APPENDIX R. AMBIENT AIR QUALITY IMPACT ANALYSIS – ALTERNATIVE F, WELL SITE PRODUCTION EQUIPMENT NO_2 MODELING

Ambient Air Quality Impact Analysis

Gasco Energy Inc.
Uinta Basin Natural Development Project
Environmental Impact Analysis
Alternative F

Well Site Production Equipment
NO_2 Modeling

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1.0 INTRODUCTION

Gasco Energy (Gasco), as part of their Uinta Basin Natural Gas Development Project is planning well development in the Uinta Basin. The proposed well sites cover a large distance and are located approximately 7 miles southwest of Myton, Utah in Section 13, Township 4S, Range 3W, Duchesne County. Approximate UTM coordinates for one of the well areas are 560,000 m Easting, 4,417,000 m Northing, Zone 12.

This analysis evaluates emissions from the well sites under the development scenario proposed under Alternative F of the EIS. Alternative F accounts for the development of 1,298 wells. For modeling purposes, three different areas of the development field were identified as being geographically separated from one another to show emissions from each side of the prospective field. Within each of the three sections eight well sites were selected and all NO_2 sources from these wells were included in the model. Note, a fourth geographically different section of the field was modeled for NO_2 with the previous Water Evaporation Facility modeling.

This analysis is being completed for 1-hour nitrogen dioxide (NO_2) impacts from the potential heater treaters at each of the identified well sites. Also included in the model are two storage tanks from each well site to account for any potential downwash that may occur.

Figure 1 presents one well site from one of the development areas input into AERMOD for modeling, which includes the Gasco emission points at the well sites, including the heater treater, and the sites tanks, fenceline and the nearby receptors. Figure 2 presents the full layout of one of the development areas, which includes 8 well sites.

