date: 9/2/81

 Well Designation: L-5
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

 Geologist: J. Ballerino

Time	Diam	Bar	At	Interval from	to	Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
00	12"			0	5'	Inside drop inlet - storm drain roadway		
						invert elev: -5' below street level		
				5'	7'	fill sand - gas detector: 7%		
				7'	13'	moist brown sand; gas detector: 10%		
				13'	14'	begin wet sand - smells of gasoline		
				14'	15'	gas detector: 15%		#1
				15'	19'	spoon sample-loose sand		
					19'	detector reads: 50%		#2
				19'	22'	sand saturated with gasoline; reads: 80%		
				22'	23'	encountered water - begin revert		
				23'	27'	caving sand - revert not holding well		
				27'	32'	cont'd sand - in water table		
						strong gasoline fumes		
				32'	40'	becoming more compact sand		
						some clay- (gray to gray-green)		
				40'	42'	dense, stiff clay- bay mud - bottom hole		
						cased with 20' slotted PVC .020" (4")		
						17' regular PVC & gravel packed		
						Elevation at street level		

12"

Project: Bart/Shell
 Name: Oakland, California
 Date: 8/31/81

Well Designation: L-4
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger & Barrel

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
	12"			0	4'	Fill: sand-silt-clay, rock, debris, concrete and bricks		
				4'	7'	light brown sand (backfill?) some clayey sand		
						slightly moist clayey sand - gas detector: Nil		
				7'	13'	cont'd moist sand - some gray sand mixed		
						detector reads: 3%		
				13'	16'	cont'd moist sand - minor clay. detector reads: 5%		
				16'	21'	brown moist sand - layered gray sand		
				21'	23'	cont'd sand - spoon sample - wet		L-4 #1
				23'	24'	bucket grinding put on auger - clear		
				24'	31'	caving from water at 22' -		
						cont'd drilling out to 35' +		
						able to place 30' of casing:		
						10' slotted PVC @ .020"		
						20' regular PVC		
1500	12"					Gravel packed - no evidence of gasoline		



DRILLING LOG

Project: Bart/Shell
 Name: Oakland, California
 Date: 8-27-81

Well Designation: L-3
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Pressure	Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to				
00	12"			0	4'		Sand, silt and clay, fill, bits of debris and rock		
				4'	6'		begin uniform grained, damp yellow brown sand		
				6'	9'		some clayey sand		
				9'	11'		cont'd brown sand slight gasoline smell		
							detector reads: 10%		
				11'	12'		damp, uniform sand - some gray sand		L-3 #1
				12'	14'		slight gasoline smell thin (1mm seam water)		#2
				14'	16'		gas detector reads: 10% sand		
				16'	18 1/2'		gas detector reads: 40% sand		#3
				18 1/2'	19 1/2'		slightly stiff w/ clay - sand		
				19 1/2'	21'		some gray sand mostly brown sand		
							stronger gasoline smell		#4
				21'	27'		water infiltration		
				27'	30'		caving in water-logged sand -re drill		
							several passes to 37' - casing lowered		
							10' of slotted 4" PVC; 20' of reg. PVC		
00	12"						Gravel packed -		



