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ALCO HAZMAT
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November 28, 1994

BSK JOB NO. P93156.3

Alameda County Department of Environmental Health
Hazardous Materials Division
1181 Harbor Bay Parkway
Alameda, California 94502

Attention: Ms. Eva Chu

Subject: Addendum Report
Correction to Health Risk Assessment
Dougherty Regional Fire Authority Station No. 1
7494 Donohue Drive
Dublin, California

Madam:

BSK & Associates wishes to make a correction to the Benzene concentration in ambient air, which was calculated as part of its Risk Assessment for the Dougherty Regional Fire Authority Station No. 1. Benzene is the focus contaminant of concern as described in the original report. The estimated Ambient Air Concentration was erroneously reported on Page 2, Health Risk Assessment as 0.05 ppm; however, it is much lower (i.e., 0.02 ppb) than originally reported in Step 3 of the calculations to determine air concentrations. A conversion of milligrams per cubic meter (mg/m^3) to parts per million (ppm) was omitted and ppm was therefore, incorrectly calculated as 0.055 ppm. Simply put, there are 3.2 mg/m^3 per each one ppm. Therefore, the calculation in Step 3 for Ambient Air Concentration of Benzene should read as follows:

$$Ca = 5.5 \times 10^{-5} \text{ mg/m}^3$$
$$= 1.7 \times 10^{-5} \text{ ppm (this step was omitted in original calculations)}$$
$$= 0.02 \text{ ppb (parts per billion)}$$

In conclusion the 0.055 mg/l (ppm) is incorrect. The correct Ca is as stated above, 0.02 ppb. Therefore, the actual risk is even lower than originally represented in the November 18, 1994 Report, BSK Job No. P93156.3

Respectfully submitted,
BSK & Associates

R.J. Archer, C.I.H. 1067
Director, Health & Safety

Alex Y. Eskandari, C.E. 38101
Project Manager

AYE\RJA:hhc
(RJA P93156.3 N22)

Copy to:
Dougherty Regional Fire Authority
Attn: Chief Karl Diekman
Aztec Consultants
Attn: Mr. Glenn D. Miller

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November 18, 1994 BSK Job No. P93156.3

Alameda County Department of Environmental Health
Hazardous Materials Division
1181 Harbor Bay Parkway
Alameda, CA 94502

Attention: Ms. Eva Chu

Subject: Health Risk Assessment
Remnant Motor Fuel Concentration
Dougherty Regional Fire Authority Station Number 1
7494 Donohue Drive
Dublin, California

Madam:

As discussed with you on November 9, 1994, and subsequently authorized by Aztec Consultants, the representative of the Dougherty Regional Fire Authority (DRFA), BSK & Associates has prepared this assessment of the potential health risk of remnant motor fuel in soil at the subject fire station (site). It is our understanding that the Alameda County Department of Environmental Health (ACDEH) desires closure of this site with respect to motor fuel contamination, and has requested a "brief assessment"[1] of the potential health risk for remnant motor fuel at the site.

BACKGROUND

Three underground storage tanks (UST) formerly containing gasoline and diesel were removed from the site in 1989 and 1992. Groundwater monitoring was performed at the site from April 1990 to June 1991; no groundwater contamination by motor fuels was detected during this period.

Soil contaminated by motor fuel was excavated in August and September 1992. The approximate excavation extent was 14,200 square feet and 12 feet in depth. As stipulated by ACDEH[2], localized concentrations of motor fuels located below the elevation of first encountered groundwater in the excavation were allowed to remain in place. The excavation was subsequently backfilled with imported fill and compacted, and a new fire station was constructed. Three shallow groundwater monitoring wells were installed at the new fire station to assess the results of soil remediation on groundwater. The wells were monitored quarterly from October 1993 to October 1994, during which period only trace concentrations of toluene and xylene were detected; TPH as diesel was detected once in October 1993[3].

1 Glenn Miller, Aztec, reported personal communication with Eva Chu, ACDEH, November 1994
2 Meeting, August 14, 1992
3 Tables 1 and 2, BSK Fourth Quarterly Groundwater Monitoring Report, DRFA Fire Station No. 1, dated 10/31/94 - see Appendix "A"

Current site conditions comprise an operating two-story brick fire station, concrete parking and driveways north, west and southeast of the station building, and landscaping east and south of the building. Site layout is depicted in Figure 1, Site Plan.

