Title V Permit Renewal
Permit No. P186L-R3M1

Camino Real Environmental Center, Inc.
1000 Camino Real Blvd
Sunland Park, NM 88063
(575) 589-9440

SCS ENGINEERS

SCS No. 16220119.00 | June 2021

1901 Central Drive, Suite 550
Bedford, Texas 76021
(817) 571-2288

June 2, 2021
Proposal No. 16220119.00

Ms. Melinda Owens
New Mexico Environmental Department
Title V Permit Program Manager
525 Camino de los Marquez, Suite 1
Santa, Fe, NM 87505

Subject: Title V Permit Renewal
Camino Real Landfill
Sunland Park, New Mexico
Operating Permit No. P186L-R3M1

Dear Ms. Owens:

On behalf of Camino Real Environmental Center, Inc., SCS Engineers is pleased to submit this Title V Operating Permit Renewal for the Camino Real Landfill (landfill). This renewal is being submitted prior to the required June 13, 2021 renewal application due date.

Both hard copy and electronic copies are being included as set forth on the Universal Air Quality Permit Application form for a Title V Permit renewal. Some of the pertinent changes included within this application are as follows:

- Emissions were maintained as represented in the last Title V major amendment for Regulated Emissions Sources 1-5;
- Natural gas comfort heating and a portable diesel fuel tank were added to the insignificant source list (these were previously added into the permit administratively via the permitting administrative multi-form);
- Five engines were added to Table 2-A (Units 6-8) as regulated emissions due to their treatment in the landfill's NSR permit (a significant revision to the NSR permit to accommodate this addition is being submitted concurrently with this application). Emissions were set in the renewal to match the NSR revision; and
- Since 40 CFR 63, Subpart AAAA was revised in March 2020 and there is now more clarity regarding the landfill's transition from 40 CFR 60, Subpart WWW to Subpart XXX/Subpart AAAA, the renewal application has been revised to discuss this transition (which will occur on September 27, 2021).

Should you have any questions or need additional information, please do not hesitate to contact David Mezzacappa, P.E. at (817) 358-6108, or the Landfill Manager, Mr. Juan Carlos Tomas, at (575) 589-9440.

Sincerely,

Joseph D. Krasner, P.E.
Project Manager
SCS ENGINEERS

David J. Mezzacappa, P.E.
Vice President
SCS ENGINEERS

cc: Mr. Juan Carlos Tomas, Camino Real Environmental Center, Inc.
Mr. Brady Stewart, Waste Connections (e-copy)

Attachment

FedEx

June 04, 2021

Dear Customer,

The following is the proof-of-delivery for tracking number: 773860754273

Delivery Information:

Status:	Delivered	**Delivered To:**	Receptionist/Front Desk
Signed for by:	R.RHONDA	**Delivery Location:**	525 CAMINO DE LOS MARQUEZ
Service type:	FedEx Express Saver		
Special Handling:	Deliver Weekday		SANTA FE, NM, 87505
		Delivery date:	Jun 4, 2021 09:03

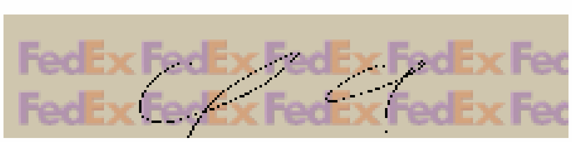
Shipping Information:

Tracking number:	773860754273	**Ship Date:**	Jun 2, 2021
		Weight:	9.0 LB/4.09 KG

Recipient:
Kirby Olson, NMED Air Quality Bureau
525 Camino de los Marquez, Suite 1
SANTA FE, NM, US, 87505

Shipper:
Ryan Kuntz, P.E., SCS Engineers
1901 CENTRAL DR
STE 550
BEDFORD, TX, US, 76021

Reference	16220119.00 T6 TB
Purchase Order	Camino NSR Sig. Rev.



Thank you for choosing FedEx

Mail Application To:		For Department use only:
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		AIRS No.:

Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. See Section 1-I for submittal instructions for other permits.

This application is submitted as (check all that apply)**:** ☐ Request for a No Permit Required Determination (no fee)
☐ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
Construction Status: ☐ Not Constructed ☑ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC ☐ 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application
Title V Source: ☐ Title V (new) ☑ Title V renewal ☐ TV minor mod. ☐ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal
PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

Acknowledgements:
☑ I acknowledge that a pre-application meeting is available to me upon request. ☑ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
☐ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
☐ Check No.: in the amount of
☑ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.70.201.A(2) NMAC**
(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

Section 1 – Facility Information

Section 1-A: Company Information

		AI # if known (see 1st 3 to 5 #s of permit IDEA ID No.): **167**	Updating Permit/NOI #: **P186L-R3M1**
1	Facility Name: **Camino Real Landfill**	Plant primary SIC Code (4 digits): **4953**	
		Plant NAIC code (6 digits): **562212**	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): **1000 Camino Real Blvd., Sunland Park, NM 88063**		
2	Plant Operator Company Name: **Camino Real Environmental Center, Inc.**	Phone/Fax: **(575) 589-9440/(505) 213-0427**	
a	Plant Operator Address: **P.O. Box 580, Sunland Park, New Mexico 88063**		

b	Plant Operator's New Mexico Corporate ID or Tax ID: **74-1659-415**	
3	Plant Owner(s) name(s): **Camino Real Environmental Center, Inc.**	Phone/Fax: **(575) 589-9440/(505) 213-0427**
a	Plant Owner(s) Mailing Address(s): **P.O. Box 580, Sunland Park, New Mexico 88063**	
4	Bill To (Company): **Camino Real Environmental Center, Inc.**	Phone/Fax: **(575) 589-9440/(505) 213-0427**
a	Mailing Address: **P.O. Box 580, Sunland Park, New Mexico 88063**	E-mail: **JuanT@WasteConnections.com**
5	☐ Preparer: ☑ Consultant: **SCS Engineers**	Phone/Fax: **(817) 571-2288/(817) 571-2188**
a	Mailing Address: **1901 Central Drive, Suite 550, Bedford, TX 76021**	E-mail: **DMezzacappa@SCSEngineers.com**
6	Plant Operator Contact: **Dr. Juan Carlos Tomas**	Phone/Fax: **(575) 589-9440/(505) 213-0427**
a	Address: **P.O. Box 580, Sunland Park, New Mexico 88063**	E-mail: **JuanT@WasteConnections.com**
7	Air Permit Contact: **Dr. Juan Carlos Tomas**	Title: **Landfill Manager**
a	E-mail: **JuanT@WasteConnections.com**	Phone/Fax: **(575) 589-9440/(505) 213-0427**
b	Mailing Address: **P.O. Box 580, Sunland Park, NM 88063**	
c	The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau.	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☑ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☑ Yes ☐ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? ☐ Yes ☑ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? ☐ Yes ☑ No
3	Is the facility currently shut down? ☐ Yes ☑ No	If yes, give month and year of shut down (MM/YY): **N/A**
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes ☑ No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐Yes ☐No ☑N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: P-**186L-R3M1**
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes ☑ No	If yes, the NPR No. is: **N/A**
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes ☑ No	If yes, the NOI No. is: **N/A**
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: **NSR Permit 7592**
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes ☑ No	If yes, the register No. is: **N/A**

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required) **Not listed here since this is not a manufacturing operation. The annual waste acceptance rate is customer driven and will vary from one year to the next.**			
a	Current	Hourly:	Daily:	Annually:
b	Proposed	Hourly:	Daily:	Annually:
2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			

a	Current	Hourly:	Daily:	Annually:
b	Proposed	Hourly:	Daily:	Annually:

Section 1-D: Facility Location Information

1	Section: **12, 13**	Range: **3 E**	Township: **29 S**	County: **Doña Ana**	Elevation (ft): **4008**
2	UTM Zone: ☐ 12 or ☑ 13			Datum: ☐ NAD 27 ☑ NAD 83 ☐ WGS 84	
a	UTM E (in meters, to nearest 10 meters): **349,280**			UTM N (in meters, to nearest 10 meters): **3,518,860**	
b	**AND** Latitude (deg., min., sec.): **31° 47' 43.61"**			Longitude (deg., min., sec.): **106° 35' 31.28"**	
3	Name and zip code of nearest New Mexico town: **Sunland Park, NM 88063**				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): **From Interstate 10 Exit 13 (Sunland Park Drive), follow Sunland Park Drive approximately 2-miles south to McNutt Road, turn right and travel approximately 1.6 miles to Camino Real Blvd., turn left and follow Camino Real Blvd. approximately one mile to the landfill entrance.**				
5	**The facility is on the southwest side of Sunland Park, New Mexico.**				
6	Status of land at facility (check one): ☑ Private ☐ Indian/Pueblo ☐ Federal BLM ☐ Federal Forest Service ☐ Other (specify)				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: **Municipalities:** Town of Sunland Park, NM – 0 miles Anapra, Chihuahua, Mexico - 0.5 miles El Paso, TX – 1.3 miles Village of Santa Teresa, NM – 4 miles Ciudad Juarez, Mexico – 8 miles **Indian Tribes/Pueblos:** None within 10 miles **Counties:** Doña Ana County, NM – 0 miles El Paso County, TX – 2 miles				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? ☐ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers:				
9	Name nearest Class I area: **Guadalupe Mountains National Park**				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): **~146 km**				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: **The nearest residence, school or occupied structure to landfill is located 220 meters east of the northeastern property boundary of the facility.**				
12	Method(s) used to delineate the Restricted Area: **Landfill access is restricted by barbed-wire fence and physical barriers (steep hillsides, sand dunes, and elevated railroad tracks), and access is controlled by a locking gate. The southern boundary of the landfill is delineated by the USA/Mexico border fence, a 15-foot high fence that is patrolled 24-hours per day, 365-days per year by US Border Patrol Personnel.** "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area				

	within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes ☑No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☐ No ☑ Yes If yes, what is the name and permit number (if known) of the other facility? **The Four Peaks Energy Landfill Gas-to-Energy Plant (NSR Permit No. 3275-M2) is located at the landfill site on property leased to Four Peaks Energy, LLC by Camino Real Environmental Center, Inc.**

Section 1-E: Proposed Operating Schedule **(The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)**

1	Facility **maximum** operating ($\frac{\text{hours}}{\text{day}}$): **11.5**	($\frac{\text{days}}{\text{week}}$): **6**	($\frac{\text{weeks}}{\text{year}}$): **52**		($\frac{\text{hours}}{\text{year}}$):**3,443** **(Facility is open 313 days/year, avg. 11 hours/day)**	
2	Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)?	Start: **5:30**		☑AM ☐PM	End: **5:00**	☐AM ☑PM
3	Month and year of anticipated start of construction: **N/A**					
4	Month and year of anticipated construction completion: **N/A**					
5	Month and year of anticipated startup of new or modified facility: **N/A**					
6	Will this facility operate at this site for more than one year? ☑Yes ☐ No					

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? ☐ Yes ☑ No If yes, specify:		
a	If yes, NOV date or description of issue: **N/A**		If yes, NOV date or description of issue: **N/A**
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes ☑ No If Yes, provide the 1c & 1d info below:		
c	Document Title: **N/A**	Document Title: **N/A**	Document Title: **N/A**
d	Provide the required text to be inserted in this permit: **N/A**		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? ☐ Yes ☑ No **Not required since NSR modeling was performed for Permit 7592, and since proposed emissions here match NSR modeling.**		
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? ☐ Yes ☑No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☑ Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ ≥10 tpy of any single HAP **OR** ☐ ≥25 tpy of any combination of HAPS) **OR** ☑ **Minor** (☑ <10 tpy of any single HAP **AND** ☑ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☐ Yes ☑ No		
a	If yes, include the name of company providing commercial electric power to the facility: ____________________ Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.		

