



Atlantic Richfield Company
(a BP affiliated company)

P.O. Box 1257
San Ramon, CA 94583
Phone: (925) 275-3801
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15 October 2007

Re: Preferential Pathway Survey
Former BP Station # 11124
3315 High Street
Oakland, California
ACEH Case # RO0000239

“I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct.”

Submitted by:

Paul Supple
Environmental Business Manger

RECEIVED

2:38 pm, Oct 16, 2007

Alameda County
Environmental Health



Preferential Pathway Survey

Former BP Station #11124

3315 High Street
Oakland, California

Prepared for

Mr. Paul Supple
Environmental Business Manager
Atlantic Richfield Company
P.O. Box 1257
San Ramon, California 94583

Prepared by



1324 Mangrove Avenue, Suite 212
Chico, California 95926
(530) 566-1400
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15 October 2007

Project No. 06-08-652

Broadbent & Associates, Inc.
1324 Mangrove Ave., Suite 212
Chico, CA 95926
Voice (530) 566-1400
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15 October 2007

Project No. 06-08-652

Atlantic Richfield Company
P.O. Box 1257
San Ramon, CA 94583
Submitted via ENFOS

Attn.: Mr. Paul Supple

Re: Preferential Pathway Survey, Former BP Station #11124, 3315 High Street, Oakland, California; ACEH Case # RO0000239

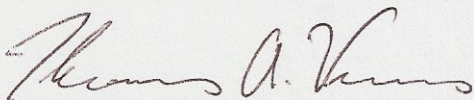
Dear Mr. Supple:

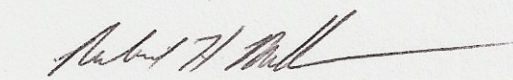
Attached is the *Preferential Pathway Survey* for Former BP Station #11124 (herein referred to as Station #11124) located at 3315 High Street, Oakland California (Site). This report presents a summary of results from the preferential pathway survey performed for Station #11124, and supplements the previously submitted *Initial Site Conceptual Model* report for the Site (BAI, 15 May 2007).

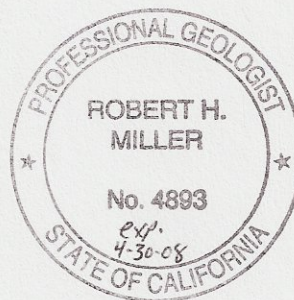
Should you have questions regarding the work performed or results obtained, please do not hesitate to contact us at (530) 566-1400.

Sincerely,

BROADBENT & ASSOCIATES, INC.


Thomas A. Venus
Senior Engineer, P.E.


Robert H. Miller, P.G., C.HG.
Principal Hydrogeologist



Enclosures

cc: Mr. Steven Plunkett, Alameda County Environmental Health (Submitted via ACEH ftp site)
Ms. Shelby Lathrop, ConocoPhillips, 76 Broadway, Sacramento, CA 95818
Electronic copy uploaded to GeoTracker

**Preferential Pathway Survey
Former BP Station #11124
3315 High Street
Oakland, California**

INTRODUCTION

On behalf of BP, Broadbent & Associates, Inc. (BAI) prepared this *Preferential Pathway Survey Report* for the Former BP Station #11124 (herein referred to as Station #11124) located at 3315 High Street, Oakland, Alameda County, California (Site). A Site Location Map is provided as Drawing 1. This Preferential Pathway Survey was prepared in response to the original 23 December 2005 request from Mr. Don Hwang of Alameda County Environmental Health Services (ACEH), as subsequently discussed with Mr. Steven Plunkett of ACEH, the present manager of this Local Oversight Program case (Case #RO0000239).

This report presents a summary of the existing underground utilities in the vicinity of the Site that might behave as potential subsurface conduits for migration of petroleum hydrocarbon contamination to offsite receptors. This report supplements the previously submitted *Initial Site Conceptual Model Report* for the Site (BAI, 15 May 2007). For the reader's convenience, some discussion of the Site setting is provided below. For a more developed discussion of the on-site and off-site geology, hydrogeology, release history, source zone, plume development and migration, the reader is referred to the Initial SCM Report previously provided.

SITE BACKGROUND

The Site was operated as a Mobil-brand service station prior to 1989, when it was transferred to BP. BP operated the Site as a service station until it was transferred to TOSCO in 1994, then ConocoPhillips, which operated the Site as a 76-branded service station until 2004. The Site is currently a non-operational service station. However, the current property owner is in the process of obtaining the necessary permitting to operate an independent service station on the Site.