DRILLING LOG

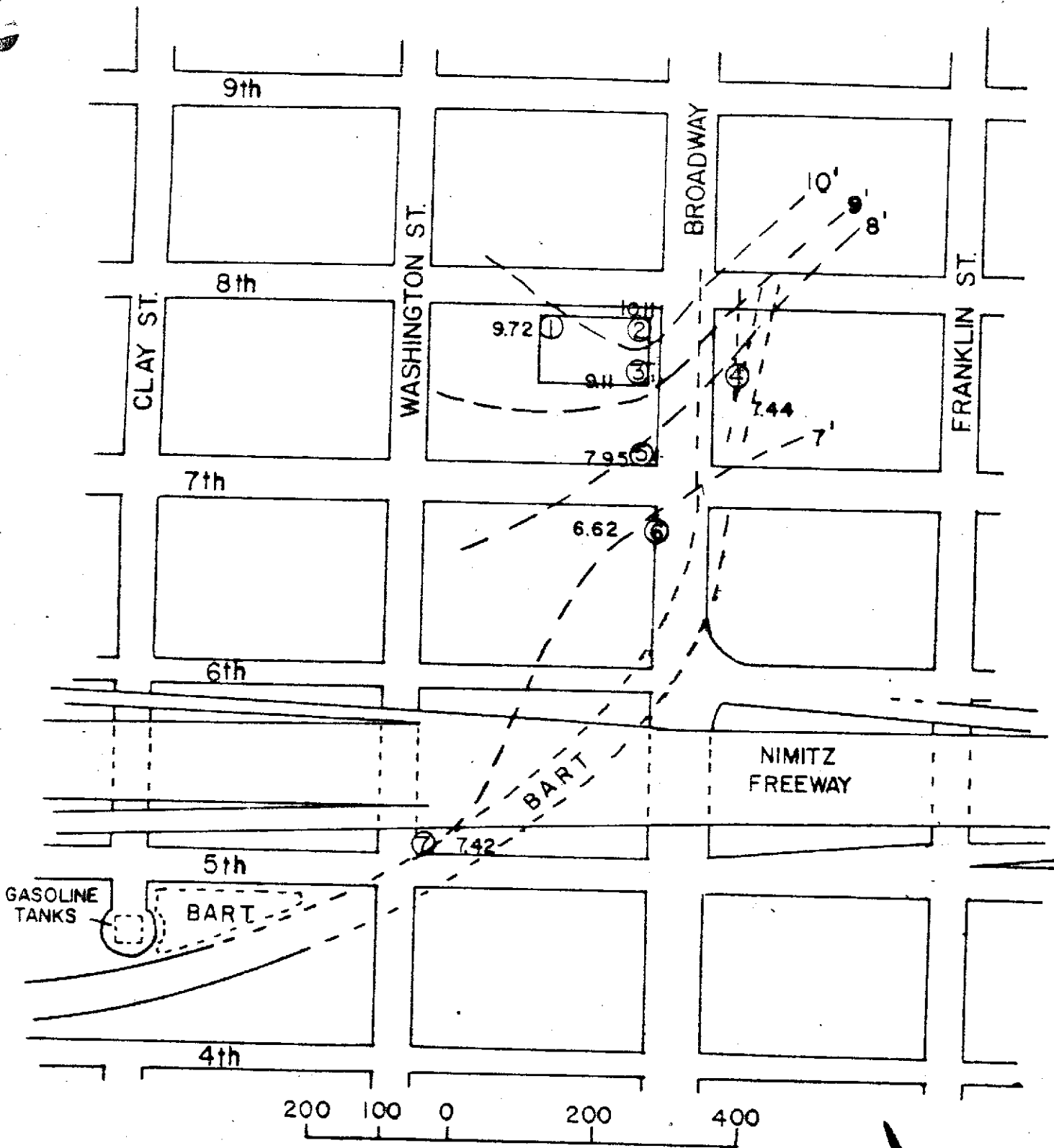
Project: Bart/Shell
Name: Oakland, California
Date: 8/26/81