Section 1-G: Streamline Application **(This section applies to 20.2.72.300 NMAC Streamline applications only)**

1	☐ I have filled out Section 18, "Addendum for Streamline Applications."	☑ N/A (This is not a Streamline application.)

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (20.2.70.300.D.2 NMAC): **Dr. Juan Carlos Tomas**	Phone: **(575) 589-9440**
a	R.O. Title: **Landfill Manager**	R.O. e-mail: **JuanT@WasteConnections.com**
b	R.O. Address: **P.O. Box 580, Sunland Park, New Mexico 88063**	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC): **N/A**	Phone: **N/A**
a	A. R.O. Title: **N/A**	A. R.O. e-mail: **N/A**
b	A. R. O. Address: **N/A**	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): **None**	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): **Waste Connections**	
a	Address of Parent Company: **3 Waterway Square Place #110, The Woodlands, Texas 77380**	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): **N/A**	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: **Dr. Juan Carlos Tomas, (575) 589-9440**	
7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers: **The City of El Paso, Texas and the Texas state boundary are located approximately 1.3 miles northeast of the landfill. The Texas Commission on Environmental Quality (TCEQ) is the main air pollution control program for the State of Texas; however, TCEQ also lists the City of El Paso Environmental Services as a local air pollution control program.** **Chihuahua, Mexico is located approximately 60 feet (18.3 m) south of the landfill property.** **The Tigua (Ysleta del Sur) Pueblo is the only known Indian Tribe/Pueblo within 50 miles of the Landfill. The Pueblo is located in El Paso County, approximately 20 miles (32 km) southeast of the Camino Real Landfill.**	

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (**NOI**), a 20.2.70 NMAC (**Title V**), a 20.2.72 NMAC (**NSR** minor source), or 20.2.74 NMAC (**PSD**) application package shall consist of the following:

Hard Copy Submittal Requirements:

1) One hard copy **original signed and notarized application package printed double sided 'head-to-toe' 2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be head-to-head. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. Please include a copy of the check on a separate page.

2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This copy should be printed in book form, 3-hole punched, and **must be double sided**. Note that this is in addition to the head-to-to 2-hole punched copy required in 1) above. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.

3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically. Electronic files for applications for NOIs, any type of General Construction Permit (GCP), or technical revisions to NSRs must be submitted with compact disk (CD) or digital versatile disc (DVD). For these permit application submittals, **two** CD copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a single CD submittal. Electronic files for other New Source Review (construction) permits/permit modifications or Title V permits/permit modifications can be submitted on CD/DVD or sent through AQB's secure file transfer service.

Electronic files sent by (check one):

☑ CD/DVD attached to paper application

☐ secure electronic transfer. Air Permit Contact Name____________________________

Email______________________________

Phone number _______________________

a. If the file transfer service is chosen by the applicant, after receipt of the application, the Bureau will email the applicant with instructions for submitting the electronic files through a secure file transfer service. Submission of the electronic files through the file transfer service needs to be completed within 3 business days after the invitation is received, so the applicant should ensure that the files are ready when sending the hard copy of the application. The applicant will not need a password to complete the transfer. **Do not use the file transfer service for NOIs, any type of GCP, or technical revisions to NSR permits.**

4) Optionally, the applicant may submit the files with the application on compact disk (CD) or digital versatile disc (DVD) following the instructions above and the instructions in 5 for applications subject to PSD review.

5) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** and/or electronic air dispersion modeling report, input, and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau.

6) If the applicant submits the electronic files on CD and the application is subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
   a. one additional CD copy for US EPA,
   b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
   c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

   If the application is submitted electronically through the secure file transfer service, these extra CDs do not need to be submitted.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

1) All required electronic documents shall be submitted as 2 separate CDs or submitted through the AQB secure file transfer service. Submit a single PDF document of the entire application as submitted and the individual documents comprising the application.

2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible

format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc,), submit these items in hard copy format. We must be able to review the formulas and inputs that calculated the emissions.

3) It is preferred that this application form be submitted as 4 electronic files (3 MSWord docs: Universal Application section 1 [UA1], Universal Application section 3-19 [UA3], and Universal Application 4, the modeling report [UA4]) and 1 Excel file of the tables (Universal Application section 2 [UA2]). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.

4) The electronic file names shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the core permit number (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the section # (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the header information throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision number (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. Do not use special symbols (#, @, etc.) in file names. The footer information should not be modified by the applicant.

Table of Contents

Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
1	Road Particulate Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	30502504	X Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
2	Landfill Earthmoving Particulate Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	30502504	X Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
3	Landfill Gas Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	50100402	X Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
4	Petroleum Hydrocarbon Landfarm	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	50410310	X Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
5	Landfill Gas Flare	LFG Specialities	PCF1230 I10	N/A	N/A	N/A	May-00 May-00	N/A 1	50100410	X Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
6	Portable Light Towers (Diesel)	Varies	Varies	Varies	Varies	Varies	N/A N/A	N/A N/A	20200107	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
7	Portable Compressor Engine (Diesel)	Varies	Varies	Varies	≤75 hp	≤75 hp	N/A N/A	N/A N/A	20200107	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
8	Portable Diesel Engines	Varies	Varies	Varies	≤100 hp	≤100 hp	N/A N/A	N/A N/A	20200107	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
[2] Specify dates required to determine regulatory applicability.
[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.
[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Table 2-B: Insignificant Activities[1] (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exemp under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at https://www.env.nm.gov/wp-content/uploads/sites/2/2017/10/InsignificantListTitleV.pdf. TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form

Unit Number	Source Description	Manufacturer	Model No.	Max Capacity	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction[2]	For Each Piece of Equipment, Check Onc
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction[2]	
2	Diesel Fuel Storage Tank	N/A	N/A	10,000	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	gallons	I.A. List Item #8	N/A	
2	Waste Oil Storage Tank	N/A	N/A	≤ 500	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	gallons	I.A. List Item #5	N/A	
2	Parts Degreaser	N/A	N/A	<10mm Hg	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	vapor pressure	I.A List Item #5	N/A	
2	Motor Oil and Antifreeze Storage	N/A	N/A	<1mm Hg	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	vapor pressure	I.A. List Item #5	N/A	
2	Comfort Heating	N/A	N/A	≤ 5,000,000	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	Btu/hour	I.A. List Item #3	N/A	
2	Portable Diesel Fuel Tank	N/A	N/A	≤ 1,000	N/A	N/A	X Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
			N/A	gallons	I.A. List Item #8	N/A	
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced
							˜ Existing (unchanged) ˜ To be Removed ˜ New/Additional ˜ Replacement Unit ˜ To Be Modified ˜ To be Replaced

[1] Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

[2] Specify date(s) required to determine regulatory applicability.

Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
1	Water Wagon	N/A	Fugitive Dust Emissions	1, 2	60%, 90%, 95%	NMED AQB Recommendation
2	Utility Flare	May-00	VOCs, NMOCs, HAPs	3	>98%	Manuf. Perf. Guide

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

Table 2-D: Maximum Emissions (under normal operating conditions)

☐ **This Table was intentionally left blank because it would be identical to Table 2-E.**

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
1	-	-	-	-	-	-	-	-	410.83	591.48	110.75	159.41	11.14	16.05	-	-	-	-
2	-	-	-	-	-	-	-	-	44.28	36.56	11.78	6.58	1.25	1.06	-	-	-	-
3	-	-	-	-	15.50	67.91	-	-	-	-	-	-	-	-	0.31	1.38	-	-
4	-	-	-	-	<3.29	<14.40	-	-	-	-	-	-	-	-	-	-	-	-
5[2]	6.19	27.13	28.23	123.67	-	-	1.40	6.15	0.09	0.41	0.09	0.41	0.09	0.41	-	-	-	-
6	0.62	2.70	0.45	1.98	0.62	2.70	0.10	0.45	0.05	0.22	0.05	0.22	0.05	0.22	-	-	-	-
7	0.58	2.53	0.61	2.68	0.58	2.53	0.15	0.67	0.05	0.22	0.05	0.22	0.05	0.22	-	-	-	-
8	1.54	6.76	1.63	7.15	1.54	6.76	0.41	1.80	0.13	0.58	0.13	0.58	0.13	0.58	-	-	-	-
Totals	8.93	39.13	30.93	135.47	<21.53	<94.31	2.07	9.07	455.44	629.46	122.85	167.41	12.71	18.53	0.31	1.38	-	-

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but PM is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

[2] HAPs from the Landfill Gas Flare are inclusive only of the HAPs that are combustion by-products, Mercury and HCL. All VOC and HAP emissions through the flare (Unit 5) are from the landfill gas emissions sent from the landfill to the flare and are represented within the emissions of the landfill gas emissions (Unit 3)

Table 2-E: Requested Allowable Emissions

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E^{-4}).