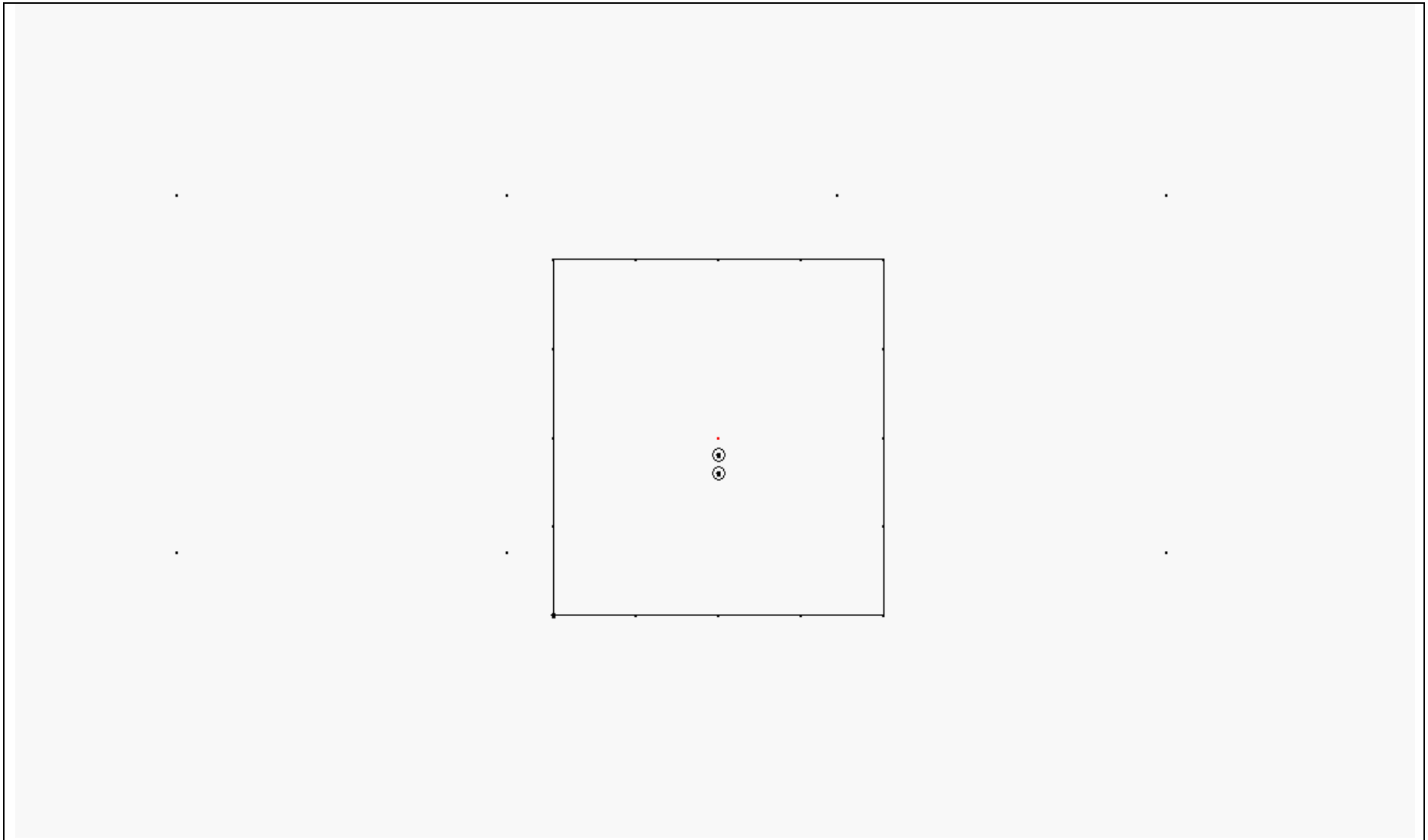


Figure 1. Facility Diagram – Gasco individual wellsite area and nearby receptors

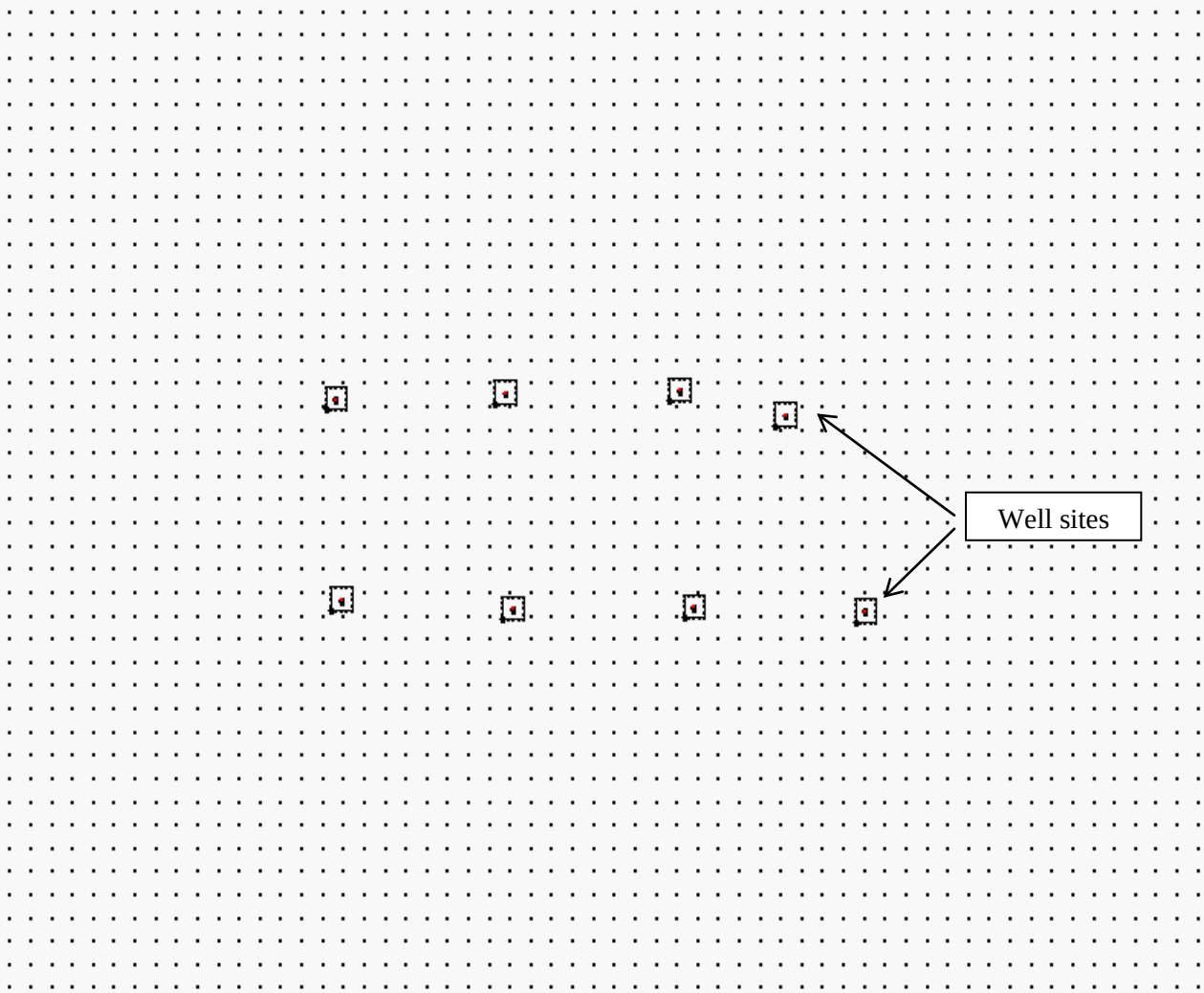


Figure 2. Site Diagram – One of three full Gasco development areas

2.0 REGULATORY STANDARDS

2.1 CRITERIA EMISSIONS

Utah and National Ambient Air Quality Standards (UAAQS and NAAQS) have been promulgated for the purpose of protecting human health and welfare with an adequate margin of safety. Pollutants for which standards have been determined include sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

The only criteria pollutant being modeled in this analysis is nitrogen oxides (NO_X) from the proposed wellsite heater treaters for comparison to the 1-hour NO_2 NAAQS. The majority of NO_X is emitted as nitric oxide (NO) which will gradually convert to NO_2 depending on the amount of sunlight and the amount of ambient ozone.

The NAAQS has recently been revised to reflect changes to the NO_2 1-hr standard. The 1-hr NO_2 standard is set at 100 parts per billion (ppb) (or 188 $\mu g/m^3$) based on the 3-year average of the 98th percentile of the annual distribution of the daily maximum 1-hour concentrations. The new standard was published in the Federal Register on February 9, 2010, and became effective on April 12, 2010.

3.0 MODELING INFORMATION

3.1 MODEL SELECTION

The most recent version of the AERMOD (version no. 11103) air dispersion model was selected to perform this modeling analysis. AERMOD is an EPA approved steady-state model capable of analyzing multiple sources over distances of up to 50 km. All technical options within the model were set according to regulatory defaults. The current EPA approved AERMOD model version 11103 was utilized using Bee-Line software (version 9.90a).

3.2 METEOROLOGICAL DATA