Well Designation: L-2
Driller: Powell
Equip. Used: LDH Hughes 50' Auger

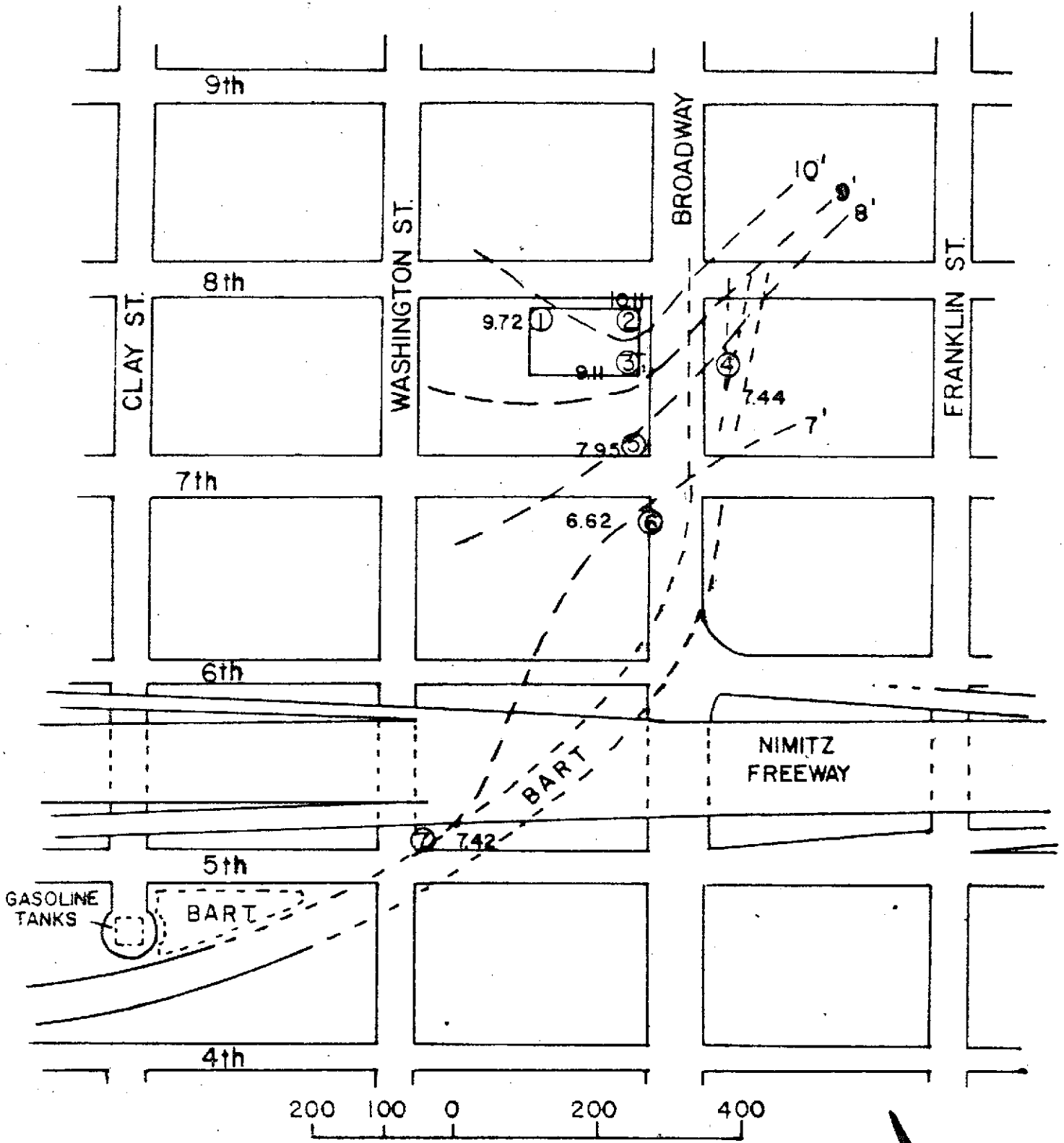
Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
5	12"			0	6'	Artificial fill: brown sand - concrete, asphalt and rock		
				6'	7'	begin clayey sand: light brown to yellow brown, damp		
				7'	10'	well sorted brown sand, some darker streaks		
				10'	12'	small fraction of clay binder		
				12'	15'	loose, unconsolidated uniform sand - moist		
				15'	16'	Gas detector reads 14% slight gasoline smell		
				16'	18'	cont'd brown, uniform sand, damp		sample no. L-2
				18'	19'	gas detector reads greater than 100% - purged with nitrogen		
				19'	23'	no smell cont'd damp brown sand - (well sorted)		
				23'	24'	begin water seepage		
				24'	26'	hole caving from water		
30	12"			26'	30'	hole kept open only to 26'		
						cased with 4" PVC 10' of slotted .020" screen 20' of regular PVC; gravel packed.		
						Note: It was necessary to drive casing 4' into sand due to caved condition at bottom of hole.		