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
1	-	-	-	-	-	-	-	-	43.33	62.38	11.70	16.85	1.23	1.79	-	-	-	-
2	-	-	-	-	-	-	-	-	25.68	22.64	7.67	6.81	0.74	0.66	-	-	-	-
3	-	-	-	-	6.92	30.33	-	-	-	-	-	-	-	-	0.14	0.62	-	-
4	-	-	-	-	<3.29	<14.40	-	-	-	-	-	-	-	-	-	-	-	-
5	6.19	27.13	28.23	123.67	0.31	1.37	1.40	6.15	0.09	0.41	0.09	0.41	0.09	0.41	-	-	-	-
6	0.62	2.70	0.45	1.98	0.62	2.70	0.10	0.45	0.05	0.22	0.05	0.22	0.05	0.22	-	-	-	-
7	0.58	2.53	0.61	2.68	0.58	2.53	0.15	0.67	0.05	0.22	0.05	0.22	0.05	0.22	-	-	-	-
8	1.54	6.76	1.63	7.15	1.54	6.76	0.41	1.80	0.13	0.58	0.13	0.58	0.13	0.58	-	-	-	-
Totals	8.93	39.13	30.93	135.47	<13.26	<58.09	2.07	9.07	69.34	86.43	19.70	25.08	2.30	3.87	0.14	0.62	-	-

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 an PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC

Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)

X This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scehduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine our predictable startup, shutdown or scheduled maintenance (SSM)[1], including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (https://www.env.nm.gov/aqb/permit/aqb_pol.html) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		PM[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals																		

[1] **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

[2] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

X I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol an on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		PM		PM10		PM2.5		H_2S or Lead	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals:																	

Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
1	5	V	N	34	~1500	3000	3000	N/A	65.62	1.00

Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

Stack No.	Unit No.(s)	Total HAPs		Toluene x HAP or TAP		Xylenes x HAP or TAP		Provide Pollutant Name Here HAP or TAP		Provide Pollutant Name Here HAP or TAP		Provide Pollutant Name Here HAP or TAP		Provide Pollutant Name Here HAP or TAP		Provide Pollutant Name Here HAP or TAP		Provide Pollutant Name Here HAP or TAP	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
N/A	3	1.45	6.37	0.48	2.11	0.36	1.59												
N/A	4	<3.31	<14.50	-	-	-	-												
1	5[1]	0.72	3.13																
Totals:		<5.48	<24.00	0.48	2.11	0.36	1.59												

Table 2-J: Fuel

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

Unit No.	Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, …)	Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other	Specify Units				
			Lower Heating Value	Hourly Usage	Annual Usage	% Sulfur	% Ash
N/A							

Table 2-K: Liquid Data for Tanks Listed in Table 2-L

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

Tank No.	SCC Code	Material Name	Composition	Liquid Density (lb/gal)	Vapor Molecular Weight (lb/lb*mol)	Average Storage Conditions		Max Storage Conditions	
						Temperature (°F)	True Vapor Pressure (psia)	Temperature (°F)	True Vapor Pressure (psia)
N/A									

Table 2-L: Tank Data

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary. See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn-overs (per year)
					(bbl)	(M^3)			Roof	Shell			
N/A													

Table 2-L2: Liquid Storage Tank Data Codes Reference Table

Roof Type	Seal Type, Welded Tank Seal Type		Seal Type, Riveted Tank Seal Type		Roof, Shell Color	Paint Condition
	Mechanical Shoe Seal	Liquid-mounted resilient seal	Vapor-mounted resilient seal	Seal Type		
FX: Fixed Roof	**A**: Primary only	**A**: Primary only	**A**: Primary only	**A**: Mechanical shoe, primary only	**WH**: White	Good
IF: Internal Floating Roof	**B**: Shoe-mounted secondary	**B**: Weather shield	**B**: Weather shield	**B**: Shoe-mounted secondary	**AS**: Aluminum (specular)	Poor
EF: External Floating Roof	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**AD**: Aluminum (diffuse)	
P: Pressure					**LG**: Light Gray	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

Table 2-M: Materials Processed and Produced (Use additional sheets as necessary.)

Material Processed				Material Produced			
Description	Chemical Composition	Phase (Gas, Liquid, or Solid)	Quantity (specify units)	Description	Chemical Composition	Phase	Quantity (specify units)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A									

Table 2-O: Parametric Emissions Measurement Equipment

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
N/A								

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year. **Anthropognic CO2e emissions are less than 75,000 tons per year.**

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4,6]	Total CO_2e ton/yr[5,6]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
3	**mass GHG**	10,934	-	3,260	-	-									14,194	
	CO_2e	10,934	-	81,495	-	-										92,429
5	**mass GHG**	91,520	0.55	2.81	-	-									91,524	
	CO_2e	91,520	165	70	-	-										91,756
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
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	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO2e															
Total[6]	**mass GHG**	102,454	0.55	3,263											105,718	
	CO_2e	102,454	165	81,565												184,185

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[3] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

[6] The totals represent both biogenic and anthropogenic GHG emissions. Also, the operating scenarios represented by Sources 3 and 5 are mutually exclusive and would not happen at the same time (even though they are added here).

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

The **Process Summary** shall include a brief description of the facility and its processes.

Startup, Shutdown, and Maintenance (SSM) routine or predictable emissions: Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

This application has been prepared to renew the Camino Real Landfill's current Title V permit. The renewal is timely per (20.2.70.300.B.2 NMAC) since it is being submitted at least a year prior to the permit expiration date of June 13, 2022. The original trigger for the landfill requiring a Title V permit was from it being over the capacity limit in the NSPS rules for landfills (originally 40 CFR 60, Subpart WWW), which requires a Title V permit (20.7.72.200.B NMAC).

The landfill currently operates under Title V Permit Number P186L-R3M1, which expires on June 13, 2022. The Universal Air Quality Permit Application has been completed. Emissions shown in this application match the NSR permit, for which a significant revision is being filed concurrently. These NSR emissions more than cover any necessary emissions during the next 5-year permit period. The only changes associated with this renewal include the following:

- Natural gas comfort heating and a portable diesel fuel tank were added to the insignificant source list (these were previously added into the permit administratively via the permitting administrative multi-from);
- Five engines were added to Table 2-A (new Units 6-8) as regulated emissions points due to their treatment in the landfill's NSR permit (a significant revision to the NSR permit to accommodate this is being submitted concurrently with this application). The modeling section and all emissions were set here to match the NSR revision; and
- Since 40 CFR 63, Subpart AAAA was revised in March 2020 and there is now more clarity regarding the landfill's transition from 40 CFR 60, Subpart WWW to Subpart XXX/Subpart AAAA, the renewal application has been revised to discuss this transition (which will occur on September 27, 2021).

The landfill is a municipal solid waste (MSW) landfill operating pursuant to NMED Solid Waste Facility Permit No. SWM-030738. The landfill is authorized to dispose of MSW and the following approved special wastes:

- Petroleum contaminated soils (PCS);
- Sludge; and

- Industrial solid waste.

A public convenience station is operated for residential self-hauler customers and a registered, single-stream recycling center.

Since, March 2001, CRLF has operated a gas collection and control system (GCCS), which routes landfill gas (LFG) to either a beneficial-use gas-to-energy (LFGE) facility, or an on-site open flare for destruction. The LFGE Plant, is co-located on the landfill's property; and is owned and operated by Four Peaks Energy, Inc. of Santa Fe, New Mexico. This LFGE facility is a separate source (see Section 11). The GCCS must be operated as the landfill is has been subject to NSPS requirements, beginning with the control requirements of 40 CFR 60, Subpart WWW as of November 16, 2018.

Regarding Startup, Shutdown, and Maintenance (SSM) emissions, please refer to Section 14 for a description of the operational plan to mitigate these types of emissions. With regard to how any such emissions are accounted for in this application, the potential-to-emit emissions calculations and assumptions are conservative enough such that any such minor SSM emissions that might occur are encompassed within them.