Historically, four steel underground storage tanks (USTs) were removed from the Site and replaced in 1986: one 10,000 gallon, one 8,000 gallon, and one 6,000 gallon used for storing gasoline, and one 280 gallon waste-oil tank. Sheen was noted on the ground water present within the UST excavation. Petroleum hydrocarbons were not detected in the soil samples collected from the excavation area. In July 1990, the dispenser islands and product piping were replaced. Total petroleum hydrocarbons as gasoline (TPHg), benzene, toluene, ethylbenzene, and total xylenes (BTEX) were detected above laboratory reporting limits in the soil samples collected beneath the removed dispenser islands. On 2 December 2004, Secor observed the removal of facility structures by Fuller Excavating of Sacramento, California. According to the *UST Removal and Facility Soil Sampling Report* (Secor, 3 August 2005), the removed facility structures included one 12,000-gallon and two 10,000-gallon gasoline USTs, one 1,000-gallon waste-oil UST, three hydraulic lifts, one clarifier, four fuel dispensers, and associated product lines. The USTs and product lines appeared to be in good condition, with no holes or cracks reportedly observed during removal. Several soil and ground-water samples collected during the excavation were found to contain petroleum hydrocarbons and oxygenates.

Subsequent subsurface environmental investigations detected soil contaminated with TPH-g (also known as Gasoline Range Organics – GRO) up to 160 milligrams per kilogram (mg/kg), Benzene up to 0.41 mg/kg, and Methyl Tertiary Butyl Ether (MTBE) up to 0.22 mg/kg. There are currently five ground-water monitoring wells on the Site. No separate phase hydrocarbons have been reported at the Site in collected ground-water samples since sheen was observed in the open UST excavation in 1986. Since then,

GRO has been detected in ground water at the Site up to 880 micrograms per liter ($\mu\text{g/L}$) and MTBE has been detected in ground water at the Site up to 1,400 $\mu\text{g/L}$ (both in MW-5 on 3/13/2007). BTEX concentrations above laboratory reporting limits have not been observed in ground water at the Site within the last 15 years.

The Site is situated approximately 155 feet above mean sea level. The local topography generally slopes to the south-southwest. Sediments encountered at the Site consist primarily of clays and silts with traces of sand and gravel, extending from the ground surface to the total depth investigated, approximately 35 feet below ground surface (bgs). Ground water is typically seven to ten feet bgs, but has been recorded as high as 6.43 ft below the top of casing measuring point in well MW-2 on 13 January 2005 (Based on survey data, the TOC measuring point for well MW-2 is located approximately 0.25 ft bgs, making this measurement approximately 6.68 ft bgs). Historically, the ground-water gradient has ranged from 0.006 ft/ft to 0.022 ft/ft. Based on ground-water elevation data, the ground-water flow direction has varied between north and southwest to southeast, with the majority of the measurements towards the southwest.

According to the *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report* (SFRWQCB, June 1999), the majority of East Bay Plain Cities (except the City of Hayward) do not have “any plans to develop local ground-water resources for drinking water purposes, because of existing or potential saltwater intrusion, contamination, or poor or limited quantity.” The San Francisco Regional Water Quality Control Board’s (SFRWQCB) basin plan for the East Bay Plain ground-water basin denotes existing beneficial uses as municipal and domestic supply (MUN), industrial process supply (PROC), industrial service supply (IND), and agricultural supply (AGR).

PREFERENTIAL PATHWAY SURVEY

An underground utility site survey was conducted in the second and third quarter of 2007 to identify potential man-made migration pathways and conduits, and to assess whether preferential pathways and conduits may promote the offsite migration of petroleum hydrocarbons. The initial stage of the preferential pathway survey consisted of requesting utility drawings/maps from the East Bay Municipal Utility District (EBMUD) depicting utilities relating to water, natural gas, sanitary sewer, and storm drains. The City of Oakland was contacted to determine the locations and depths of subsurface sanitary sewer and storm drain pipelines. The Pacific Gas & Electric Company was also contacted regarding possible electrical and gas utilities located underground on or near the Site. BAI was unable to gather pertinent information from AT&T regarding potential cable, fiber optic, or phone lines that may exist on or near the Site. Copies of useful plans received from EBMUD and the City of Oakland are provided within Appendix A. Drawing 2 depicts the results of the preferential pathway survey.

As shown in Drawing 2, underground water service is provided to the Site from the middle of the northeast Site boundary along Porter Street. Offsite water pipelines are located within Porter Street and High Street. A four-inch cast iron pipeline is located within Porter Street running parallel to the northeast side of the Site, approximately 18 feet northeast of the sidewalk curb. This line tees into an 18-inch diameter cast iron water main in High Street running northeast from the eastern corner of the Site approximately 15 feet southeast of the Site’s southeastern sidewalk curb. A six-inch diameter cast iron water pipeline also runs northeast-southwest past the Site in High Street, approximately 42 feet from the Site’s southeastern sidewalk curb. The water service on the Site is expected to be buried less than 30 inches bgs. The water mains in High Street and Porter Street are expected to be buried less than 48 inches bgs. Due to the location of the onsite water service, and depths of area water mains, subsurface migration of contaminants within historic water line construction trenches is considered unlikely.

