

COSTCO WHOLESALE
GASOLINE DISPENSING FACILITY

NWC of Beach Blvd & Edinger Ave.
Huntington Beach, California

**Air Dispersion Modeling
and
Health Risk Assessment**

Revision 1.0

June 2010

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and
Health Risk Assessment**

**Costco Wholesale
NWC Beach Blvd. & Edinger Ave.
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**submitted by
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CONFIDENTIAL

This report presents the air quality impact analysis and health risk assessment for benzene emissions from an independent gasoline dispensing facility located at the northwest corner of Beach Boulevard and Edinger Avenue, California. This application is submitted to apply for an air quality permit for a maximum annual throughput of 16,000,000 gallons. This risk assessment is conducted based on the requested throughput and USEPA ISCST3 air dispersion model was used to analyze air quality impacts.

2. Facility Description

The gasoline dispensing facility is located at the northwest corner of Beach Boulevard and Edinger Avenue, California. (Figure 1). The facility operates 16 hours per day with multiple product dispensers. Figure 2 shows the vicinity of the station and Figure 3 shows the plot plan of the facility.

3. Emission Calculations

Emission rates of benzene are calculated using accepted emission factors for gasoline dispensing facility that are equipped with both Phase I and Phase II vapor recovery systems, as required by SCAQMD Rule 461. Phase I control refers to the collection of gasoline vapors displaced from the USTs when cargo trucks make gasoline deliveries. Phase II vapor recovery controls the vapor displaced from the vehicle fuel tanks during refueling.

The vent pipes at the tanks are equipped with vent valves and therefore, both Phase I and Phase II vapor recovery systems are considered to be 95% efficient in reducing volatile organic compounds (VOC) emissions. The control efficiency of spillage emissions is considered to be 50%. It is assumed that the benzene content of gasoline is 0.3% in vapor phase and 1.0% in liquid phase. Based on guidelines from CAPCOA Air Toxics Hot Spot Program and SCAQMD emission calculation procedures, the net emissions of VOC from gasoline and benzene from UST filling and motor vehicle refueling operations are shown in Table 1 and Table 2.

The proposed maximum throughput for the subject gasoline dispensing facility is 16,000,000 gallons per year. The facility is equipped with Phase I and Phase II control and the ventpipes are fitted with pressure-vacuum relief valves. Uncontrolled emission factors used were based on Scenario 6B of CAPCOA guidelines and controlled emission factors were based on guidelines from SCAQMD air toxic program. Details of the VOC and benzene emission calculations are shown in Table 1 and Table 2.

4. Air Dispersion Modeling

U.S. EPA-approved ISCST3 model was used in this assessment. SCAQMD recommends the use of the model, along with a full year of meteorological data, to estimate the maximum annual average ground-level concentrations that could occur at any point outside the property lines of the facility. The results of this analysis are considered as conservative and tend to over-estimate the exposure to the population.

Emissions from the stack were calculated using point source algorithms and emissions due to spillage and dispensing were calculated using volume source algorithms. The side length of the volume was determined to be the square roots of the area under the canopy. The initial lateral dimension (σ_{y0}) is defined as the side length divided by 4.3. The initial vertical dimension (σ_{z0}) is defined as the canopy height divided by 2.15. Table 2 summarizes the parameters of the facility used in the analysis.

5. Dispersion Modeling and Health Risk Assessment Results

Based on the calculations of the ISCST3 modeling conducted for the facility, the highest benzene concentrations predicted at locations from the property line to the nearest commercial and residential buildings are tabulated in Table 3. The calculated results of maximum individual cancer risks and health indices are also shown in Table 3; and the calculated excess cancer risk is shown in Table 4. The output files from the modeling conducted for the facility are presented in Appendices A.