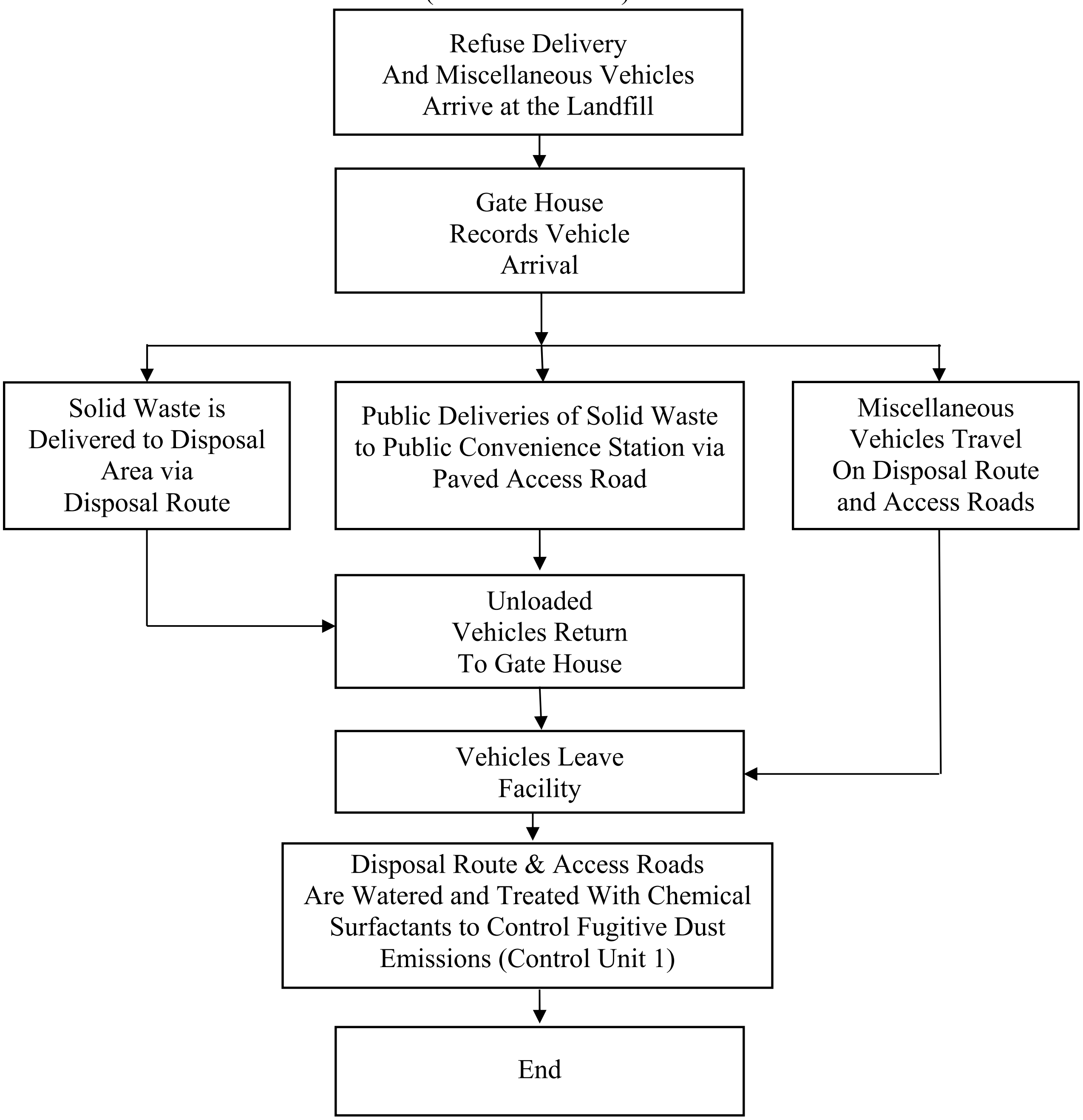
Section 4

Process Flow Sheet

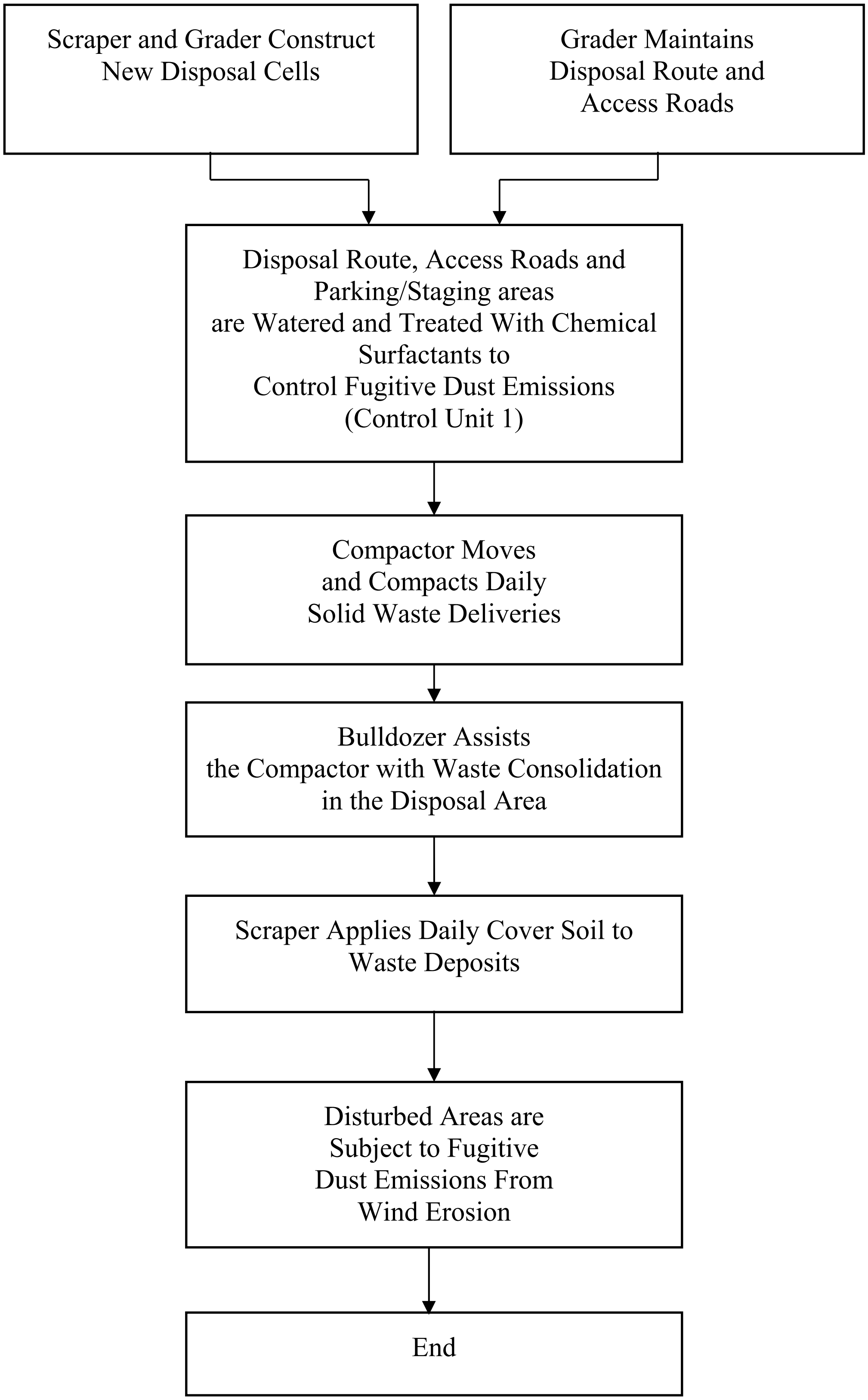
A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

Note that the portable engines are not shown as a process flow since they simply have no processes associated with them (they simply produce emissions as estimated in this renewal application).

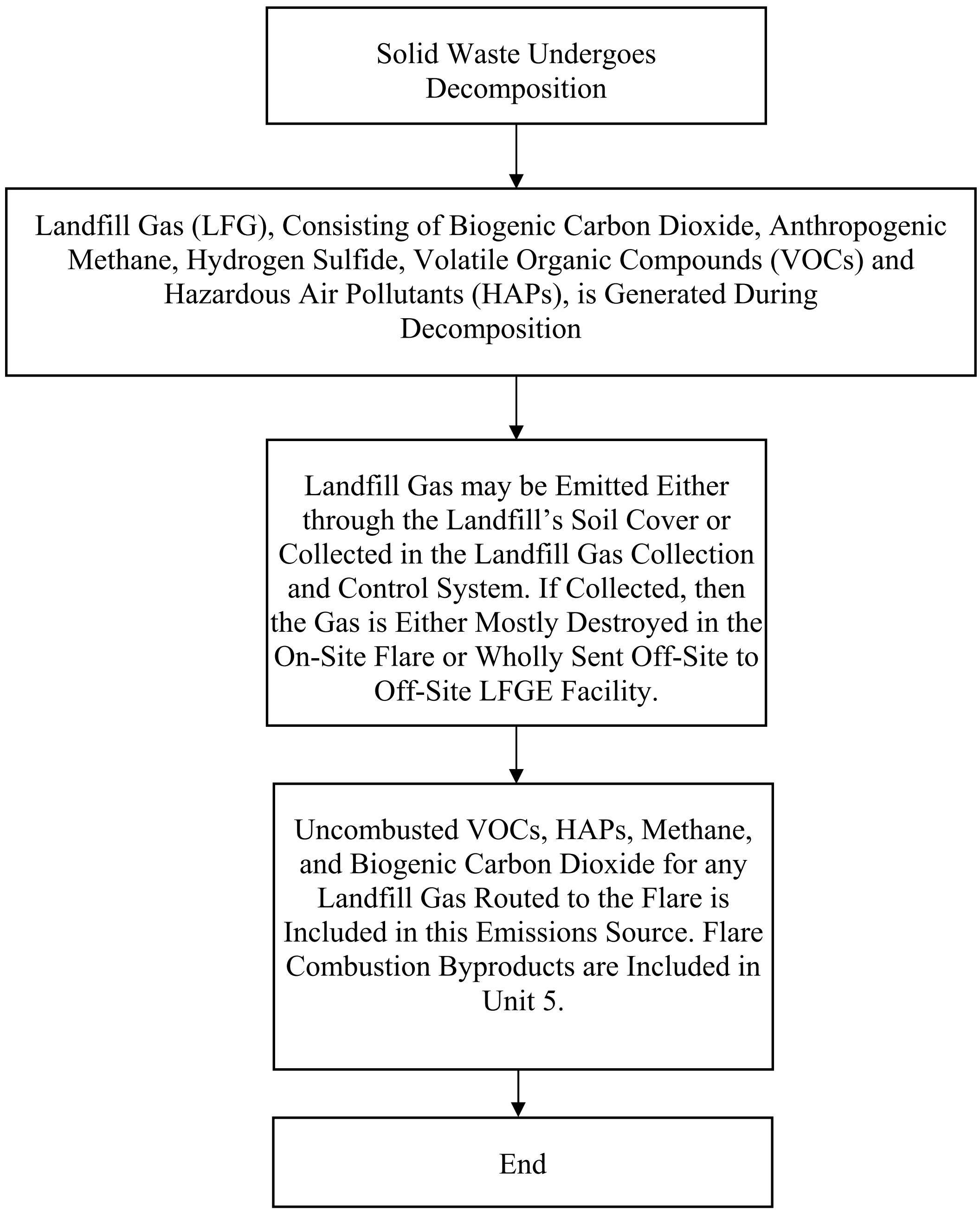
Road Particulate Emissions
(Emissions Unit 1)



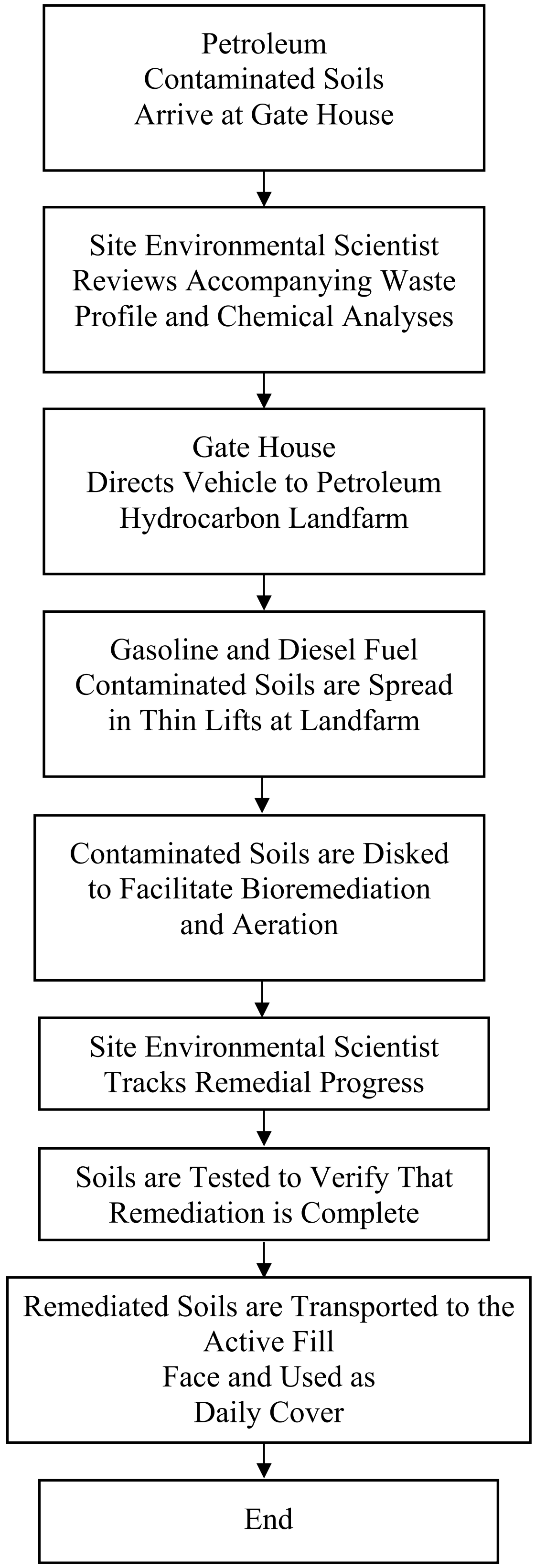
Landfill Earthmoving Particulate Emissions
(Emissions Unit 2)