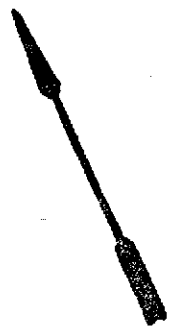
TELEX 92-8420



WATER-TABLE GRADIENT MAP from 9/14/81



WATER-TABLE GRADIENT MAP from 9/14/81



DRILLING LOG

Project: Bart/Shell
 Name: Oakland, California
 Date: 8/26/81

Well Designation: L-2
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval from	to	Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
0945	12"			0	6'	Artificial fill: brown sand - concrete, asphalt and rock		
				6'	7'	begin clayey sand: light brown to yellow brown, damp		
				7'	10'	well sorted brown sand, some darker streaks		
				10'	12'	small fraction of clay binder		
				12'	15'	loose, unconsolidated uniform sand - moist		
				15'	16'	Gas detector reads 14% slight gasoline smell		
				16'	18'	cont'd brown, uniform sand, damp		sample no. L-2
				18'	19'	gas detector reads greater than 100% - purged with nitrogen		
				19'	23'	no smell cont'd damp brown sand - (well sorted)		
				23'	24'	begin water seepage		
				24'	26'	hole caving from water		
530	12"			26'	30'	hole kept open only to 26'		
						cased with 4" PVC 10' of slotted .020" screen 20' of regular PVC; gravel packed.		
						Note: It was necessary to drive casing 4' into sand due to caved condition at bottom of hole.		

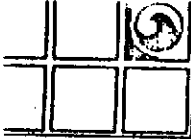
DRILLING LOG

Project: Bart/Shell
 Name: Oakland, California
 Date: 8-27-81

Well Designation: L-3
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval from	to	Pressure	Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
00	12"			0	4'		Sand, silt and clay, fill, bits of debris and rock		
				4'	6'		begin uniform grained, damp yellow brown sand		
				6'	9'		some clayey sand		
				9'	11'		cont'd brown sand slight gasoline smell		
							detector reads: 10%		
				11'	12'		damp, uniform sand - some gray sand		L-3 #1
				12'	14'		slight gasoline smell (thin 1mm seam on water of gasoline)		#2
				14'	16'		gas detector reads: 10% sand		
				16'	18 1/2'		gas detector reads: 40% sand		#3
				18 1/2'	19 1/2'		slightly stiff w/ clay - sand		
				19 1/2'	21'		some gray sand mostly brown sand		
							stronger gasoline smell		#4
				21'	27'		water infiltration		
				27'	30'		caving in water-logged sand - re drill		
							several passes to 37' - casing lowered		
							10' of slotted 4" PVC; 20' of reg. PVC		
0	12"						Gravel packed -		



Project: Bart/Shell
Name: Oakland, California
Date: 8/31/81

Well Designation: L-4
Driller: Powell
Equip. Used: LDH Hughes 50' Auger & Barrel

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
0	12"			0	4'	Fill: sand-silt-clay, rock, debris, concrete and bricks		
				4'	7'	light brown sand (backfill?) some clayey sand		
						slightly moist clayey sand - gas detector: Nil		
				7'	13'	cont'd moist sand - some gray sand mixed		
						detector reads: 3%		
				13'	16'	cont'd moist sand - minor clay. detector reads: 5%		
				16'	21'	brown moist sand - layered gray sand		
				21'	23'	cont'd sand - spoon sample - wet		L-4 #1
				23'	24'	bucket grinding put on auger - clear		
				24'	31'	caving from water at 22' -		
						cont'd drilling out to 35' +		
						able to place 30' of casing:		
						10' slotted PVC @ .020"		
						20' regular PVC		
00	12"					Gravel packed - no evidence of gasoline		