HEALTH RISK ASSESSMENT

The health risk assessment (HRA) is based on the reported[1] remnant motor fuel contaminant concentrations at soil test location "E", as specified by Ms. Eva Chu of the ACDEH. The contaminant concentrations at test location "E" are the greatest remnant concentrations detected at the site. The contaminant concentrations at soil test location "E" were (in parts per million - ppm): TPH as gasoline - 1900, TPH as diesel - 18, benzene - 15, toluene - 4.7, ethylbenzene - 34, xylenes - 52. The location of the soil test location "E" is indicated on Figure 1, Site Plan, in the parking area/driveway west of the north half of the station building.

The HRA methodology is based on the California EPA, Department of Toxic Substances Control (DTSC), 1994 Preliminary Endangerment Assessment Guidance Manual (PEAGM) for evaluation of hazardous substance release sites. The routes of exposure considered were inhalation, dermal contact and ingestion from air, soil and groundwater sources. Benzene was the focus contaminant because of its designation as a carcinogen, mobility and low exposure limit (Cal OSHA Permissible Exposure Limit - PEL) of 1.0 ppm[2].

Exposure to benzene by ingestion and dermal contact were not considered because of the lack of access to soil and water contaminated with benzene; contaminated soil is located approximately 12 feet below ocmpacted fill and a concrete surface, and groundwater has not been shown to be contaminated by benzene. Inhalation was considered as the receptor pathway of concern. Benzene is a volatile compound present in soil beneath the site. Concrete pavement was not considered a barrier to gas-phase benzene. Potential receptors were considered to be fire station personnel.

Using the PEAGM prescribed EPA Volatile Emission and ambient air concentration box models, the ambient air concentration of benzene was calculated for the approximate area of exposure. The site modeling varies from default values provided in the PEAGM where site data is specific, and the area of the box model reflects the assumed area of residual contamination. Model calculations are presented in Appendix B; site specific data applied to the models are indicated as such.

The resultant ambient air concentration was determined to be 0.05 ppm.

CONCLUSION

As stated, the intended TWA exposure limit is 1.0 ppm. The ambient air concentration of 0.05 ppm is five percent of the intended exposure limit. As the sole route of exposure, the health risk presented to receptors by inhalation of volatilized benzene from remnant concentrations of motor fuel in soil is considered negligible.

1 BSK Report, Soil Sampling and Analytical Services, Contaminated Soil Removal and Disposal, Dougherty Regional Fire Authority Station No. 1, dated 11/30/92

2 California Code of Regulations, Title 8, Section 5155, Table AC-1 "Permissible Exposure Limits for (Airborne) Chemical Contaminants"

LIMITATIONS

The findings and conclusions presented in this assessment are based on field observations, and on data obtained from the sources listed in this report. This report has been prepared in accordance with generally accepted methodologies and standards of practice for the area. No other warranty, either expressed or implied, is made as to the findings or conclusions included in this report.

The findings of this report are valid as of the present. The passage of time, natural processes or human intervention on the property or adjacent properties, and changes in the regulations can cause changed conditions which can invalidate the findings and conclusions in this report.

This report is neither certification nor guarantee that the property is free of, or contains hazardous substance contamination, other than that mentioned in the report.

* * * *

If there are questions or comments regarding this report, please contact the undersigned.