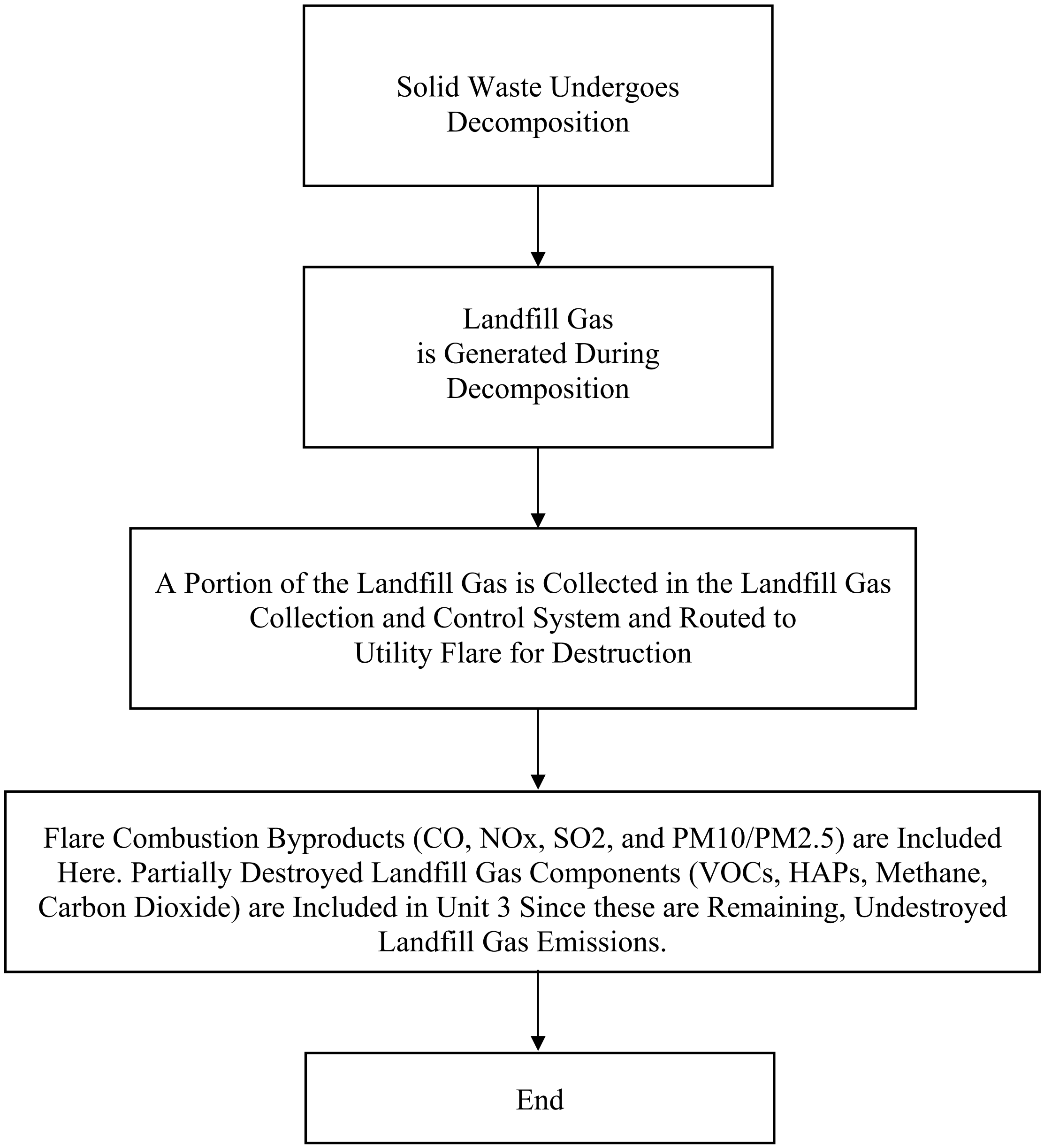
Landfill Gas Emissions
(Emissions Unit 3)



Petroleum Hydrocarbon Landfarm
(Emissions Unit 4)



Landfill Gas Flare
(Emissions Unit 5)

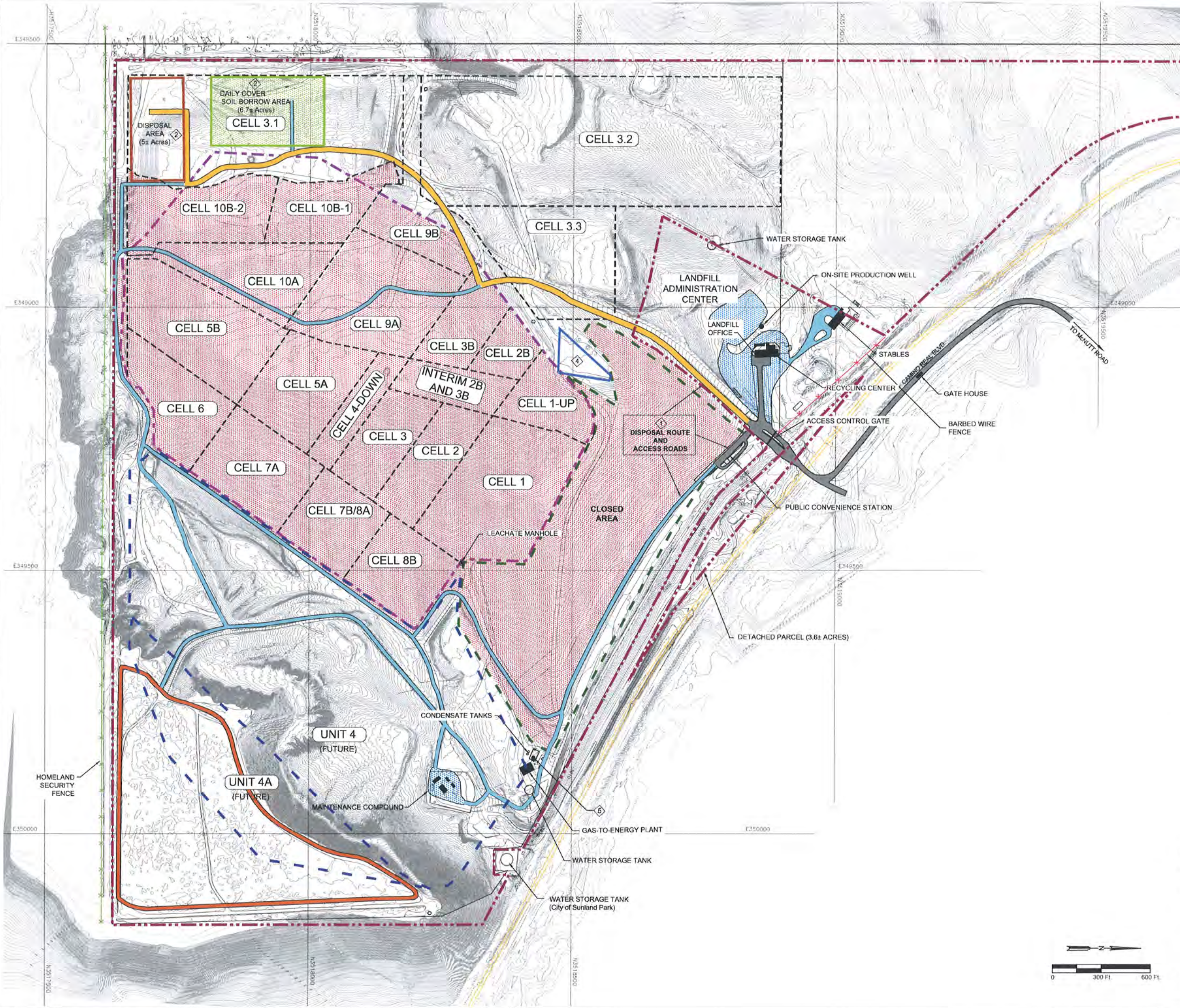


Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

A scaled map (Plot Plan) of CRLF showing emission points, structures, tanks, and fences is included in this Section. Note that the various engines are portable and, as such, not shown at a specific location.



LEGEND

- PERMIT BOUNDARY (RESTRICTED BOUNDARY)
- ACTIVE AREA BOUNDARY (1995 PERMIT AREA)
- CLOSED AREA BOUNDARY
- PLANNING-LEVEL LIMITS
- LANDFILL CELL BOUNDARY
- 5' AND 10' INDEX CONTOUR
- 1' AND 2' INTERMEDIATE CONTOUR
- HOMELAND SECURITY FENCE (SEE NOTE 3)
- BARBED WIRE FENCE (SEE NOTE 3)
- RAILROAD TRACKS
- 1 PAVED ROADWAY
- 1 DISPOSAL ROUTE (UNPAVED)
- 1 ACCESS ROADS (UNPAVED)
- AUXILIARY ROADS (UNPAVED – FEDERAL ACTIVITY)
- 2 DISPOSAL AREA
- 2 DAILY COVER SOIL BORROW AREA
- 2 PREVIOUS DISPOSAL AREAS
- 2 ADDITIONAL AREAS SUBJECT TO DUST CONTROL
- 4 PETROLEUM HYDROCARBON LANDFARM
- UTM GRID

1. ROAD PARTICULATE EMISSIONS
2. LANDFILL EARTHMOVING PARTICULATE OPERATIONS
3. LANDFILL GAS EMISSIONS
4. PETROLEUM HYDROCARBON LANDFARM
5. LANDFILL GAS FLARE

NOTES:

1. THIS PLOT PLAN WAS ADAPTED FROM THE PLOT PLAN (FIGURE 5.1) COMPLETED BY GORDON ENVIRONMENTAL, INC. IN MARCH 2011.
2. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2020 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2020 TOPOGRAPHY IS FROM AN AERIAL SURVEY FLOWN ON FEBRUARY 15, 2020.
3. HOMELAND SECURITY RESTRICTED BOUNDARY FENCE SHOWN OFFSET FROM PERMIT BOUNDARY FOR CLARITY. OTHER PERMIT BOUNDARIES ARE RESTRICTED BY BARBED WIRE FENCING OR PHYSICAL FEATURES (STEEP CLIFFS, ETC.).

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: PLOT PLAN

PROJECT TITLE: TITLE V RENEWAL

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER INC. SUNLAND PARK, NEW MEXICO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
1901 CENTRAL DRIVE, SUITE 550, BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188

PROJ. NO. 16220119.00 | DWN. BY: ORA | Q/A RVW BY: DJM | DSN. BY: JK | CHK. BY: JK | APP. BY: DJM

CADD FILE: PLOT PLAN (RENEWAL)

DATE: 06/2021

SCALE: AS SHOWN

DRAWING NO. 5.1

Section 6

All Calculations

<u>Show all calculations</u> used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:
A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.
B. At least 5 significant figures shall be retained in all intermediate calculations.
C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

- **(1)** If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;
- **(2)** If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**
- **(3)** If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.
- **(4)** The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

Emissions calculations are provided for the following sources and were prepared to conform to the requirements listed above:

- Road Particulate Emissions inclusive of both paved and unpaved routes (Unit Number 1);
- Landfill Earthmoving Particulate Emissions inclusive of bulldozing operations, grading operations, scraper operations, and wind erosion (Unit Number 2);
- Landfill Gas Emissions (Unit Number 3);
- Petroleum Hydrocarbon Landfill (Unit Number 4);
- Landfill Gas Flare inclusive of flare combustion by-products (Unit Number 5); and
- Portable Engines (Unit Numbers 6-8);

The emissions calculations themselves are included in the following tables.