No onsite meteorological data are available for the project area. Correspondence with the Utah Department of Environmental Quality – Division of Air Quality (UDEQ-DAQ) indicated that suitable meteorological data for AERMOD for a four-year period (2005-2008) was available from a monitor located in Vernal, Utah. The data consist of surface measurements collected in Vernal, Utah for the years 2005, 2006, 2007 and 2008 combined with upper air data recorded in Grand Junction, Colorado. Individual model runs for each calendar year of data were completed for three of the four calendar years of meteorological data; however, 2008 was an incomplete year of data. The most recent version of AERMOD cannot process and post-process NO_2 1-hour data unless the data year is complete. For operation of the meteorological data, a profile base elevation of 1470 meters was utilized.

Figure 3 presents a wind rose of the 2005-2008 meteorological data.

3.3 TERRAIN ELEVATION

Terrain elevations for receptors within the modeling domain were determined by AERMAP processed with National Elevation Dataset (NED) prepared by the U.S. Geologic Survey (USGS). NED provides elevations based upon 10 meter grid spacing (1/3 arc-second). Elevations were converted from the NED grid spacing to the model receptor grid spacing by interpolating from the elevation values closest to the receptor grid point.

3.4 RECEPTOR SELECTION

The model receptors consisted of fenceline receptors and a Cartesian grid. The receptor grid is extended out to a distance of what is considered to be the maximum distance any noticeable impact could occur (1.5 kilometers). Table 3-1 presents the spacing of the receptor grid. Figures 1 and 2 above, shows the site diagram with surrounding discrete Cartesian receptors, including fenceline receptors.

3.5 DOWNWASH EFFECTS

There are also two (2) proposed onsite storage tanks for each of the eight (8) tanks well sites included in each of the models. The tanks are incorporated into the model as a concern for downwash and considered through the application of the BPIP model. The dimensions for the tanks are specified in Table 3-2.