As shown in Drawing 2, a four-inch diameter cast iron underground natural gas pipeline is shown on the EBMUD plans running in High Street parallel to the southeastern side of the Site, approximately

eight feet from the Site's southeastern curb. This natural gas pipeline is anticipated to be buried less than 48 inches bgs. Due to the expected depth of the natural gas pipeline, subsurface migration of contaminants within the historic construction trench is considered unlikely.

The City of Oakland plans show underground sanitary sewer pipelines buried under Porter Street and High Street. An 12-inch diameter vitrified clay pipe (VCP) sewer pipeline runs in the approximate middle of Porter Street, and connects with a 12-inch diameter VCP sewer pipeline running parallel to High Street under the sidewalk adjacent to the Site, approximately seven feet behind the sidewalk curb. A 10-inch diameter sewer pipeline of unknown material construction is shown in the City of Oakland sewer plans on the south side of High Street also. According to the City of Oakland, the sanitary sewer pipelines in Porter Street and High Street are reportedly at approximately 60 inches bgs. BAI believes that wastewater historically generated in the building at Station #11124 was connected via lateral service sewer into the 12-inch VCP sanitary sewer on the north side of High Street. BAI was unable to determine what depth the lateral sewer pipeline was constructed. However, lateral sewer pipelines are rarely constructed deeper than necessary, and in this case the grade line would require that it be less than the sewer in High Street, reportedly at 60 inches bgs. The City of Oakland does not have storm drains on this block.

As reported earlier, depth to water at the Site has ranged as high as approximately 6.68 ft bgs (approximately 80 inches bgs). Even if the sewer pipeline trenches had been cut approximately half a foot deeper than necessary and backfilled with a uniform bedding material (common practice now but not necessarily performed in the past), the City of Oakland trenches would have been cut approximately 66 inches bgs. This is still approximately one and a half feet above the highest ground-water table on record. Therefore, BAI believes that it is unlikely that local subsurface utility trenches have intercepted subsurface contamination and acted as preferential pathways for offsite migration of petroleum hydrocarbon contamination from the Site.

CLOSURE

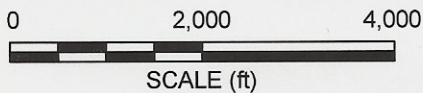
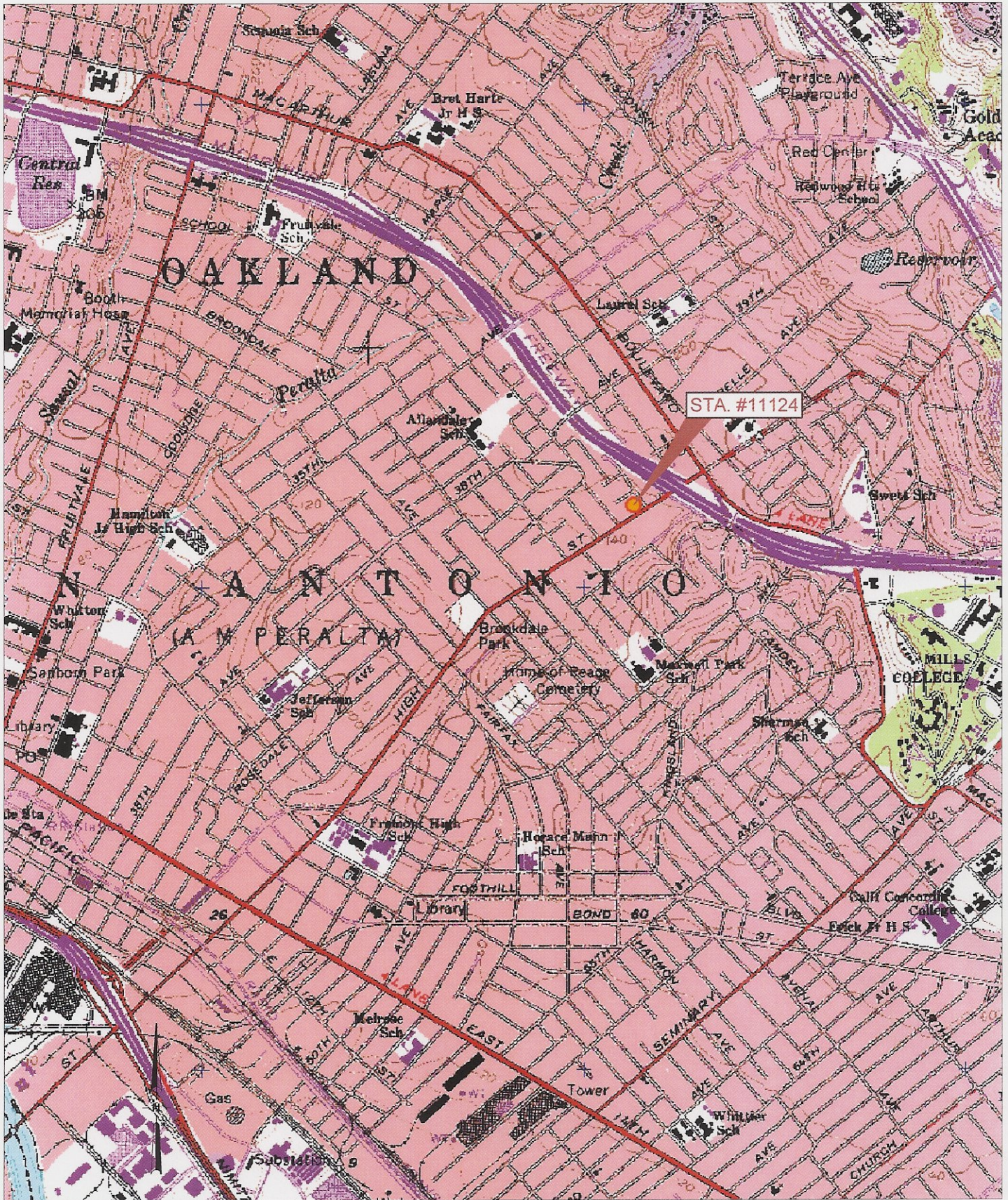
This report has been prepared for the exclusive use of Atlantic Richfield Company. The findings presented in this report are based upon the observations of our personnel and points of investigation. Our services were performed in accordance with the generally accepted standard of practice at the time this report was written. No warranty, expressed or implied, is intended. It is possible that variations in the soil or ground-water conditions could exist beyond the points explored in this investigation. Also, changes in site conditions could occur at some time in the future due to variations in rainfall, temperature, regional water usage, or other factors.