No potential emissions during startup, shutdown, and routine maintenance (SSM) are included in this application. A backup water truck is available for the primary control system water truck for Units 1 and 2 in case of an SSM event. Any potential SSM event for the controls system of Unit 3 (Unit 5 being the control unit) would be covered by the existing emissions reported. No SSM events are expected for Unit 4 as emissions from operations since all emissions are from this unit are from a continual process neither subject to malfunction nor “started up” or “shut down” at will. No SSM events are expected from Units 6-8 since the emissions from these units are shown as continual in this application for conservativeness.

To match the recent NSR permit application, the flare’s emissions were estimated assuming that the flare’s full capacity was utilized, while the landfill’s emissions were estimates assuming a lower gas system capture efficiency. These assumptions effectively bracket the possible extremes of high and moderate gas collection.

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following ˜ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at http://www.epa.gov/ttn/chief/ap42/index.html
- EPA's Internet emission factor database WebFIRE at http://cfpub.epa.gov/webfire/
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases:

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC).** You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

Table 6.6 includes GHG emissions calculations for both the flare and landfill. The calculations are conservative in that, for the landfill, a low GCCS collection efficiency is assumed, but for the flare, the full flare's capacity is assumed. These two operating scenarios would not occur concurrently.

TABLE 6.1
POTENTIAL-TO-EMIT EMISSIONS SUMMARY
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Emission Source/Description	Units	Regulated Air Pollutant	Potential-to-Emit Emissions			
			Uncontrolled		Controlled	
			pounds/hour	tons/year	pounds/hour	tons/year
Road Particulate Emissions	001	Particulate Matter < 2.5 Microns	11.14	16.05	1.23	1.79
		Particulate Matter < 10 Microns	110.75	159.41	11.70	16.85
		Total Suspended Particulates	410.83	591.48	43.33	62.38
Landfill Earthmoving Particulate Emissions	002	Particulate Matter < 2.5 Microns	1.25	1.06	0.74	0.66
		Particulate Matter < 10 Microns	11.78	6.58	7.67	6.81
		Total Suspended Particulates	44.28	36.56	25.68	22.64
Landfill Gas Emissions[1]	003	Volatile Organic Compounds	15.50	67.91	6.92	30.33
		Hazardous Air Pollutants	3.25	14.26	1.45	6.37
		Hydrogen Sulfide	0.31	1.38	0.14	0.62
		Non-Methane Organic Compounds	39.75	174.13	17.75	77.76
Petroluem Contaminated Soils[2]	004	Volatile Organic Compounds	<3.29	<14.40	<3.29	<14.40
		Hazardous Air Pollutants	<3.29	<14.40	<3.29	<14.40
Landfill Gas Flare[4]	005	Carbon Monoxide	28.23	123.67	28.23	123.67
		Nitrogen Dioxide	6.19	27.13	6.19	27.13
		Sulfur Dioxide	1.40	6.15	1.40	6.15
		Volatile Organic Compounds	-	-	0.31	1.37
		Hazardous Air Pollutants[3]	0.72	3.13	0.78	3.42
		Particulate Matter < 2.5 Microns	0.09	0.41	0.09	0.41
		Particulate Matter < 10 Microns	0.09	0.41	0.09	0.41
		Total Suspended Particulates	0.09	0.41	0.09	0.41
Portable Light Towers	006	Volatile Organic Compounds	0.62	2.70	0.62	2.70
		Hazardous Air Pollutants	0.001	0.01	0.001	0.01
		Nitrogen Dioxide	0.62	2.70	0.62	2.70
		Sulfur Dioxide	0.10	0.45	0.10	0.45
		Carbon Monoxide	0.45	1.98	0.45	1.98
		Particulate Matter < 2.5 Microns	0.05	0.22	0.05	0.22
		Particulate Matter < 10 Microns	0.05	0.22	0.05	0.22
		Total Suspended Particulates	0.05	0.22	0.05	0.22
Portable Compressor Engine	007	Volatile Organic Compounds	0.58	2.53	0.58	2.53
		Hazardous Air Pollutants	0.002	0.01	0.002	0.01
		Nitrogen Dioxide	0.58	2.53	0.58	2.53
		Sulfur Dioxide	0.15	0.67	0.15	0.67
		Carbon Monoxide	0.61	2.68	0.61	2.68
		Particulate Matter < 2.5 Microns	0.05	0.22	0.05	0.22
		Particulate Matter < 10 Microns	0.05	0.22	0.05	0.22
		Total Suspended Particulates	0.05	0.22	0.05	0.22
Portable Diesel Engines	008	Volatile Organic Compounds	1.54	6.76	1.54	6.76
		Hazardous Air Pollutants	0.01	0.02	0.01	0.02
		Nitrogen Dioxide	1.54	6.76	1.54	6.76
		Sulfur Dioxide	0.41	1.80	0.41	1.80
		Carbon Monoxide	1.63	7.15	1.63	7.15
		Particulate Matter < 2.5 Microns	0.13	0.58	0.13	0.58
		Particulate Matter < 10 Microns	0.13	0.58	0.13	0.58
		Total Suspended Particulates	0.13	0.58	0.13	0.58
Totals	**-**	**Carbon Monoxide**	**30.93**	**135.47**	**30.93**	**135.47**
		Nitrogen Dioxide	**8.93**	**39.13**	**8.93**	**39.13**
		Sulfur Dioxide	**2.07**	**9.07**	**2.07**	**9.07**
		Particulate Matter < 2.5 Microns	**12.71**	**18.53**	**2.30**	**3.87**
		Particulate Matter < 10 Microns	**122.85**	**167.41**	**19.70**	**25.08**
		Total Suspended Particulates	**455.44**	**629.46**	**69.34**	**86.43**
		Volatile Organic Compounds	**<21.53**	**<94.31**	**<13.26**	**<58.09**
		Hazardous Air Pollutants	**<7.27**	**<31.83**	**<5.53**	**<24.19**
		Hydrogen Sulfide	**0.31**	**1.38**	**0.14**	**0.62**

[1] Emissions for this unit includes fugitive landfill emissions.

[2] Emissions from the Petroluem Contaminated Soils will be limited to no more than 14.4 tons of HAPs to keep the site a minor source. VOC emissions are set equal to HAP emissions.

[3] HAPs from the Landfill Gas Flare are inclusive only of the HAPs that are combustion by-products, Mercury and HCL.

[4] All VOC and HAP emissions through the flare (Unit 5) are from the landfill gas emissions sent from the landfill to the flare and are represented within the emissions of the landfill gas emissions (Unit 3).

TABLE 6.2A
FUGITIVE PARTICULATE MATTER FROM UNIT 1 - PAVED ROADWAYS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Routes				
	Length of road (one-way)		Length of road (round trip)	
Reference number and Route Name	Feet	Miles	Feet	Miles
1 - Paved Disposal Route	164	0.03	328	0.06
2 - Paved Convenience Station Loop	461	0.09	921	0.17
3 - Miscellaneous Vehicles	485	0.09	970	0.18

Vehicle Miles Traveled (VMT)							
				Maximum Length of road (round trip)		VMT	
	Routes	Number of	Number of			(per day)	(per year)
Type of Vehicle	Applicable	Vehicles/Year	Vehicles/Day	Feet	Miles	Actual	Actual
Light/Medium	1	38,563	123.20	328	0.06	7.65	2,396
Large	1	36,481	116.55	328	0.06	7.24	2,266
Roll Off Trucks	1	31,054	99.21	328	0.06	6.16	1,929
Semi-Truck	1	1,107	3.54	328	0.06	0.22	69
Water Wagon	1	3,756	12.00	328	0.06	0.75	233
Public Station Vehicles (Light/Medium)	2	3,440	10.99	921	0.17	1.92	600
Utility Vehicles	3	5,321	17.00	970	0.18	3.12	978
Supervisor Trucks	3	4,695	15.00	970	0.18	2.76	863
Totals	**-**	**124,417**	**397**	**-**	**-**	**29.8**	**9,333**

Actual Days of Operation =	313	days
Actual Closed Days =	52	days
Actual Hours of Operation/Day =	11.00	hrs/day

Assumptions:
Silt content was taken from AP-42, Table 13.2.2-1, for MSW landfills.
Mean number of days of precipitation was taken from AP-42, Figure 13.2.2-1.
Assume aerodynamic particle size is less than 10 microns.
Water truck is utilized as needed for a control efficiency of 40% for PM2.5
90% for PM10 and TSP
Mean vehicle weights were derived by averaging the full and empty vehicle weights.

Variables:

k factor (dimensionless) for PM2.5 =	0.00054	lb/VMT	(from AP-42, Table 13.2-1.1)
k factor (dimensionless) for PM10 =	0.0022	lb/VMT	(from AP-42, Table 13.2-1.1)
k factor (dimensionless) for TSP =	0.011	lb/VMT	(from AP-42, Table 13.2-1.1)
Silt loading (sL) =	7.4	g/m2	(from AP-42, Table 13.2.1-3)

Mean Vehicle Weight (W)

Type of Vehicle	W (tons)
Light/Medium	1.50
Large	20.00
Roll Off Trucks	22.50
Semi-Truck	33.80
Water Wagon	55.50
Public Station Vehicles (Light/Medium)	1.50
Utility Vehicles	1.50
Supervisor Trucks	1.50
Weighted Avg. Vehicle Weight	**11.9**

(weighted based on vehicle miles traveled)

TABLE 6.2A
FUGITIVE PARTICULATE MATTER FROM UNIT 1 - PAVED ROADWAYS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Methodologies:
AP-42, Section 13.2.1 for Paved Roads.

Example - Actual Emissions Calculation (PM-2.5):

Calculation of total particulate fugitive emissions for vehicles on paved landfill roads.