Respectfully submitted,
BSK & Associates

Tim W. Berger, C.E.G. 1828
Project Geologist

Alex Y. Eskandari, C.E. 38101
Project Manager

AYE\TWB:ndp
(ENV\P94313D.RFA)

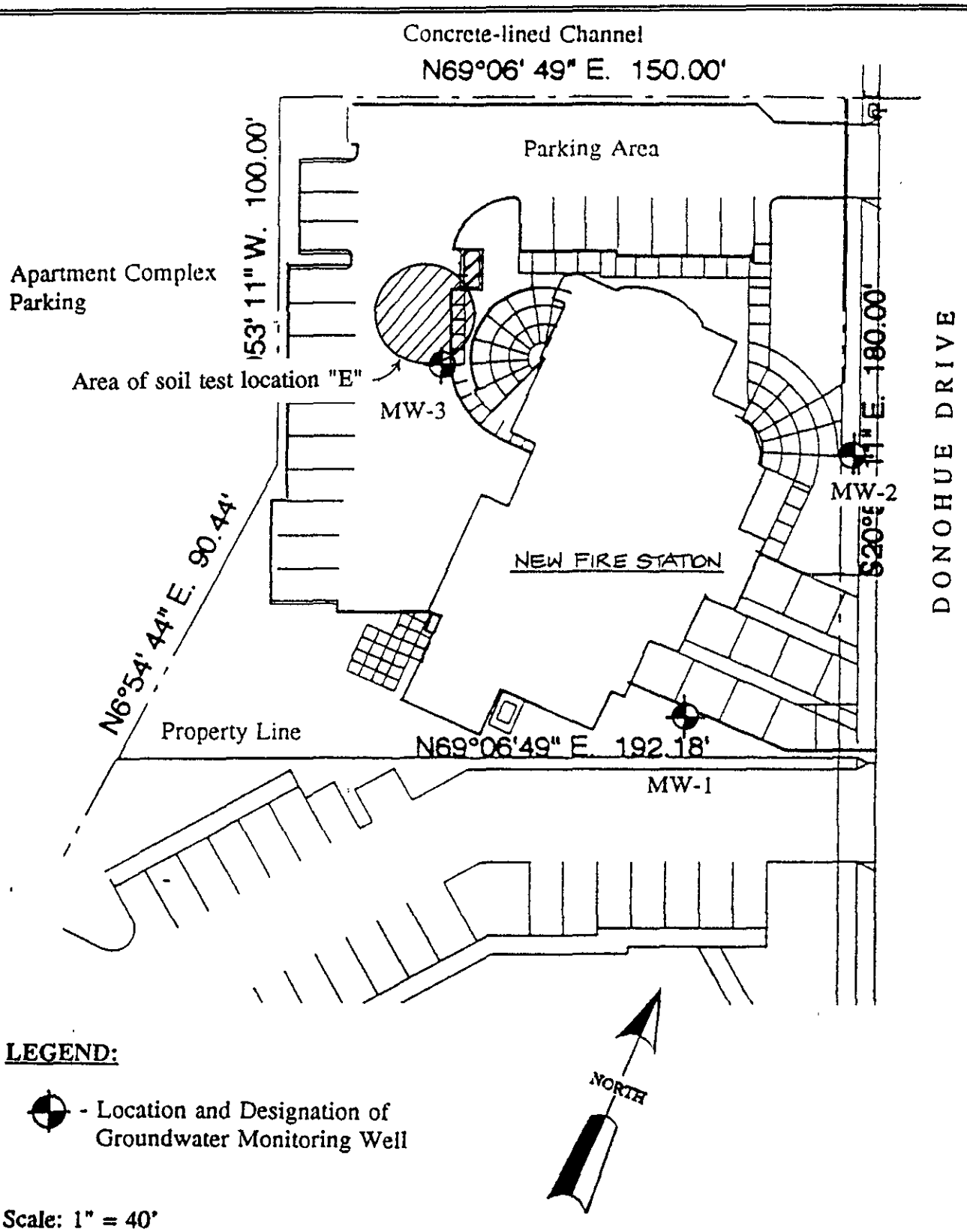
Attachments: Figure 1 - Site Plan

Appendix A - Tables 1 & 2, BSK Fourth Quarterly Groundwater Monitoring Report, DRFA Fire Station No. 1, dated 10/31/94

Appendix B - Calculations - Health Risk Assessment

Distribution: Ms. Eva Chu, Alameda County Department of Environmental Health (1 copy)

copy to: Chief Karl Diekman, Dougherty Regional Fire Authority (1 copy)
Mr. Glenn D. Miller, Aztec Consultants (1 copy)



LEGEND:

- Location and Designation of Groundwater Monitoring Well

Scale: 1" = 40'