DRILLING LOG

Project: Bart/Shell
 Name: Oakland, California
 Date: 9/2/81

Well Designation: L- 5
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
00	12"			0	5'	Inside drop inlet - storm drain roadway		
						invert elev: -5' below street level		
				5'	7'	fill sand - gas detector: 7%		
				7'	13'	moist brown sand; gas detector: 10%		
				13'	14'	begin wet sand - smells of gasoline		
				14'	15'	gas detector: 15%		#1
				15'	19'	spoon sample-loose sand		
					19'	detector reads: 50%		#2
				19'	22'	sand saturated with gasoline; reads: 80%		
				22'	23'	encountered water - begin revert		
				23'	27'	caving sand - revert not holding well		
				27'	32'	cont'd sand - in water table		
						strong gasoline fumes		
				32'	40'	becoming more compact sand		
						some clay- (gray to gray-green)		
				40'	42'	dense, stiff clay- bay mud - bottom hole		
						cased with 20' slotted PVC .020" (4")		
00	12"					17' regular PVC & gravel packed		

DRILLING LOG

Project: Bay Shell
 Name: Oakland, California
 Date: 9-3-81 & 9-8-81

Well Designation: L-6
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
1000	12"			0	2'	Street concrete and old cobblestones		
				2'	4'	mixed fill and cobbles		
					4'	begin brown sand -		
				4'	10'	sand fill some small pieces brick and rock		
				10'	16'	cont'd sand and clayey sand - moist		
					16'	slight gasoline smell ? - stopped		#1
330						hole 9-3-81 to prepare revert		
000	12"	9-8-81		16'	20'	cont'd sand, gas detector reads: 35%		#2
				20'	24'	slightly clayey sand		
					24'	top of water table - caving sand		#3
				24'	30'	revert introduced		
				30'	34'	wet gray-brown clayey sand		#4
				34'	40'	sand to clay - top of bay mud		
				40'	42'	stiff, dense clay - bay mud		
						placed 40' of casing: 20' slotted PVC .020'		
						and 20' reg. PVC - collar of casing 2" below street level		
500	12"					Gravel-packed		

DRILLING LOG

Project: Bart/Shell
 Name: Oakland, California
 Date: 9-10-81

Well Designation: L-7
 Driller: Powell
 Equip. Used: LDH Hughes 50' Auger

Geologist: J. Ballerino

Time	Diam	Bar	At	Interval		Description of Rock Cuttings	Remarks (e.g. Soft Spots)	SAMPLE #
				from	to			
030	12"			0	5'	2" asphalt - damp, loose light brown sand		
				5'	12'	cont'd loose brown sand		
				12'	16'	gas detector: Nil - moist sand		
				16'	17'	spoon sample - no gasoline smell		#1
				17'	18'	wet sand becoming slightly clayey-mottled		
					18'	top of water table caving sand		
				18'	24'	cont'd caving - placed revert		
					24'	much water - "quicksand"		#2
				24'	34'	cont'd slow drilling with revert		
					34'	sand - brown - some gray revert "weak"		#3
				34'	40'	becoming clayey sand - (no gasoline smell)		
00	12"			40'	41'	end hole in clayey sand - gray to brown		
						cased with 20' slotted PVC .020" (4")		
						and 20' regular PVC		
						Gravel packed		

Project: Shell - Bart
 Date: _____

**GROUNDWATER
 TECHNOLOGY, INC.**

CONSULTING GROUNDWATER GEOLOGISTS

Well: _____

PRODUCT THICKNESS KEY

- Slight odor of Product
- Thin film of product
- Slight odor, neither product or sewage
- Sewage odor