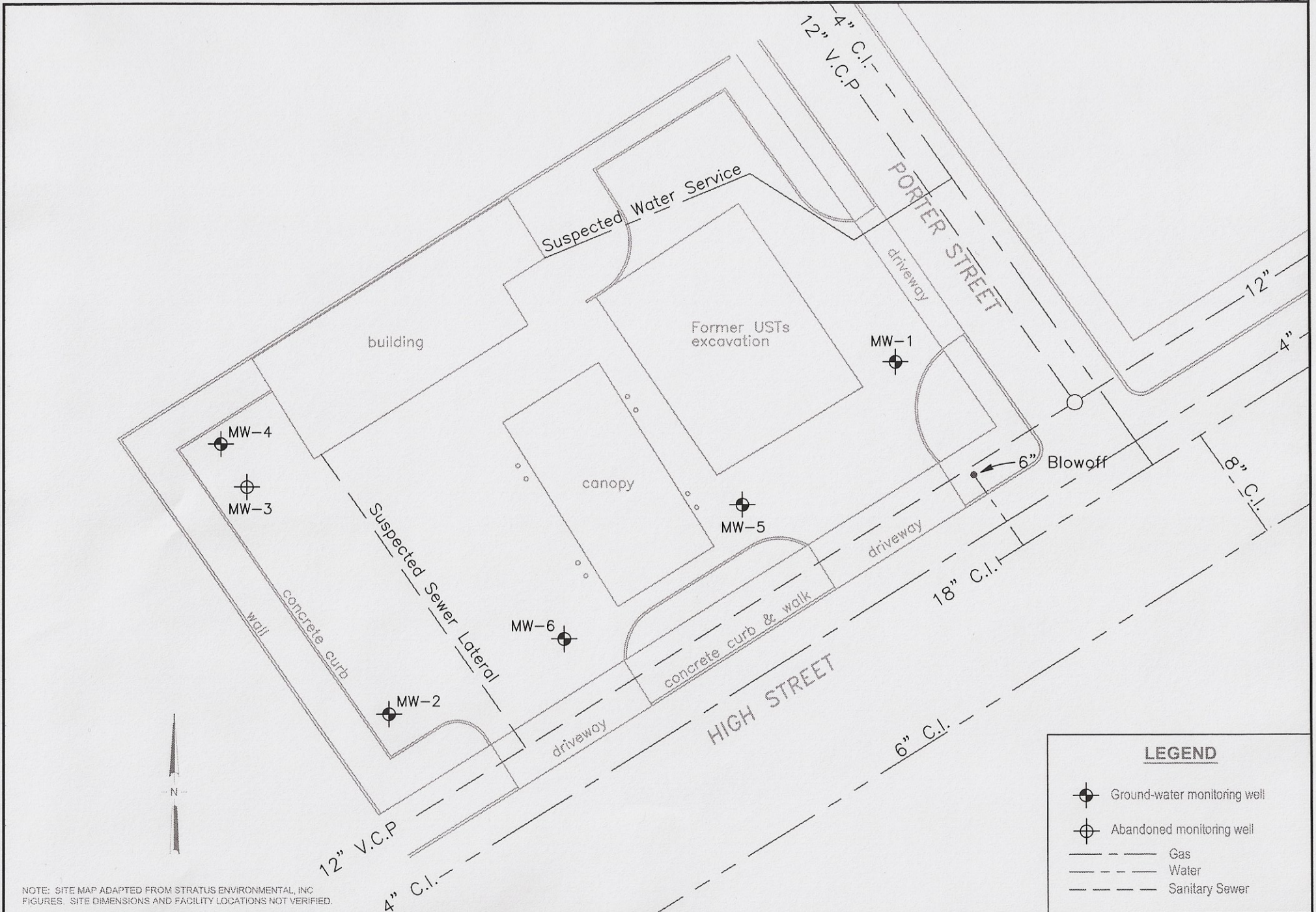
ATTACHMENTS:

Drawing 1. Site Location Map

Drawing 2. Site Layout Plan

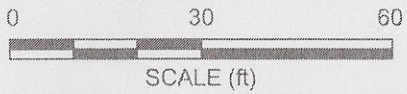
Attachment A. Subsurface Utility Plans





NOTE: SITE MAP ADAPTED FROM STRATUS ENVIRONMENTAL, INC FIGURES. SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

LEGEND	
	Ground-water monitoring well
	Abandoned monitoring well
	Gas
	Water
	Sanitary Sewer



BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL
1324 Mangrove Ave. Suite 212 Chico, CA
Project No.: 06-08-652 Date: 9/14/07

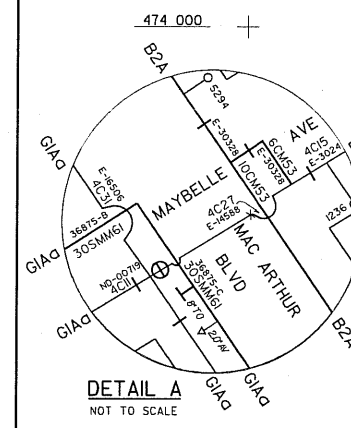
Former BP Station #11124
3315 High Street
Oakland, California

Site Layout Plan

Drawing
2

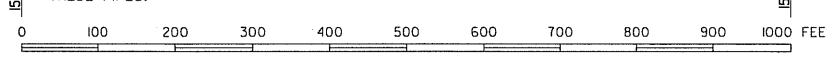
APPENDIX A

SUBSURFACE UTILITY PLANS



THIS MAP IS TO BE USED FOR GENERAL REFERENCE PURPOSES ONLY. IT IS NOT TO BE USED FOR CONSTRUCTION OF ANY UTILITY OR STRUCTURE. THE USER SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF ALL UTILITIES AND STRUCTURES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY INFORMATION FROM THE APPROPRIATE AGENCIES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY INFORMATION FROM THE APPROPRIATE AGENCIES.

NOTE:
PIPES WITH EXTENSION NUMBERS IN THE NO. XXXXX SERIES ARE 'NO DATA' PIPE. NO RECORDS OR DRAWINGS EXIST FOR THESE PIPES.