Based on the benzene emissions calculated, modeled concentrations, health risk assessment algorithms developed by Office of Environmental Health Hazard Assessment (OEHHA), and health risk calculation methodology established by SCAQMD, the maximum individual cancer risks (MICRs) are calculated to be 6.636×10^{-6} at the nearest commercial receptor and 9.435×10^{-6} at the nearest sensitive receptor. Details of the results are shown in Table 3.

Table 3 also shows the health indices to the offsite and residential receptors. The highest chronic health index (HIC) at is 0.0129 at the nearest commercial receptor and 0.00543 at residential receptor. The highest acute health index (HIA) is 0.0067 at the nearest commercial receptor, 0.0039 at the nearest residential receptor, and 0.0142 at offsite receptor.

The facility was also modeled with polar receptor grid. Using the highest MICR within one square kilometer around the facility, it is estimated that the cancer burden is 0.1344. Results of the assessment are shown in Table 4.

6. Conclusions

The facility is installed with Phase I and Phase II vapor control systems which are best available control technology for toxics (T-BACT) for gasoline dispensing facilities. The results of the ISCST3 modeling indicated that the MICRs at the nearest commercial and residential building are less than ten in a million ($< 10 \times 10^{-6}$) and the excess cancer burden is less than 0.5. These show the operation of the facility will be in compliance with SCAQMD Rule 1401.