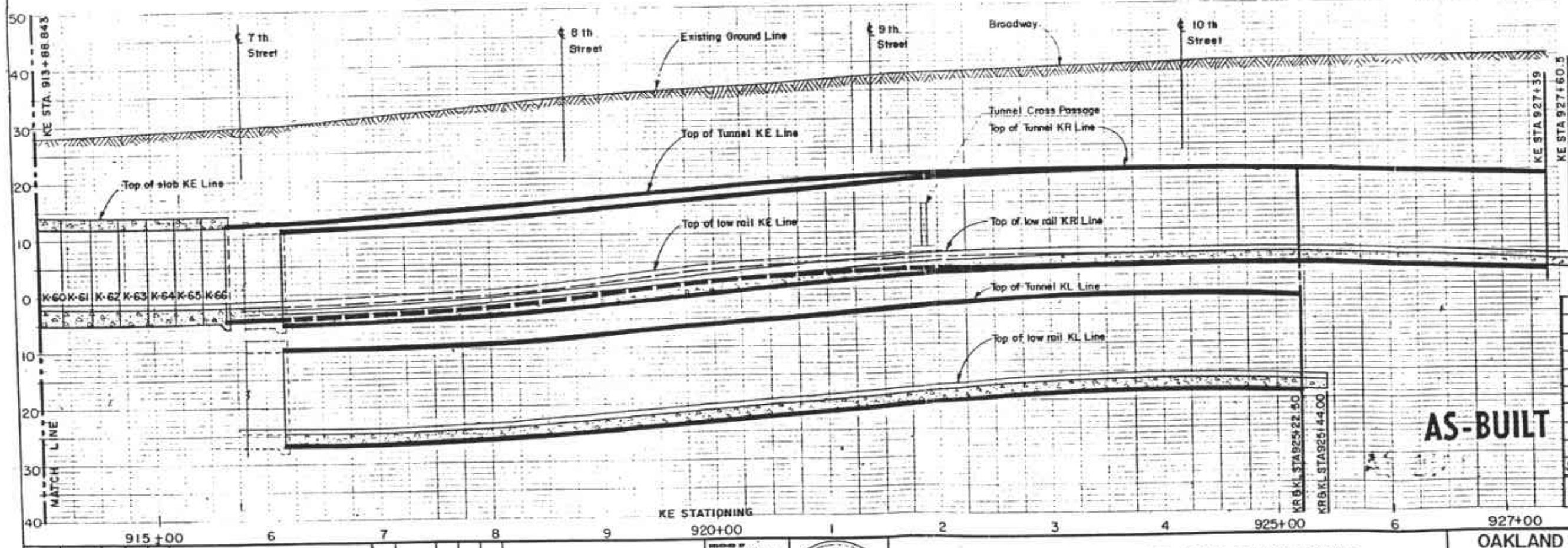
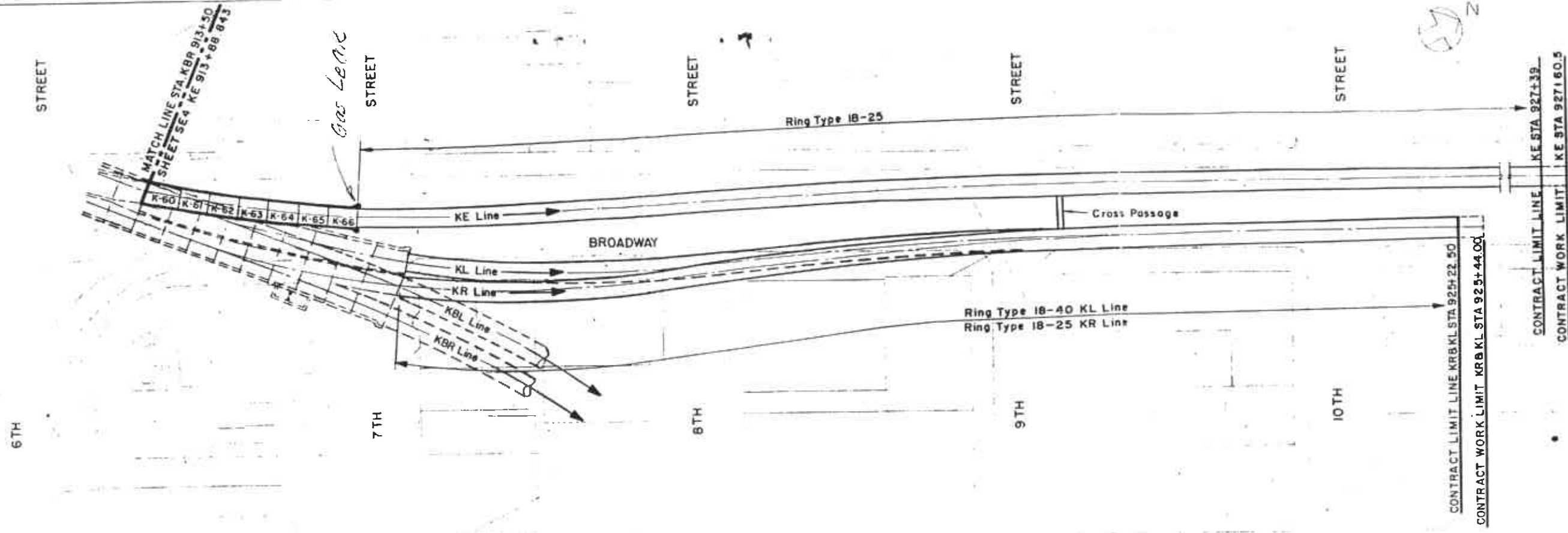
Depth to water measured in Monitoring Wells

