Appendix E

Air Quality Modeling of Emissions from Thermal Spraying Operations

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Summary

It is requested to evaluate air quality impacts from emissions of hexavalent chromium from thermal spray operations. Four separate facilities are evaluated with meteorological data from different regions in the State. The emissions from the facilities range from 0.00011 lbs/yr to 0.023 lbs/yr. The maximum above ambient annual average concentration is estimated to be 2.8×10^{-4} µg/m^3 from the facility emitting 0.023 lbs/yr hexavalent chromium. Details of the analysis and additional results are described below.

Approach

Data from four separate facilities in the San Diego AQMD which have hexavalent chromium emissions are evaluated on an annual average basis for downwind air impacts. The stack parameters and building configurations are input to the US-EPA ISCST3 (Version 02035) air quality model to estimate downwind impacts. Urban dispersion coefficients are used in ISCST3. Receptor heights are set at 1.2 meters above ground level. Terrain is assumed to be flat. Meteorological data are considered from locations that are closest to each facility and as well as data from other places in the State such as Vernon, West Los Angeles, and South San Francisco.

Inputs

Tables 1 and 2 summarize the model inputs for the source configurations as derived from data provided by SSD staff.

Table 1 – Volume Sources

ID	H (m)	Syo (m)	Szo (m)	Bw (m)	Bh (m)
Src1	1.8	9.9	2.3	42.6	4.9

Syo=L/4.3, Szo=H/2.15.
Bw is taken as the length of the shortest side of the building.

Table 2 – Point Sources

ID	Hs (m)	Ts (K)	Vs (m/s)	Ds (m)	Bw (m)	Bh(m)	Notes
Src2	5.5	299.8	23.96	0.549	43	4.0	(a)
Src3	10.7	294.3	19.01	0.811	100	9.2	(b)
Src4	13.7	293.2	12.92	0.884	181	12.2	(c)

(a) Bh estimated at 1.5 meters below Hs. Bw is estimated as the diameter of equivalent area to footprint.
(b) Bh estimated at 1.5 meters below Hs. Bw is estimated as the average of the other three facilities. Source next to Magnolia School.
(c) Bh is given. Bw is estimated as the diameter of equivalent area to footprint.

The annual average emissions are uniformly distributed over all hours when emissions may result. Even though facilities may only emit hexavalent chromium during certain periods (e.g., two hours per day), it is assumed that emissions may occur anytime the facility is in operation. Provided emissions result throughout the operating period over the year, this assumption should not bias the results. Table 3 below shows the annual inventory and the hours over which the annual average emissions are uniformly distributed based on data obtained on the operations of each facility.

Table 3 – Annual Inventory and Hourly Distribution

ID	Annual Inventory (lbs/yr)	Hours when Emissions may Occur	
		Hours per day	Beginning at
Src1	2.27E-02	9	8 am
Src2	2.85E-04	6	6 am
Src3	2.78E-03	24	-
Src4	1.10E-04	9	8 am

Meteorological data are obtained from various locations. Table 4 summarizes the meteorological data used in this analysis. While representative meteorological data is preferred, it is not always possible to determine which station is the most representative of the project site. In these cases meteorological data from two nearest stations are used and results from both are presented. US-EPA Guidelines recommend the latest five years of consecutive meteorological data for these types of analyses. Five years of data are used where available. In addition, it is requested to simulate air dispersion with meteorological data from South San Francisco, West Los Angeles, and Vernon. In this case, the model results only reflect simulations from the facility with the highest emissions.

Table 4 – Meteorological Data Summary						
Station	Abbreviation	Year	Anemometer Height Input to Model (m)	Avg. WS (m/s)	% Calms	Notes
Barrio Logan	BL	2000	7	2.0	1 %	Data gathered at Logan Memorial for special study.
Lindbergh Airport	Lind	1985-1989	10	3.6	7 %	San Diego Airport
Miramar Naval Air Station	Mir	1967-1971	10	2.8	17 %	San Diego
Vernon	Vern	1981	10	2.3	7 %	SCAQMD
West Los Angeles	WLA	1981	10	1.5	19 %	SCAQMD
San Francisco Airport	SFO	1985-1989	10	5.4	5 %	

Results

The maximum above ambient annual average concentration is estimated to be 2.8×10^{-4} µg/m^3 from the facility emitting 0.023 lbs/yr hexavalent chromium. Figure 1 is a log-log plot showing the estimated above ambient annual average concentration of hexavalent chromium from all the facilities, as a function of downwind distance. The downwind direction is selected as the direction of the maximum annual impact. Table 5 shows the data presented in Figure 1.