3.6 PVMRM

This analysis used the Plume Volume Molar Ratio Method (PVMRM) predict the NO_X to NO_2 conversion within the stack. A background ozone value of 78 parts per billion (ppb) was utilized to determine the ambient conditions for the NO_2 impact. Values used in the PVMRM analysis included setting the NO_X to

NO_2 ratio (NO2STACK) to the default value of 0.10, and the equilibrium ratio (NO2EQUIL) set to 0.90 in accordance with UDEQ guidance.

3.7 MODEL INPUTS

Inputs used in this analysis are presented in Tables 3-1 through Table 3-4.

Table 3-1. Receptor Grid Summary

Receptor Interval	Receptor Spacing
Facility Fenceline	25 meters
Fenceline to 1500 meters	100 meters

Table 3-2 Storage Tanks

Height (ft)	Width (ft)
20	12

The calculated facility emission rates, assuming constant operation, are summarized in Table 3.3. Exhaust stack parameters are summarized in Table 3.4.

Table 3-3. NO_X Emission Rates (100% Load)

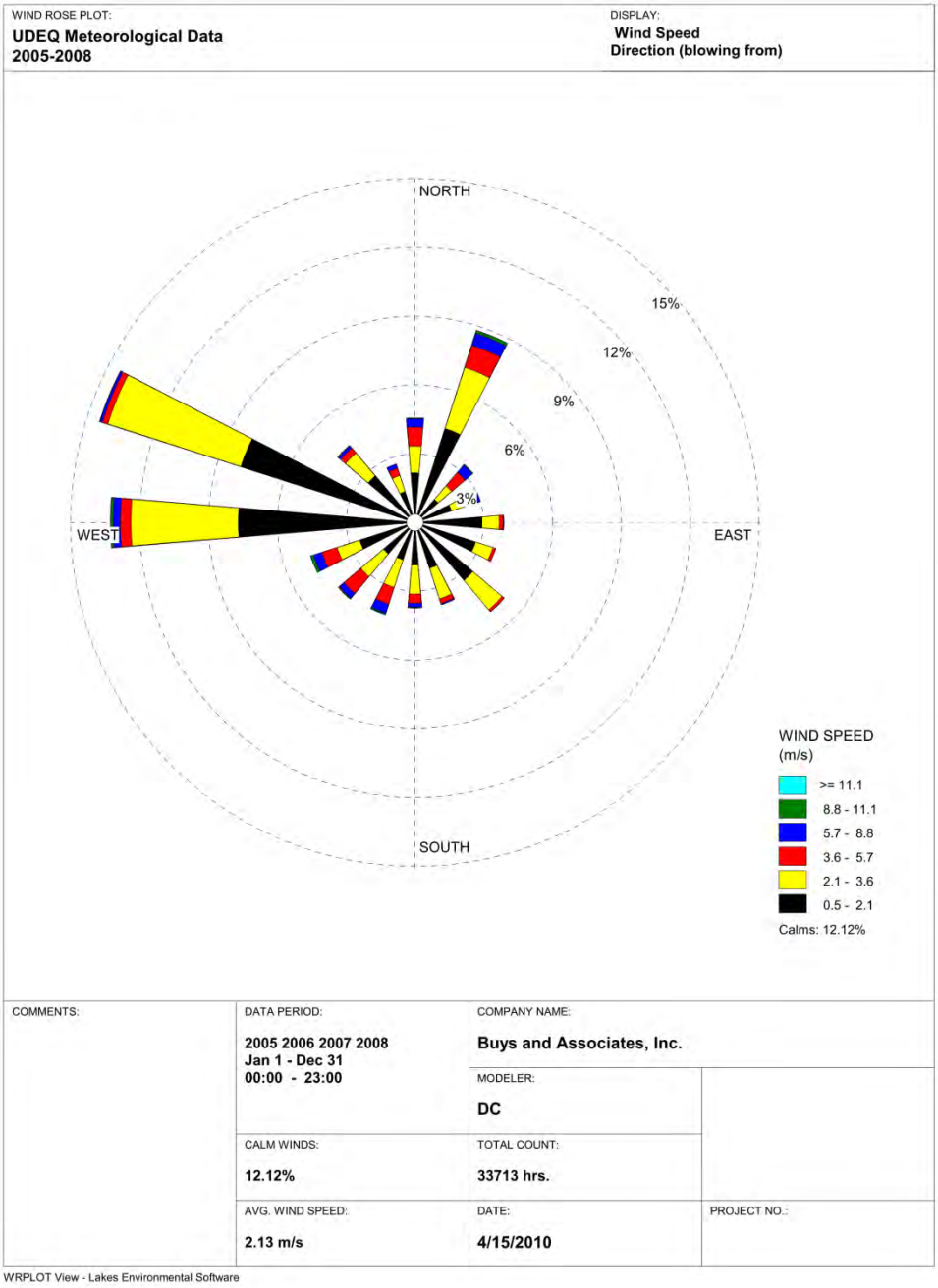
Source	Emission Factor (g/hp-hr)	Emission Rate (lb/hr)	Emission Rate (tons/year)
Separators (each)	-	0.038	0.167