	1	2	3	4	5	6	7						
ELEV.	33.54'	32.69'	31.94'	31.94'	28.96'	28.10'	20.04'						
	30.45'	30.3'	31.38'	27.55'	20.8'	40.35'	38.55'						

Note:
 Elev. is
 street grade

Total Depth
 Drilled

Date	Note	1	2	3	4	5	6	7					
8-28-81	DTW	23.75'	22.40'	22.72'									
	DTOP	23.75'	22.40'	22.72'									
	Product Thick.	0 ¹	0 ²	0 ²									
	Elev. of water	9.79'	10.3'	9.22'									
9-14	DTW	23.82'	22.58'	22.83'	24.5'	21.01'	21.48'	12.62'					
	DTOP	23.82'	22.58'	22.83'	24.5'	21.01'	21.48'	12.62'					
	Product Thick.	0 ¹	0 ¹	0 ¹	0	0 ¹	0 ³	0 ³					
	Elev. of water	9.72'	10.11'	9.11'	7.44'	7.95'	6.62'	7.42'					
10-2	DTW	23.83'	22.63'	22.75'	24.6'	21.20'	21.51'	14.72'					
	DTOP	23.83'	22.63'	22.75'	24.6'	21.20'	21.51'	14.72'					
	Product Thick.	0 ¹	0 ¹	0 ²	0 ⁴	0 ¹	0	0 ³					
	Elev. of water	9.71'	10.06'	9.16'	7.34'	7.76'	6.59'	5.32'					



AS-BUILT

SHEET NO.	TITLE
55 110	Segmented Rings Ring Type IB-25
55 109	Segmented Rings Ring Type IB-40
GT 14/516	Plan & Profile
GT 6	Alignment Data
SE 4	Structural Key Plan & Profile
SE 1	General Arrangement Plan
REFERENCE DRAWINGS	