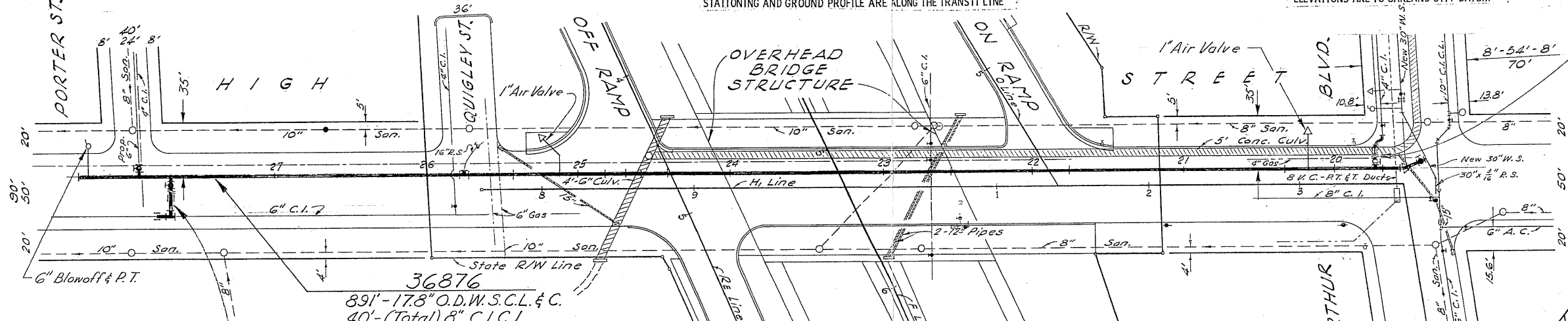
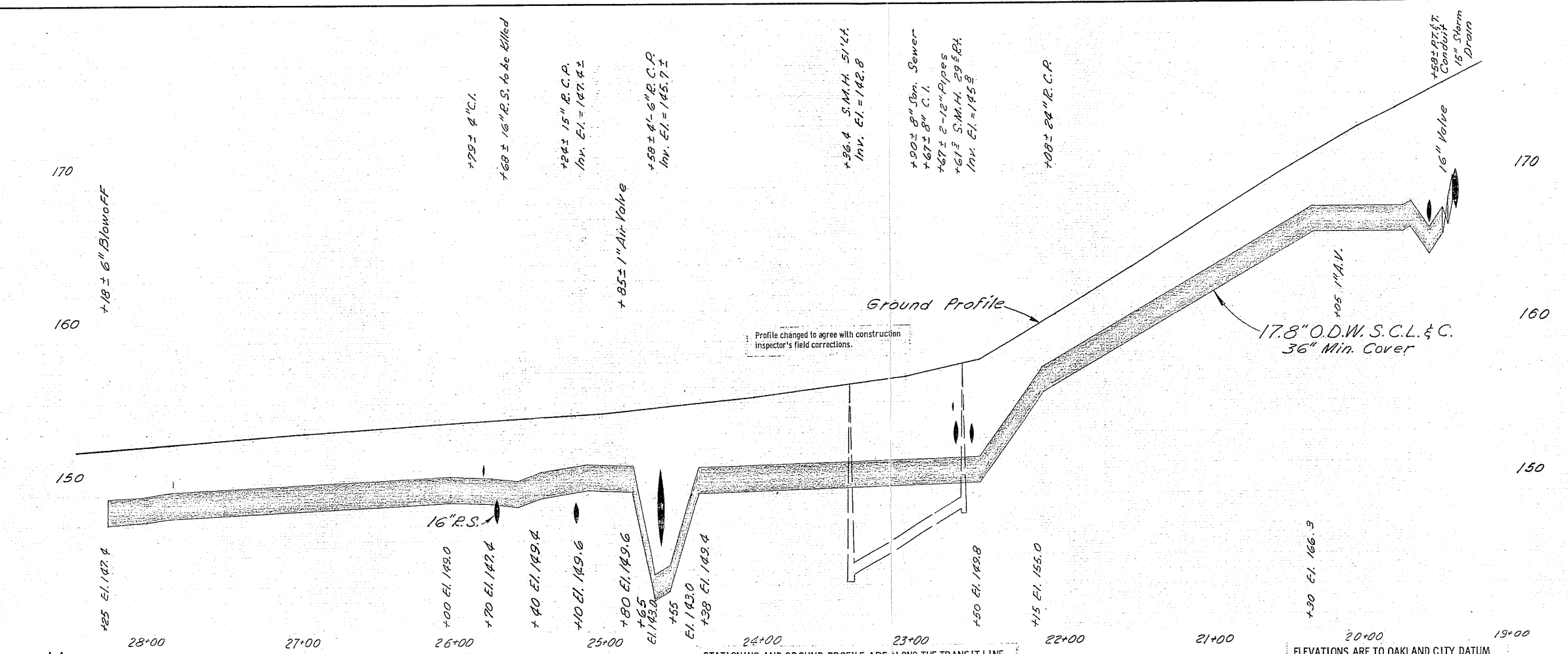
TAP LEGEND
 1 TAP IS ON MAIN 1
 2 TAP IS ON MAIN 2
 3 TAP IS ON MAIN 3

1509 B 470 123
 ONLY THOSE MAPS ON WHICH THIS LEGEND APPEARS IDENTIFY THE MAIN TAPPED.

CITY	OAKLAND	STRUCTURE	DESIGNATION	NAME	ELEV.	CAP. IN M.G.	PRESSURE ZONE	DATE ISSUED	OCT 2003
COUNTY	ALAMEDA						GIAO AQUEDUCT		
U.S.G.S.	OAKLAND EAST						B2A 39TH AVE		

22-DEC-2006 © 2004 EMUD
 EAST BAY MUNICIPAL UTILITY DISTRICT

1509B472
 System Map



CROSS CONNECTION
27'-8" C.I.C.L.

0+00	17.8" O.D.W.S. Pipe
0+02	8" Gate F&H C=3.7' M.R.S., O.R.T., T:28
0+03.7	8" Insulated Joint Dwg. No. 3446-GB Fig. C-1
0+05.2	8" Sleeve Beg. 8" C.I.C.L. C=3.5'
0+26.7	6"x8" Tee
0+29.2	6" Sleeve

36876
891'-17.8" O.D.W.S.C.L. & C.
40'-(Total) 8" C.I.C.L.