Figure 1 – Above Ambient Annual Average Hexavalent Chromium Concentrations

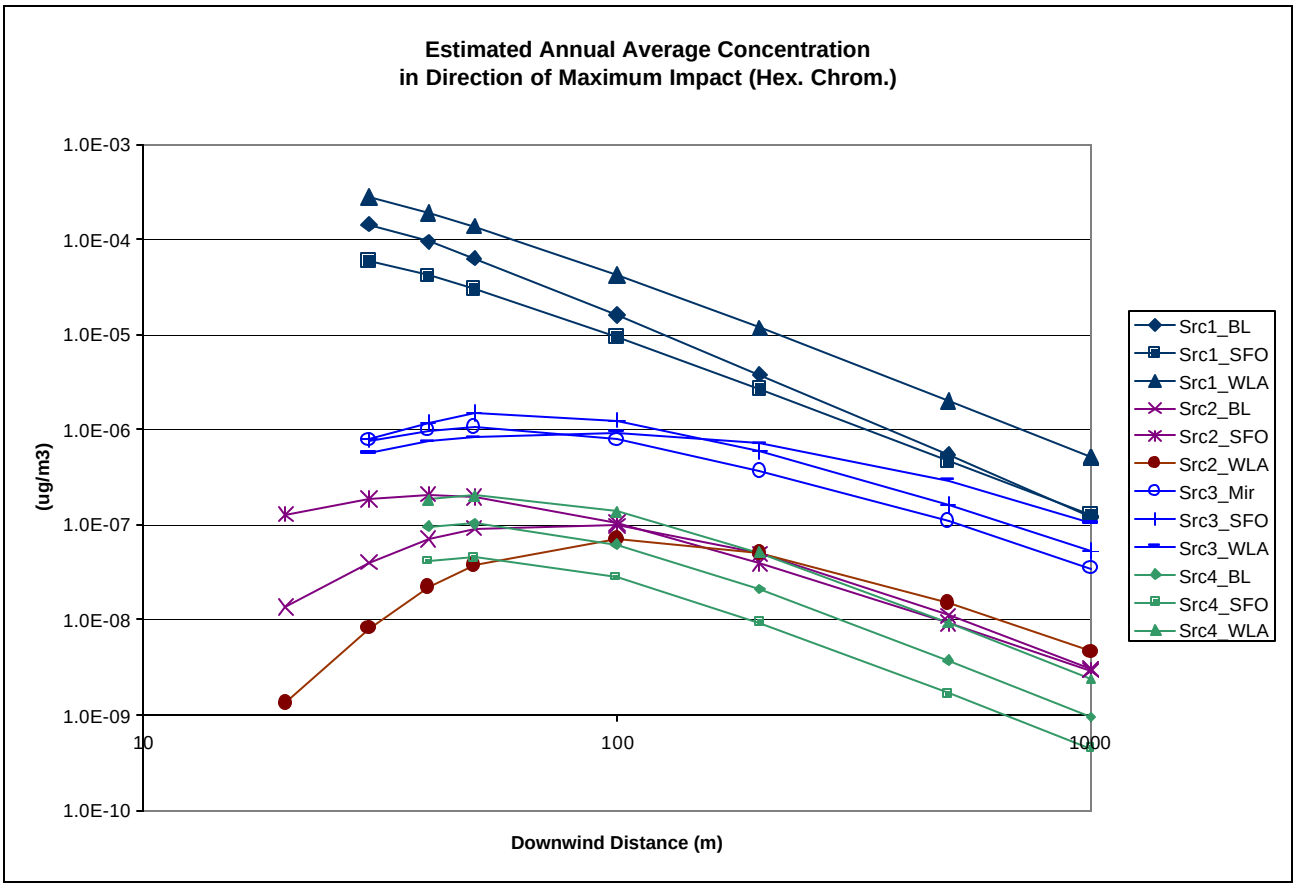

Table 5 – Summary Table of Above Ambient Annual Average Concentration of Hexavalent Chromium (µg/m^3)

Source ID	Met. Data	Dir (deg)	Distance from source (m)							
			20	30	40	50	100	200	500	1000
Src1	BL	70		1.4E-04	9.5E-05	6.3E-05	1.6E-05	3.8E-06	5.5E-07	1.2E-07
Src1	SFO	110		5.9E-05	4.2E-05	3.0E-05	9.4E-06	2.7E-06	4.7E-07	1.3E-07
Src1	WLA	40		2.8E-04	1.9E-04	1.4E-04	4.2E-05	1.2E-05	2.0E-06	5.1E-07
Src2	BL	40	1.4E-08	4.0E-08	7.1E-08	9.2E-08	9.8E-08	5.0E-08	1.1E-08	3.0E-09
Src2	SFO	120	1.3E-07	1.9E-07	2.1E-07	2.0E-07	1.0E-07	4.0E-08	9.4E-09	2.9E-09
Src2	WLA	40	1.3E-09	8.1E-09	2.2E-08	3.8E-08	7.0E-08	5.1E-08	1.5E-08	4.7E-09
Src3	Mir	120		7.7E-07	9.9E-07	1.1E-06	7.8E-07	3.7E-07	1.1E-07	3.5E-08
Src3	SFO	120		7.8E-07	1.2E-06	1.5E-06	1.3E-06	6.0E-07	1.6E-07	5.3E-08
Src3	WLA	50		5.7E-07	7.5E-07	8.3E-07	9.4E-07	7.1E-07	2.9E-07	1.0E-07
Src4	BL	100			9.7E-08	1.0E-07	6.3E-08	2.1E-08	3.7E-09	9.6E-10
Src4	SFO	220			4.2E-08	4.5E-08	2.8E-08	9.5E-09	1.7E-09	4.5E-10
Src4	WLA	50			1.8E-07	2.0E-07	1.4E-07	5.1E-08	9.3E-09	2.4E-09

A blank cell indicates plume has yet to touchdown or the receptor is near the building wake effects and no calculation is made.