Table 3.4 Point Source Stack Parameters

Source	Stack Height (ft)	Temperature (°F)	Exit Velocity (ft/s)	Stack Diameter (ft)
Separators	15.1	800	9.32	0.75

Figure 3 Wind Rose from AERMET Vernal, Utah, data years 2005–2008

Wind Speed Direction (blowing from)



4.0 IMPACT ANALYSES

4.1 NO_2 ANALYSIS

4.1.1 1-Hour NO_2 Analysis

NO_X will be emitted from the proposed heater treaters (the emission rate presented in Table 3-3).

The NO_2 1-hour background concentration of 69 µg/m^3 is based on monitored values from the Uinta Basin (Greater Natural Buttes Supplement to the Draft EIS, May 2011).

The NO_2 1-hour NAAQS is based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations. Table 4.1, 4.2 and 4.3 illustrates that the 98th percentile of the yearly predicted NO_2 impact, from each of the three modeled well site areas, in addition to the background NO_2 concentration for the local area, is below the applicable 1-hour NO_2 NAAQS. The maximum predicted impact takes place at the fenceline of one of the modeled well sites.

Note: Well Site Area 1 was modeled for NO_2 impacts with the Water Evaporation Facility (WEF) model and showed compliance with the applicable NAAQS.

Figure 4 presents the graphical output of the maximum NO_2 1-hour impact from the well site area that predicted the highest impact (well site area 4, year 2007).

Table 4.1 Predicted 1-Hour 98th Percentile NO_2 Impact Comparisons to NAAQS (100% Load) for Well Site Area 2

Table 4-1. Predicted 1-Hour 98th Percentile NO_2 Impact Comparisons to NAAQS (100% Load) for Well Site Area 2

Source	Year	98th Percentile Predicted 1-hour NO_2 Impact (µg/m^3)	Local Area Background (µg/m^3)	Maximum Predicted 1-Hour NO_2 Combined Background (µg/m^3)	NAAQS (µg/m^3)	Cumulative Impact (% of NAAQS)
Gasco	2005	27.60	69	96.60	188	51.4%