APPENDIX A

**ISCST3 OUTPUT
RECEPTOR GRID NETWORK
CARTESIAN COORDINATES**

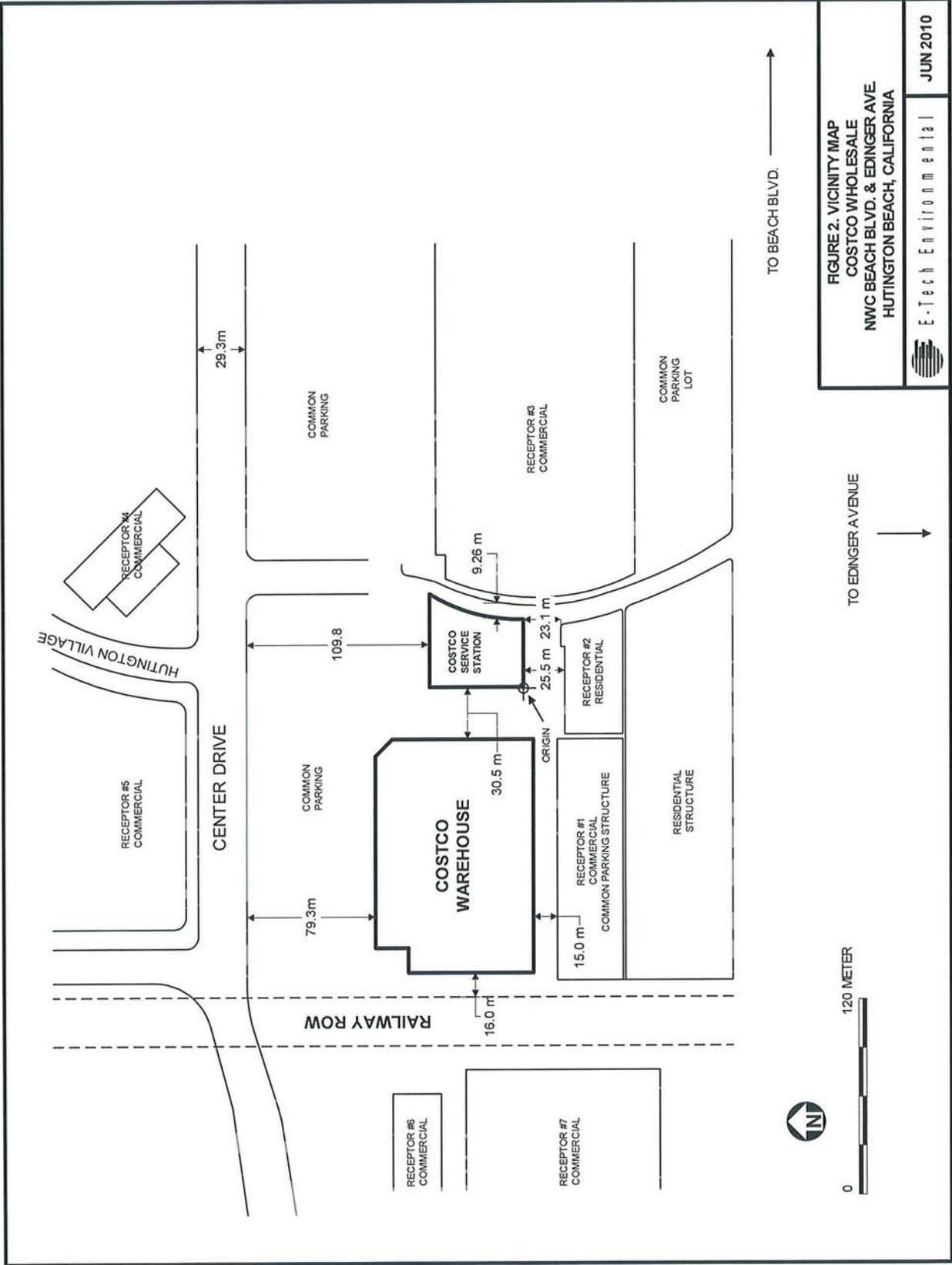


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FIGURE 1. SITE LOCATION
COSTCO WHOLESAL
NWC BEACH BLVD. & EDINGER AVE
HUNTINGTON BEACH, CALIFORNIA