DESIGNED BY W.M. MAHON	
DRAWN BY L. BROWNE	
CHECKED BY F.J. KOP	
IN CHARGE A.J. BIRKMYER	
DATE 27 JUN 1967	

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

BECHTEL CORPORATION
ENGINEERS
SAN FRANCISCO

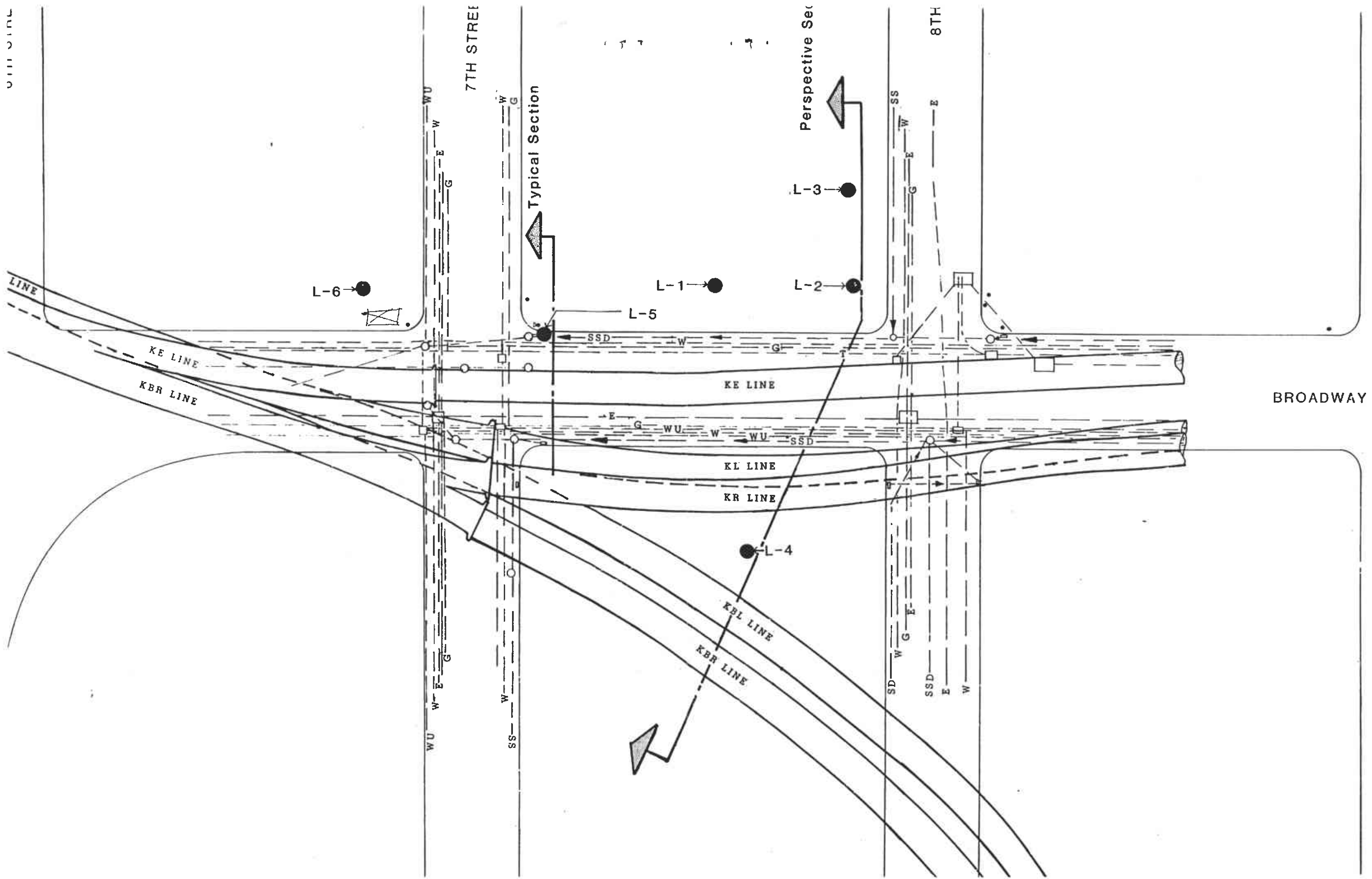
PARSONS BRINCKERHOFF-TUDOR-BECHTEL
GENERAL ENGINEERING CONSULTANTS

**OAKLAND DOWNTOWN
STRUCT. KEY PLAN & PROFILE
KE, KL AND KR LINES
FROM KE 913+88.843 TO 927+39**

SCALE: HORIZ 1" = 50'
VERT 1" = 10'
CONTRACT - RAILROAD

IK0061-K006
SHEET NO. - 01 PAGES 80
SE 5 - 0 80

0111 0111 0111



7TH STREET

8TH

BROADWAY

Typical Section

Perspective Sec

L-6

L-1

L-2

L-3

L-5

L-4

LINE

KE LINE

KBR LINE

KE LINE

KL LINE

KR LINE

KBL LINE

KBR LINE

WU W E G

W G

SS W G E W

SSD E W

SSD

SSD

SD

SSD

E

W