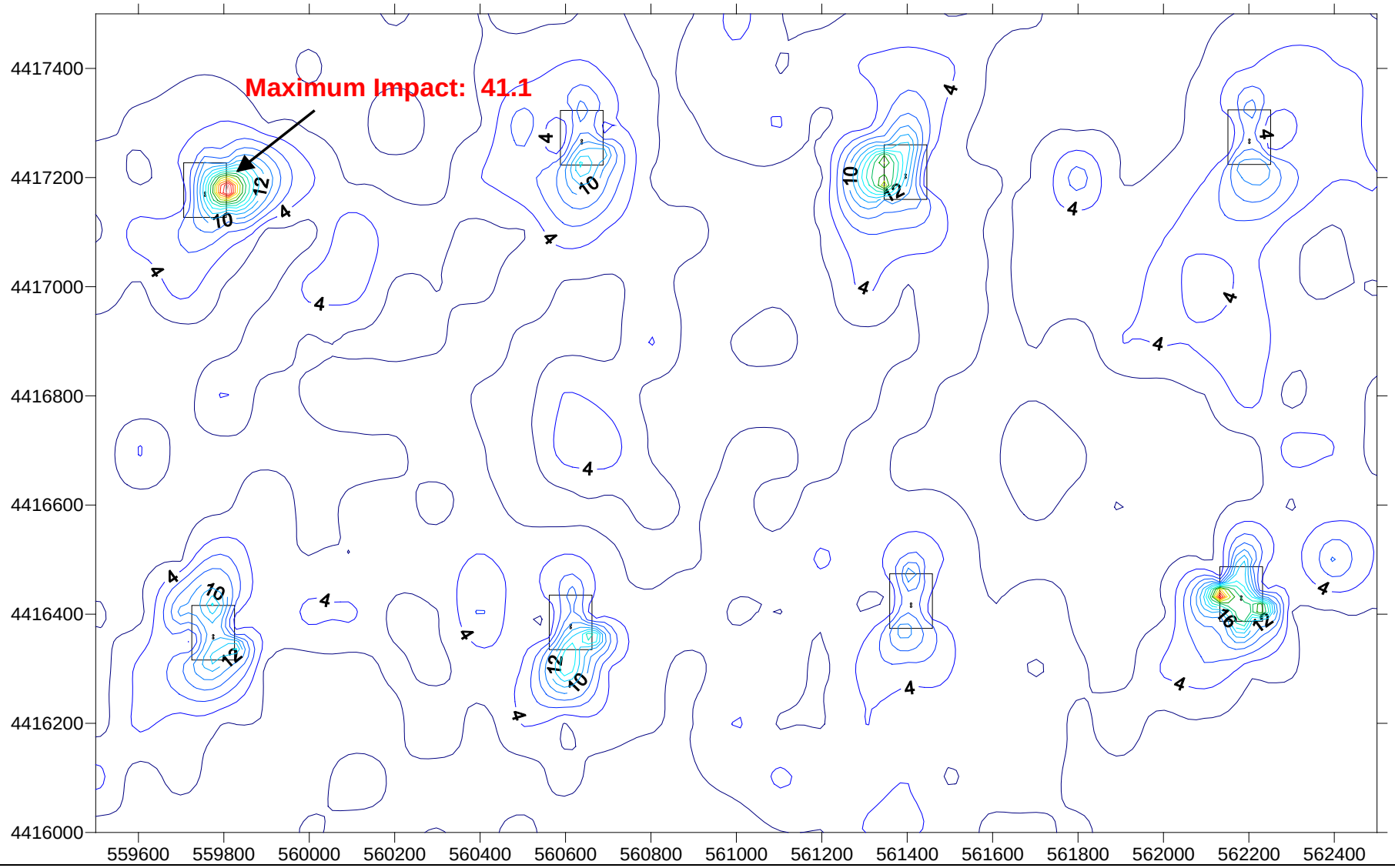
Table 4-2. Predicted 1-Hour 98th Percentile NO_2 Impact Comparisons to NAAQS (100% Load) for Well Site Area 3

Source	Year	98th Percentile Predicted 1-hour NO_2 Impact (µg/m^3)	Local Area Background (µg/m^3)	Maximum Predicted 1-Hour NO_2 Combined Background (µg/m^3)	NAAQS (µg/m^3)	Cumulative Impact (% of NAAQS)
Gasco	2005	31.22	69	100.22	188	53.3%

Table 4-3. Predicted 1-Hour 98th Percentile NO_2 Impact Comparisons to NAAQS (100% Load) for Well Site Area 4

Source	Year	98th Percentile Predicted 1-hour NO_2 Impact ($\mu g/m^3$)	Local Area Background ($\mu g/m^3$)	Maximum Predicted 1-Hour NO_2 Combined Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Cumulative Impact (% of NAAQS)
Gasco	2007	41.10	69	110.1	188	58.6%

Figure 4. 1-hour NO2 Maximum Impact (ug/m3)



APPENDIX A

LIST OF MODEL FILES

List of Model and Plot Files

BPIP Files	
***.PIP**	**Input files**
***.SO**	**Output files**
BPIP*.SUM	**Summary Output file**
***.TAB**	**Verbose Output file**
AERMOD Files	
*** _Poll.DTA**	**Input files for AERMOD; Poll. is (1-hr) NO_2**
***.LST**	**Model output list file**
***.SUM**	**Summary Output File**
***.GRF**	**Graphic Plot File**
Meteorological Data Files	
KVNL05_07.SFC or	**Processed meteorological input data; 05_07 indicates the modeling data year range (2005 – 2007).**
KVNLXX.SFC	**1-hour NO_2 modeling required individual years; XX indicates the modeling data year.**

APPENDIX B

MODELING FILES

The Appendix R Modeling Files are included on the accompanying CD.