JUN 2010



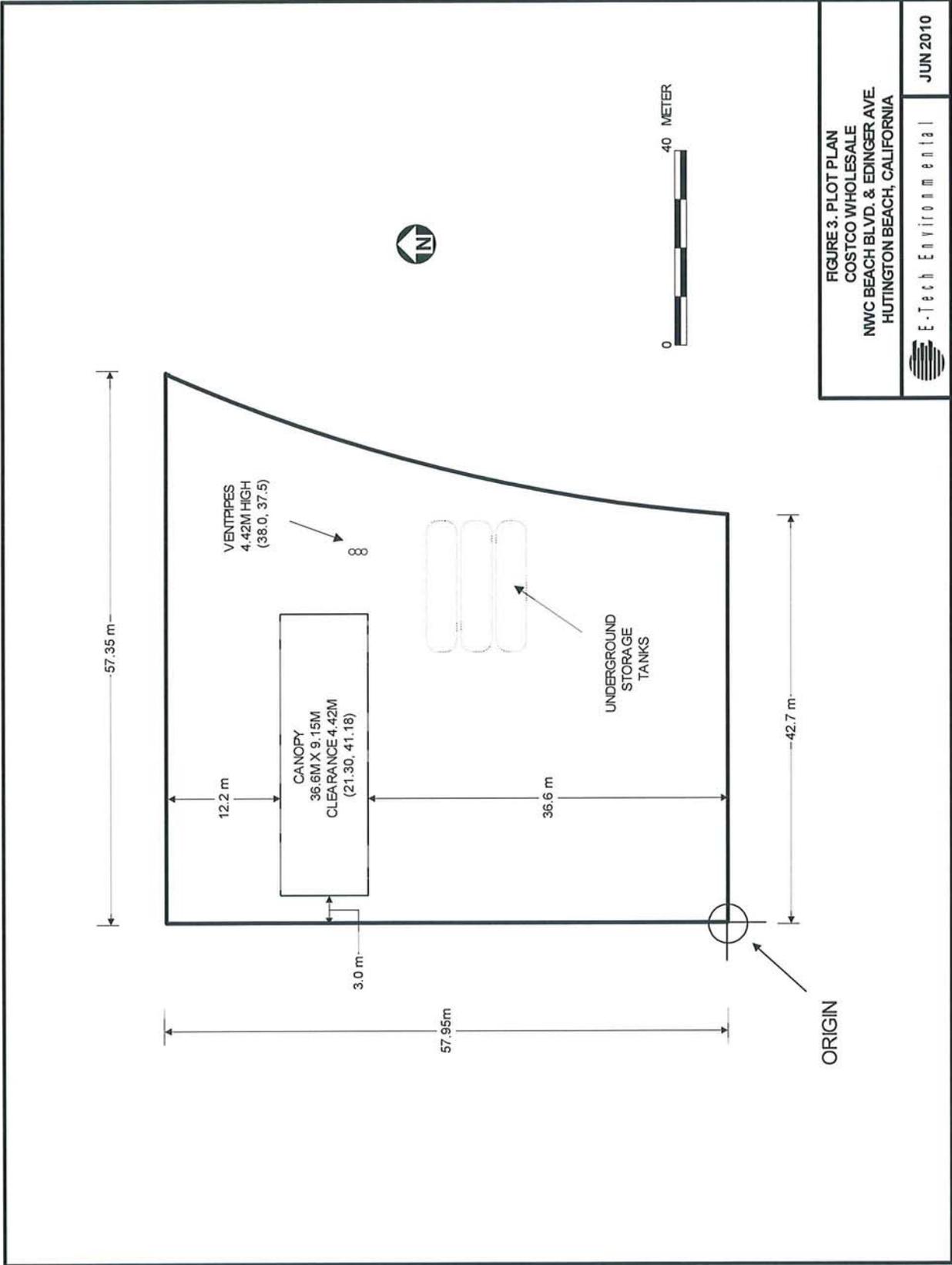


FIGURE 3. PLOT PLAN
COSTCO WHOLESAL
NWC BEACH BLVD. & EDINGER AVE.
HUTINGTON BEACH, CALIFORNIA

Table 1. Emissions Calculations

Emissions Calculations	Based on CARB & CAPCOA emission quantification methods using Scenario 6B with Phase I and II control for gasoline dispensing facility. SCAQMD Risk Assessment Guidelines for Rule 1401 and 212.	
Emissions Rates	VOC emissions are calculated using CARB & CAPCOA methods. Base on California reformulated gasoline, benzene content is 1.0 wt% in liquid phase and 0.3 wt% in vapor phase.	
	Controlled gasoline emissions per 1,000 gallons	
	Loading emissions, lb/1,000 gal	0.42
	Breathing emissions, lb/1,000 gal	0.025
	Refueling emissions, lb/1,000 gal	0.32
	Spillage emissions, lb/1,000 gal	0.42
	Controlled benzene emissions per million gallons per year	
	Loading emissions, gm/sec	1.81E-05
	Breathing emissions, gm/sec	1.08E-06
	Refueling emissions, gm/sec	1.38E-05
	Spillage emissions, gm/sec	6.05E-05
	Controlled benzene emissions based on throughput applied	
	Throughput applied, gallons/year	15,999,996
	Loading emissions, gm/sec	2.90E-04
	Breathing emissions, gm/sec	1.73E-05
	Refueling emissions, gm/sec	2.21E-04
	Spillage emissions, gm/sec	9.67E-04

Table 2. Air Dispersion Model Parameters

			Los Alamitos
Throughput, gal/mon	1,333,333	Throughput, gal/year	15,999,996
Source Characteristics	Stack height, m		4.42
	Stack diameter, m		0.049
	Exhaust temperature, deg K		291
	Exit Temperature, deg K		291
	Exit loading velocity, m/sec		0.004725
	Exit breathing velocity, m/sec		0.001431
	Stack diameter, m		0.049
	Canopy length, m		36.6
	Canopy width, m		9.15
	Canopy clearance, m		4.42
	Refueling release height, m		1.0
	Spill release height, m		0.0
	Sigma y		4.26
	Sigma z		2.06