Sta.	Desc.	Sta.	Desc.
8+91.0	16" Blind Flg. C=3.3'	28+25.8	
8+86	17.8"x6.9" Stew. Noz. Flgd	28+20.5	
	6" B.O. & P.T.		
8+63.5	17.8" W.S. C=3.3' on sur.	28+00	
8+53	17.8"x9.05" Sod. Noz. Flgd	27+85.7	
	C=3.2'		
	8" Gate F&H M.R.S., O.R.T., T:28 - Hood, Bulkhead		
8+51.1	4" C.I.(exist.) C=2.7'	27+83.6	
8+32.3	NE & Porter St.	27+69.5	
8+31.95	17.8"x9.05" Sod. Noz. Flgd	27+66	
6+65.8	17.8" W.S. C=3.5' on sur.	26+00	
6+50.7	SW & Quigley St.	25+85	
6+44	4" C.I. Water C=3'	25+78.2	
6+38.45	17.8" W.S. Tee C=3.8'	25+72.6	
6+35.1	16" B.S. Water C=5.2'	25+69.2	
6+21	Ch. in Bell 4up C=4.1'	25+55	
6+20	6" Gas C=3.5'	25+54.6	
6+14.7	6" Gas C=3.2'	25+49.1	
6+05.5	Field Cut 3 1/2" C=3.6'	25+40	
5+75.5	15" Storm Drain C=5.7'	25+09.5	
5+75.5	1" A.V. C=3.3'	25+09.5	
5+45.6	17.8" W.S. 22 1/2" Adn C=3.7'	24+79.1	
5+30.8	17.8" W.S. 22 1/2" Up C=11'	24+65.9	
5+26.8	4'-6" Culvert C=4.3'	24+62	
5+19.45	17.8" W.S. 22 1/2" Up C=10.5'	24+55.5	
5+00.6	17.8" W.S. 22 1/2" Adn C=4.2'	24+38	
3+31	6" C.I. Water (exist.) C=2.5'	22+67.7	
3+29	18"x60" Conc. Storm Drain C=3.8'	22+65.8	
3+18.2	12" Storm Drain C=4.2'	22+55	
3+13.15	Field Cut 8 1/2" C=6.3'	22+50	
2+71.65	Field Cut 5" C=3.0'	22+08.7	
0+92.85	Field Cut 3 1/2" C=3.5'	20+30	
0+77.5	1" A.V. C=4.4'	20+14.5	
0+41	SW & MacArthur Blvd. (NW) 19+78		
0+33	17.8"x9.05" Sod. Noz. Flgd 19+70		
	C=6.7'		
0+20	Field Cut Beneled Dr. C=6.7' 19+65		
0+16.5	8 K.C. Ducts-A.T. & T. C=3'		
0+14.4	15" Storm Drain C=2.3'		
0+14.4	17.8" W.S. 22 1/2" Adn 4' Horiz. & Up C=9.1'		
0+05.7	16" Skirted Flg.		
0+02.8	16" Gate F&F C=7.7'		
	M.M.E.H., O.R.T., T:102 1/2		
0+00	30" W.S. Pipe (36875-C) C=6.4'		

CONNECTION to 4" C.I.
13'-8" C.I.C.L.

- 0+35 NW & High St.
- 0+28.9 4" Gate (exist.)
- 0+17.2 End 4" Offset - 4" C.I. (exist.) C=4.4'
- 0+15.2 End 8" x 4" Red. H&S - Beg. 4" Offset C=5.8'
- 0+12.7 8" Sleeve C=5.9' - Beg. 8" x 4" Red. H&S - End 8" C.I.C.L.
- 0+04.7 8" Sleeve C=6.7' 8" Insulated Joint Dwg. 3446-GB Fig. C-1
- 0+03.4 4" Gas C=4.7'
- 0+01.7 8" Gate F&H C=7.0' M.R.S., O.R.T., T:23
- 0+00 17.8" O.D.W.S. Pipe

SPECIFICATIONS NO. 880
36876

AS BUILT
STARTED 6 Jul 61 IN SERVICE 25 Sep 61
COMPLETED 24 Oct 61
RECORDED 1 Trahern APPROVED Jorgensen
REVISED 28 Nov 61 BY E.F. Enos

APPROVED **J. D. DeCosta**
CHIEF ENGINEER R. E. No. 989

AREA: Oakland # 621
PRESSURE ZONE: Aqueduct GIAa
JUSTIFICATION: Repl. % Freeway Const.
PAVING: 30" Conc., Bal. A.C.
MAP NO: JGA
REFERENCE: HD 876, FB 2727, 93547&A
JOINTS: Welded
MAKE OF PIPE: Undergr. Const. Co.
CONSTRUCTION BY: Undergr. Const. Co.
CONTRACT NO.: 12407