HEALTH RISK ASSESSMENT
STATION NO. 1
7494 DONOHUE DRIVE
DUBLIN, CALIFORNIA

SITE PLAN

Job No. P93156.3
November 1994
FIGURE: 1

BSK
& ASSOCIATES

APPENDIX "A"

Water Results, Tables 1 and 2, BSK Fourth Quarterly Groundwater Monitoring Report, DRFA Fire Station No. 1, dated 10/31/94

TABLE 1

BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES
Action Levels and analytical results are presented in Parts Per Billion (ppb)

	CONSTITUENTS			
Sample Location (Action Level)	**Benzene $(1)_1$**	**Toluene $(100)_2$**	**Ethylbenzene $(680)_1$**	**Xylenes $(1750)_1$**
October 14, 1994 (Fourth Quarterly Monitoring)				
MW-1	**ND**	**ND**	**ND**	**ND**
MW-2	**ND**	**ND**	**ND**	**ND**
MW-3	**ND**	**ND**	**ND**	**ND**
July 7, 1994 (Third Quarterly Monitoring)				
MW-1	ND	0.6	ND	0.4
MW-2	ND	0.4	ND	0.3
MW-3	ND	0.4	ND	ND
April 8, 1994 (Second Quarterly Monitoring)				
MW-1	0.4	0.4	ND	1.6
MW-2	ND	0.3	ND	1.2
MW-3	0.8	0.7	ND	2.2
January 5, 1994 (First Quarterly Monitoring)				
MW-1	ND	ND	ND	ND
MW-2	ND	ND	ND	ND
MW-3	ND	ND	ND	ND
October 6, 1993 (Initial Well Installation Sampling)				
MW-1	ND	ND	ND	ND
MW-2	ND	ND	ND	ND
MW-3	ND	ND	ND	ND

ND - None Detected
1 - California Department Of Health Services Drinking Water Standard, Revised 10/23/91
2 - California DOHS Action Level, 7/1/92

TABLE 2

TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE AND DIESEL, AND TOTAL LEAD

Action Levels and analytical results are presented in Parts Per Billion (ppb)

	CONSTITUENTS		
Sample Location (Action Level)	**TPH Gasoline (NA)**	**TPH Diesel $(100)_1$**	**Total Lead (50)**
October 14, 1994 (Fourth Quarterly Monitoring)			
MW-1	**ND**	**ND**	**--**
MW-2	**ND**	**ND**	**--**
MW-3	**ND**	**ND**	**--**
July 7, 1994 (Third Quarterly Monitoring)			
MW-1	ND	ND	--
MW-2	ND	ND	--
MW-3	ND	ND	--
April 8, 1994 (Second Quarterly Monitoring)			
MW-1	ND	ND	ND
MW-2	ND	ND	ND
MW-3	ND	ND	ND
January 5, 1994 (First Quarterly Monitoring)			
MW-1	ND	ND	ND
MW-2	ND	ND	ND
MW-3	ND	ND	ND
October 6, 1993 (Initial Well Installation Sampling)			
MW-1	ND	ND	ND
MW-2	ND	61*	ND
MW-3	ND	58*	ND

NA - Not Available
ND - None Detected
-- - Not Tested
1 - 1980 US EPA 10-Day Suggested No Adverse Response Level (SNARL)
* - Sample contains higher molecular weight hydrocarbons than normally associated with Diesel (see Chemical Test Data Sheet, Monitoring Facilities Installation Report, October 31, 1993, Figures A-18 and A-21).