Uncontrolled Long-Term $E = [k(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)$
Uncontrolled Short-Term $E = [k(sL)^{0.91}*(W)^{1.02}]$

Where:

E	=	Emission factor in pounds per vehicle mile traveled (lb/VMT)
k	=	Particle size multiplier (lb/VMT)
sL	=	Road surface silt loading factor (grains per ft ^{2})
W	=	Vehicle weight in tons
k	=	0.0022 PM10 0.00054 PM2.5 0.011 TSP
P	=	number of days with > 0.01 inches of rain/year
N	=	number of days in the average period (year)

For example, for uncontrolled long-term PM-2.5 emissions, use the following:

k	=	0.00054	dimensionless
sL	=	7.4	g/m^2
W	=	11.9	tons (fleet average)
P	=	60	
N	=	365	

		Long-Term	Short-Term		
E	=	0.04	0.04	lb/VMT	PM2.5
		0.16	0.17	lb/VMT	PM10
		0.82	0.85	lb/VMT	TSP

Obtain vehicle miles traveled (VMT) per day as follows:

VMT/day = Sum of (Number of vehicles*length of roadway) (round trip in miles)
= 29.82

Obtain emissions in pounds per day as follows:

lbs/day = E * VMT / day
= 1.20

Assume:
Operating days per year = 313

Obtain emissions in tons per year as follows:

tons/year = (lbs per day * operating days per year) / pounds per ton
= 0.19

SUMMARY OF PARTICULATE EMISSIONS FROM PAVED ROADWAYS						
	Uncontrolled Long-Term Emissions			Uncontrolled Short-Term Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	1.20	0.11	0.19	1.25	0.11	0.20
PM_{10}	4.87	0.44	0.76	5.08	0.46	0.79
TSP	24.35	2.21	3.81	25.39	2.31	3.97
	Controlled Long-Term Emissions [1]			Controlled Short-Term Emissions [1]		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	0.72	0.07	0.11	0.75	0.07	0.12
PM_{10}	0.49	0.04	0.08	0.51	0.05	0.08
TSP	2.43	0.22	0.38	2.54	0.23	0.40

1 Long-Term Emissions determine the reported tons/year and the Short-Term Emissions determine the reported lbs/hr.
2 Controlled PM_{10} emissions reported as $PM_{2.5}$ emissions as the $PM_{2.5}$ emissions are more conservative based on the control efficiency.

TABLE 6.2B
FUGITIVE PARTICULATE MATTER FROM UNIT 1 - UNPAVED ROADWAYS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Vehicle Miles Traveled (VMT)						
Type of Vehicle	Number of Vehicles/Year	Number of Vehicles/Day	Length of road (round trip)		VMT	
					(per day)	(per year)
			Feet	Miles	Actual	Actual
Light/Medium	38,563	123.20	9,876	1.87	230.45	72,130
Large	36,481	116.55	9,876	1.87	218.01	68,236
Roll Off Trucks	31,054	99.21	9,876	1.87	185.58	58,085
Semi-Truck	1,107	3.54	9,876	1.87	6.62	2,071
Water Wagon	3,756	12.00	9,876	1.87	22.45	7,025
Public Station Vehicles (Light/Medium)	3,440	10.99	0	0	0	0
Utility Vehicles [1]	-	-	-	-	10.20	3,193
Supervisor Trucks [1]	-	-	-	-	15.00	4,695
Totals	**114,401**	**365**	**-**	**-**	**688.3**	**215,435**

1 Vehicle Miles Traveled (VMT) details for utility vehicles and supervisor trucks are based on the maximum usage on-site.

Actual Days of Operation =	313	days
Actual Closed Days =	52	days
Actual Hours of Operation/Day =	11.00	hrs/day

Assumptions:

Silt content was taken from AP-42, Table 13.2.2-1, for MSW landfills.
Mean number of days of precipitation was taken from AP-42, Figure 13.2.2-1.
Assume aerodynamic particle size is less than 10 microns.
Water truck is utilized as needed for a control efficiency of 90% for unpaved disposal roads per the permit application
60% for unpaved access roads per the permit application
Weighted Average control efficiency is calculated as follows:

$$\frac{[(0.9)*[(\text{Route 1 VMT})+(0.5 * \text{Routes 2 \& 3 VMT})]+(0.6)*[(0.5*\text{Routes 2 \& 3 VMT})]]}{\text{Total VMT}}$$

Weighted Average Control Efficiency = ((0.9)*(663.09+0.5*25.2)+(0.6)*(0.5*25.2))/(688.29) = 89%
Mean vehicle weights were derived by averaging the full and empty vehicle weights.

Mean Vehicle Weight (W)	
Type of Vehicle	W (tons)
Light/Medium	1.50
Large	20.00
Roll Off Trucks	22.50
Semi-Truck	33.80
Water Wagon	55.50
Public Station Vehicles (Light/Medium)	1.50
Utility Vehicles 1	1.50
Supervisor Trucks 1	1.50
Weighted Avg. Vehicle Weight	**15.1**

(weighted based on vehicle miles traveled)

Methodologies:

AP-42, Section 13.2.2 for Unpaved Roads.

Example - Actual Emissions Calculation (PM10):

Calculation of total particulate fugitive emissions for vehicles on unpaved haul roads.

Uncontrolled Long-Term $E_{ext} = [k * (s/12)^a * (W/3)^b] * [(365 - p)/365]$

Uncontrolled Short-Term $E_{ext} = [k * (s/12)^a * (W/3)^b]$

Variables:

Mean Silt content (s)	6.4	%	(from AP-42, Table 13.2.2-1)
# of days w/ >0.01 in. rainfall (p)	60	days/yea	(from AP-42, Figure 13.2.2-1)
k factor (dimensionless) for PM2.5 =	0.15	lb/VMT	(from AP-42, Table 13.2.2-2.)
k factor (dimensionless) for PM10 =	1.5	lb/VMT	(from AP-42, Table 13.2.2-2.)
k factor (dimensionless) for TSP =	4.9	lb/VMT	(from AP-42, Table 13.2.2-2.)
a (constant) for PM2.5 and PM10 =	0.9		(from AP-42, Table 13.2.2-2.)
a (constant) for TSP =	0.7		
b (constant) =	0.45		(from AP-42, Table 13.2.2-2.)

Facility		Uncontrolled Long-Term		Uncontrolled Short-Term		
E_{ext}	=	0.15	lb/VMT	0.18	lb/VMT	PM2.5
		1.47	lb/VMT	1.76	lb/VMT	PM10
		5.46	lb/VMT	6.53	lb/VMT	TSP

Obtain vehicle miles traveled (VMT) per day as follows:

VMT/day = Number of vehicles * length of roadway (round trip in miles)
= 688.29

Assume:
89% reduction in PM10 emissions through dust suppression operations with the water truck.

Obtain long-term emissions in pounds per day as follows:

lbs/day = E * VMT / day
= 106.94

Obtain long-term emissions in pounds per hour as follows:

lbs/hour = lbs per day / operating hours per day
= 9.72

Assume:
Operating days per year = 313

Obtain long-term emissions in tons per year as follows:

tons/year = (lbs per day * operating days per year) / pounds per ton
= 16.74

SUMMARY OF PARTICULATE EMISSIONS FROM UNPAVED ROADWAYS						
	Uncontrolled Long-Term Emissions			Uncontrolled Short-Term Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	101.37	9.22	15.86	121.31	11.03	18.99
PM_{10}	1013.71	92.16	158.65	1213.13	110.28	189.85
TSP	3755.07	341.37	587.67	4493.78	408.53	703.28
	Controlled Long-Term Emissions [1]			Controlled Short-Term Emissions [1]		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	10.69	0.97	1.67	12.80	1.16	2.00
PM_{10}	106.94	9.72	16.74	127.98	11.63	20.03
TSP	396.13	36.01	61.99	474.06	43.10	74.19

1 Per the permit, Long-Term Emissions determine the reported tons/year and the Short-Term Emissions determine the reported lbs/hr.

TABLE 6.3A
PARTICULATE EMISSIONS FROM UNIT 2 - MOTOR GRADER, COMPACTOR, BULLDOZER OPERATIONS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Emission Source:
Earthmoving and Landfilling Operation Emissions
This spreadsheet is divided into two sections for Grading Operations and Dozer/Compactor Operations.
This list of equipment below represents PTE calculations in 2080 and were conservatively based on data provided by site personnel.
All equations taken from AP-42, Table 11.9-1.

Bulldozing Operations (Inclusive of Dozers and Compactors)

The emissions factors this operation in lbs/hr are based on the following

TSP: $\frac{5.7*(s)^{1.2}}{(M)^{1.3}}$ PM10: $\frac{0.75*(s)^{1.5}}{(M)^{1.4}}$ PM2.5: $\frac{0.105*(s)^{1.2}}{(M)^{1.3}}$

where s = material silt content (%) and M = material moisture content (%) and assuming s = 0.5% and M = 15%

Therefore the emission factors for this operation are: 0.0734 (TSP), 0.0060 (PM10), and 0.0008 (PM2.5) [lbs/hr]
The equipment is expected to run a maximum of 6,886 hours per year.

Therefore PM2.5 emissions are as follows: 1*0.0008 lbs/hr)*(6,886 hours/yr)*(1 ton/2000 lbs) =	0.003 tons/year	0.001 lbs/hr
Therefore PM10 emissions are as follows: 1*0.0060 lbs/hr)*(6,886 hours/yr)*(1 ton/2000 lbs) =	0.02 tons/year	0.01 lbs/hr
Therefore TSP emissions are as follows: 1*0.0734 lbs/hr)*(6,886 hours/yr)*(1 ton/2000 lbs) =	0.25 tons/year	0.07 lbs/hr

Grading Operations (Inclusive of 1 Grading Dozer)

The emissions factors this operation in lbs/VMT are based on the following equations:

TSP: $0.040*(S)^{2.5}$ PM10: $0.60*0.051*(S)^{2.0}$ PM2.5: $0.031*0.051*(S)^{2.5}$

where S = mean vehicle speed (mph) and assuming S = 3.0 mph

Therefore the emission factors for this operation is: 0.6235 (TSP), 0.2754 (PM10), and 0.0142 (PM2.5) [lbs/VMT]
The equipment is expected to run a maximum of 1,252 hours per year at an efficiency of 0.75%.

Therefore PM2.5 emissions are as follows: 1*(0.0142 lbs/VMT)*(1,252 hours/yr)*(0.75%)*(3.0 mph)*(1 ton/2000 lbs) =	0.02 tons/year	0.03 lbs/hr
Therefore PM10 emissions are as follows: 1*(0.2754 lbs/VMT)*(1,252 hours/yr)*(0.75%)*(3.0 mph)*(1 ton/2000 lbs) =	0.39 tons/year	0.62 lbs/hr
Therefore TSP emissions are as follows: 1*(0.6235 lbs/VMT)*(1,252 hours/yr)*(0.75%)*(3.0 mph)*(1 ton/2000 lbs) =	0.88 tons/year	1.40 lbs/hr

Emissions	tons/year	lbs/hr
Total PM2.5 Emissions From Earthmoving =	**0.02**	**0.03**
Total PM10 Emissions From Earthmoving =	**0.41**	**0.63**
Total TSP Emissions From Earthmoving =	**1.13**	**1.48**

TABLE 6.3B
FUGITIVE EMISSIONS FROM UNIT 2 - SCRAPER OPERATIONS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Emission Source:
Scraper Travel

Route	Trips per day	One-Way Length		Roundtrip Length		VMT	
		Feet	Mile	Feet	Mile	Per Day	Per Year
Travel On Scraper Road	30	900	0.17	1800	0.34	10.23	107
Total	**30**	**-**	**-**	**-**	**-**	**10.23**	**107**

Days of Operation =	313	days
Closed Days =	52	days
Scraper Hours of Operation/Day =	4.00	hrs/day

Assumptions:
Silt content was taken from AP-42, Table 13.2.2-1, for MSW landfills.
Mean number of days of precipitation was taken from AP-42, Figure 13.2.2-1.
Assume aerodynamic particle size is less than 10 microns.
Water truck is utilized as needed for a control efficiency of 60.00% for unpaved disposal roads per the permit application

Mean vehicle weights were derived by averaging the full and empty vehicle weights.