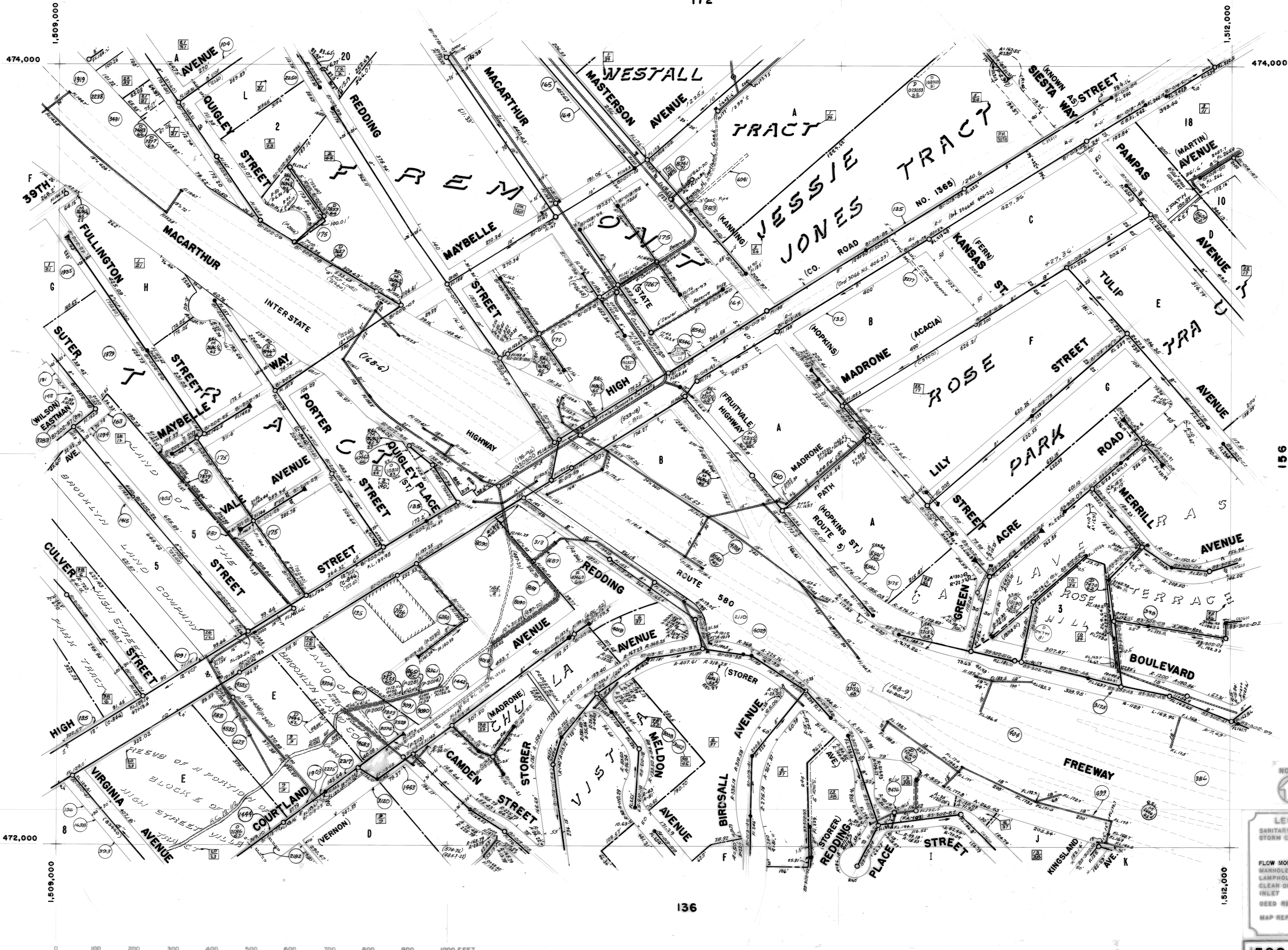
DESIGNED BY	I. W. Ross
DRAWN BY	D. Wong, E. Hall
CHECKED BY	W. E. Bradbury
CORROSION CHECK BY	G. H. Dowd
PROJECT ENGR.	I. W. Ross
SUPERVISOR	G. B. Griese
MANAGER	J. W. Trahern
MANAGER WATER PRGD. & DIST.	D. G. Larkin

27 Feb 61	Sewers & Storms Added	D.W.M.R.

STRUCTURE OR ZONE DESIGNATION	GIAa
SCALE	1"=40'(H); 1"=4'(V)
DATE	17 Feb 61

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA
MACARTHUR BLVD. FREEWAY
UNIT V
16" W.S. MAIN
HIGH ST.
OAKLAND
W-2408

25 Nov 61
E.E.



83440 VIRGINIA AVE. 6-11-78
 87160 BOWSER ST. 5-1-78
 87160 CRYSTAL 500-6800 83-502 8-9-78
 87210 Hill St 8-7-78

SCALE: 0 100 200 300 400 500 600 700 800 900 1000 FEET

LEGEND

- SANITARY SEWER
- STORM CONDUIT
- FLOW MONITOR
- MANHOLE
- LANE HOLE
- CLEAR OUT
- INLET
- DEED REFERENCE
- MAP REFERENCE

509 B 472