APPENDIX "B"

Calculations - Health Risk Assessment

Source: California EPA, DTSC Preliminary Endangerment Assessment Guidance Document, January 1994; specifically Chapter 2, Figure 2.7, Table 3 of Appendix A, and Appendix B

Volatile Emission Model (EPA, 1991 and 1992)

Step 1: Calculate the Saturation Concentration to determine model validity with respect to the potential for free-phase contaminant; if free-phase is present, the model is invalid.

$$C_{sat} = \underline{(K_d \times C_w \times \beta) + (C_w \times P_w) + (C_w \times H' \times P_a)}/\beta$$

Where:

C_{sat} = soil saturation concentration, mg/kg

K_d = 1.3 (soil/water partition coefficient)

C_w = 537.3 (upper limit of free moisture in soil, mg/l-water)

β = 1.5 (soil bulk density - gm/cm^3, site specific)

P_w = 0.3 (water filled porosity - unitless, site specific)

H' = 0.22 (Henry's Constant, unitless)

P_a = 0.13 (air-filled porosity, site specific)

$$C_{sat} = \underline{(1.3 \times 537.3 \times 1.5) + (537.3 \times 0.15) + (537.3 \times 0.22 \times 0.13)}/1.5$$

$$C_{sat} = \underline{1047.74 + 80.6 + 15.37}/1.5$$

C_{sat} = 762.47 mg/kg

The solubility of benzene is listed in Table 3 of Appendix A as 1791 mg/l; therefore, this model is valid

Step 2: Calculate the Total Emission Rate

$E = \underline{2AD_{ei}P_aK_{as}C_i \times 10^3 mg/g}/(\pi\alpha T)^{1/2}$

Where:

E	=	average emission rate of contaminant - mg/sec.
A	=	551,844 (area of contamination - cm^2, site specific)
D_{ei}	=	5.2×10^{-4} (effective diffusivity of compound)
P_a	=	0.13 (air-filled porosity, site specific)
K_{as}	=	0.29 (soil/air partition coefficient - g/cm^3)
C_i	=	1.5×10^{-5} (bulk soil concentration of contaminant - g/g-soil)
α	=	8.2×10^{-6} (conversion factor)
T	=	9.5×10^8 (exposure interval - seconds, default)

$E = \underline{[2 \times 551844 \times 0.00052 \times 0.13 \times 0.29 \times (1.5 \times 10^{-5})] \times 1000}/$
$[3.14 \times (8.2 \times 10^{-6}) \times (9.5 \times 10^8)]^{1/2}$

$E = 0.325/156.44$

$E = 2.1 \times 10^{-3}$ mg/sec.

$5.43 \times 10^{-3} \times 41 = 0.17\ g/m^3$

Step 3: Calculate Ambient Air Concentration

$C_a = \underline{E}/(LS \times V \times MH)$

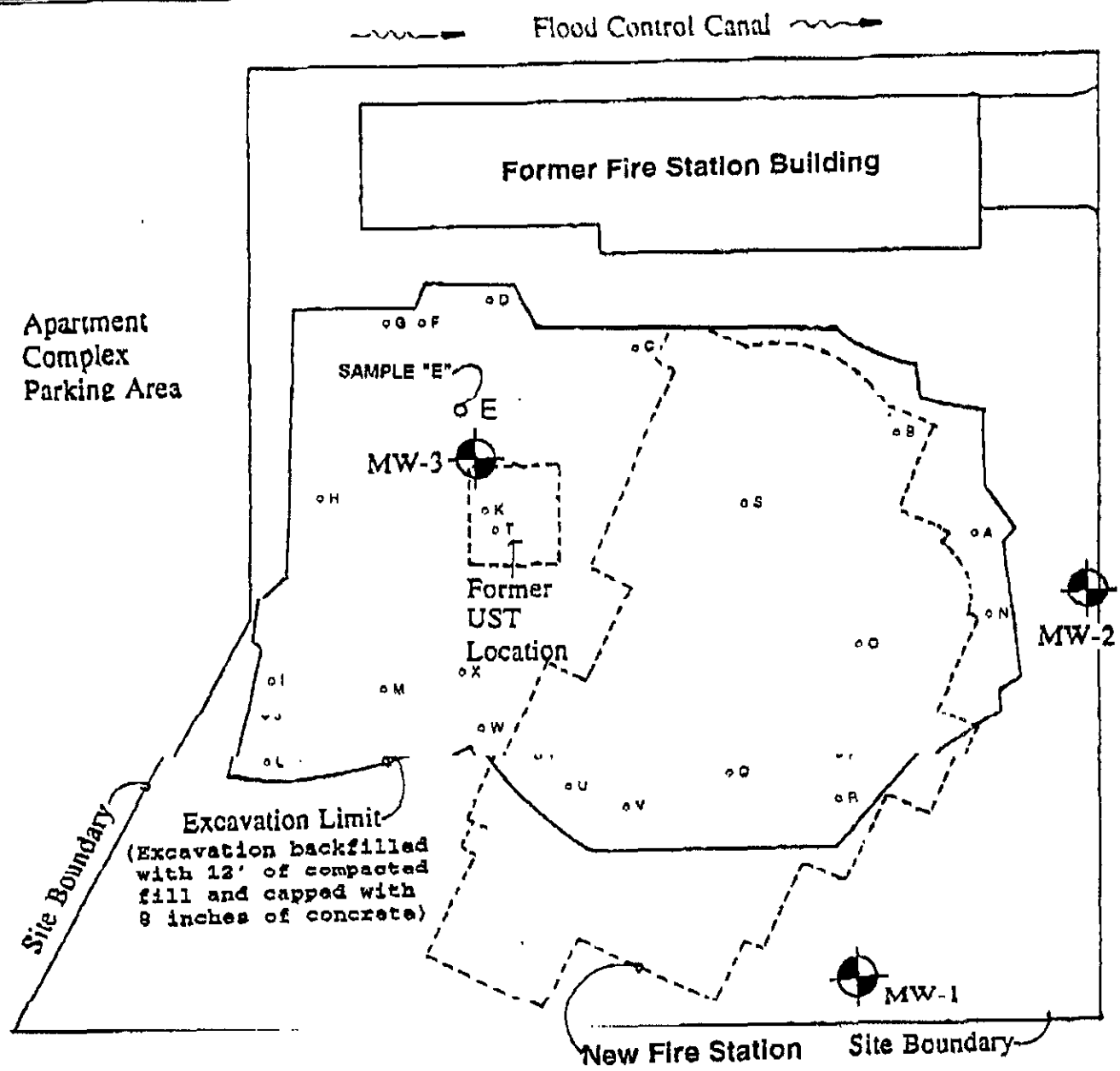
Where:

C_a	=	ambient air concentration
E	=	2.1×10^{-3} mg/sec.
LS	=	8.4 m (length dimension perpendicular to wind)
V	=	2.25 (average wind velocity - m/sec, default)
MH	=	2 (mixing height - m, default)

$C_a = \underline{2.1 \times 10^{-3}}/(8.4 \times 2.25 \times 2)$

$C_a = 5.5 \times 10^{-5}$ mg/m^3, or ~~0.055 mg/l (ppm)~~

$= 1.7 \times 10^{-5}$ ppm $\approx$ .02 ppb



HEALTH RISK ASSESSMENT 7494 DONOHUE DRIVE DUBLIN, CALIFORNIA	SITE PLAN Job No. P93156.3 FIGURE 1	RSK & ASSOCIATES

Comments on Health Risk Assessment for Dougherty Regional Fire Authority Station Number 1

1. Ingestion and Dermal pathways eliminated - Does it mean that no contamination found above 12 feet in soil and in future will the soil be disturbed for any reason ? Yes contam @ > 12' and site is capped w/ concrete

2. The Indoor/enclosed space air pathway has been left out and no adequate reasons for it. This method/equation is specified in ASTM's RBCA

3. Appendix B- step 2 - calculation of Emission Rate

   a. All the parameters involved in deriving Dei- the effective diffusivity of the compound, the values used for each of the parameter (Pa and Pt and in turn soil bulk density, particle density, soil moisture content), and method used to derive the value (either default or site specific) should be clearly explained.

   b. All the parameters and their values involved in deriving Kas - the soil/air partition coefficient should be described.

4. After Ca - the ambient air concentration is calculated the value should be input in the appropriate equtions given in Figure 5 and 7 of Appendix B of the PEA document. This will give the final risk due to the 15ppm Benzene in the soil. — Instead of comparing Ca to TWA - this is to be consistent & PEA does not bring TWA into the picture.

Bob Archer, IH w/ BSK

1120 - Alex will send site plan w/ former UST loc. former overex, former firehouse, and S.S. locations - in relation to 'hot spot' and new Firestation