Mean Vehicle Weight (W)
W (tons) = 52.2

Methodologies:
AP-42, Section 13.2.2 for Unpaved Roads.

Example - Actual Emissions Calculation (PM10):

Calculation of total particulate fugitive emissions for vehicles on unpaved haul roads.

Uncontrolled Long-Term $E_{ext} = [k * (s/12)^a * (W/3)^b] * [(365 - p)/365]$

Uncontrolled Short-Term $E_{ext} = [k * (s/12)^a * (W/3)^b]$

Variables:

Mean Silt content (s)	6.4 %	(from AP-42, Table 13.2.2-1)
# of days w/ >0.01 in. rainfall (p)	60 days/year	(from AP-42, Figure 13.2.2-1)
k factor (dimensionless) for PM2.5 =	0.15 lb/VMT	(from AP-42, Table 13.2.2-2.)
k factor (dimensionless) for PM10 =	1.5 lb/VMT	(from AP-42, Table 13.2.2-2.)
k factor (dimensionless) for TSP =	4.9 lb/VMT	(from AP-42, Table 13.2.2-2.)
a (constant) for PM2.5 and PM10 =	0.9	(from AP-42, Table 13.2.2-2.)
a (constant) for TSP =	0.7	
b (constant) =	0.45	(from AP-42, Table 13.2.2-2.)

Facility	Uncontrolled Long-Term		Uncontrolled Short-Term		
E_{ext} =	0.26	lb/VMT	0.31	lb/VMT	PM2.5
	2.57	lb/VMT	3.08	lb/VMT	PM10
	9.54	lb/VMT	11.41	lb/VMT	TSP

Obtain vehicle miles traveled (VMT) per day as follows:

VMT/day = Number of vehicles * length of roadway (round trip in miles)
= 10.23

Obtain long-term emissions in pounds per day as follows:

lbs/day = E * VMT / day
= 26.33

Obtain long-term emissions in pounds per hour as follows:

lbs/hour = lbs per day / operating hours per day
= 6.58

Assume:
Operating days per year = 313

TABLE 6.3B
FUGITIVE EMISSIONS FROM UNIT 2 - SCRAPER OPERATIONS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Obtain long-term emissions in tons per year as follows:

tons/year = (lbs per day * operating days per year) / pounds per ton
= 4.12

Summary of particulate emissions from Scraper Travels						
	Uncontrolled Long-Term Emissions			Uncontrolled Short-Term Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	2.63	0.66	0.41	3.15	0.79	0.49
PM_{10}	26.33	6.58	4.12	31.51	7.88	4.93
TSP	97.52	24.38	15.26	116.71	29.18	18.26
	Controlled Long-Term Emissions			Controlled Short-Term Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	1.05	0.26	0.16	1.26	0.32	0.20
PM_{10}	10.53	2.63	1.65	12.60	3.15	1.97
TSP	39.01	9.75	6.10	46.68	11.67	7.31

Emission Source:
Scraper Loading

The following uncontrolled emissions for scraper loading at the Daily cover Soil Borrow Area was estimated through application of emission factors presented in AP-42, Section 11.9, Western

E_{TSP} = 0.058 lbs/ton of soil loaded (Table 11.9-4)

The emission factors for PM10 and PM2.5 were calculated by applying the ratio of the PM10 and PM2.5 to the TSP particle size multiplier (k) values, obtained from AP-42, Section 13.2.2.2, to the TSP emission factor of 0.058 lbs/ton of soil loaded.

$E_{PM10} = (1.5/4.9)*E_{TSP} = 0.31*0.058 =$ 0.018 lbs/ton of soil loaded
$E_{PM2.5} = (0.15/4.9)*E_{TSP} = 0.031*0.058 =$ 0.0018 lbs/ton of soil loaded

Number of Scraper loads per day =	30	loads/day
Scraper capacity =	20	yd^3/load
Soil density =	1.2	tons/yd^3
Mass of soil loaded per day =	720	tons/day
Operating days in year =	313	days
Mass of soil loaded in year =	225,360	tons
Control Efficiency	0	%

Summary of particulate emissions from Scraper Loading			
	Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	1.30	0.32	0.20
PM_{10}	12.96	3.24	2.03
TSP	41.76	10.44	6.54

Emission Source:
Scraper Unloading

Stockpile Area or Disposal Area. Equation (1) from Section 13.2.4 is used to calculate TSP and PM_{10} emissions.

$$E = \frac{(k)(0.0032)(U/5)^{1.3}}{(M/2)^{1.4}}$$ (AP-42, 13.2.4.3, equation (1))

E = size-specific emission factor (lbs/ton of material unloaded)
k = particle size multiplier (dimensionless)

k_{TSP} =	0.74	(AP-42, 13.2.4.3)
k_{PM10} =	0.35	(AP-42, 13.2.4.3)
$k_{PM2.5}$ =	0.053	(AP-42, 13.2.4.3)
U = mean wind speed (mph) =	10	(Santa Teresa Airport)
M = soil moisture content (%) =	12	(AP-42, Table 13.2.4-1)

ETSP = 0.000475 lbs/ton of soil unloaded
EPM10 = 0.000224 lbs/ton of soil unloaded
EPM2.5 = 0.000034 lbs/ton of soil unloaded

Mass of soil unloaded in year = 225,360 tons

Summary of particulate emissions from Scraper Unloading			
	Emissions		
Pollutant	lbs/day	lbs/hr	tons/yr
$PM_{2.5}$	0.024	0.006	0.004
PM_{10}	0.162	0.040	0.025
TSP	0.342	0.085	0.053

TABLE 6.3C
FUGITIVE EMISSIONS FROM UNIT 2 - WIND EROSION EMISSIONS
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Emission Source:
Wind Erosion

The emission factor for TSP is obtained from AP-42, Section 11.9 (Table 11.9-4) and Section 13.2.2.2:

E_{TSP} = 0.38 tons/acre (Table 11.9-4)

The emission factor for PM10 was calculated by applying the ratio of the PM 10 and TSP particle size multiplier (k) values, obtained from Ap-42, Section 13.2.2.2, to the TSP emission factor of 0.38 ton/acre:

$E_{PM10} = (1.5/4.9)E_{TSP} =$ 0.12 tons/acre
$E_{PM2.5} = (0.15/4.9)E_{TSP} =$ 0.012 tons/acre

Days in Year	365	days
Hours in Year	8,760	hours

Area	Length (feet)	Width (feet)	Area (acre)	TSP		PM_{10}		$PM_{2.5}$		Control Efficiency	TSP		PM_{10}		$PM_{2.5}$	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Disposal Route [1]	5,620	32.8	4.2	0.367	1.608	0.112	0.492	0.011	0.049	90%	0.037	0.161	0.011	0.049	0.001	0.005
Access Roads [1]	18,858	20	8.7	0.751	3.290	0.230	1.007	0.023	0.101	60%	0.300	1.316	0.092	0.403	0.009	0.040
Maintenance Compound	-	-	1.4	0.121	0.532	0.037	0.163	0.004	0.016	60%	0.049	0.213	0.015	0.065	0.001	0.007
Landfill Office Parking Area	-	-	4.5	0.390	1.710	0.120	0.523	0.012	0.052	60%	0.156	0.684	0.048	0.209	0.005	0.021
Auxiliary Roads [1]	6,404	20	2.9	0.255	1.117	0.078	0.342	0.008	0.034	0%	0.255	1.117	0.078	0.342	0.008	0.034
Disposal Area	-	-	5	0.434	1.900	0.133	0.582	0.013	0.058	0%	0.434	1.900	0.133	0.582	0.013	0.058
Daily Cover Soil Borrow Area	-	-	9	0.781	3.420	0.239	1.047	0.024	0.105	0%	0.781	3.420	0.239	1.047	0.024	0.105
Total	**-**	**-**	**35.7**	**3.0999**	**13.5776**	**0.9490**	**4.1564**	**0.0949**	**0.4156**	**65%**	**2.0116**	**8.8110**	**0.6158**	**2.6972**	**0.0616**	**0.2697**

[1] Average width of landfill roads are 32.8 ft (10 m) and the conversion from ft^2 to acre is 43,560 ft^2/acre.

TABLE 6.4
EMISSIONS FROM UNITS 3 & 5 - LANDFILL & FLARE STACK
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

A	B	C	D	E	F	G	H	I
			EMISSIONS ESTIMATES					
Pollutant	Molecular Weight (g/Mol)	Average Concentration Found In LFG (ppmv) (2)	LFG Generation (tons/yr) (3)	LFG to Open Flare (tons/yr) (4)	Open Flare Control Efficiency (5)	LFG Emissions from Open Flare (tons/yr) (6)	Total Landfill Emissions (No Flaring in 2018) (tons/yr) (12)	Total Landfill Emissions (No Flaring in 2018) (lb/hr)
Hazardous Air Pollutants (HAPs) (1)								
1,1,1-Trichloroethane (methyl chloroform)	133.41	0.168	0.045	0.046	98.0%	0.0009	0.020	0.005
1,1,2,2-Tetrachloroethane	167.85	0.070	0.024	0.024	98.0%	0.0005	0.011	0.002
1,1-Dichloroethane (ethylidene dichloride)	98.97	0.741	0.148	0.150	98.0%	0.0030	0.066	0.015
1,1-Dichloroethene (vinylidene chloride)	96.94	0.092	0.018	0.018	98.0%	0.0004	0.008	0.002
1,2-Dichloroethane (ethylene dichloride)	98.96	0.120	0.024	0.024	98.0%	0.0005	0.011	0.002
1,2-Dichloropropane (propylene dichloride)	112.99	0.023	0.005	0.005	98.0%	0.0001	0.002	0.001
Acrylonitrile	53.06	0.036	0.004	0.004	98.0%	0.00008	0.002	0.000
Benzene	78.11	0.972	0.154	0.155	98.0%	0.00311	0.069	0.016
Carbon disulfide	76.13	0.320	0.049	0.050	98.0%	0.0010	0.022	0.005
Carbon tetrachloride	153.84	0.007	0.002	0.002	98.0%	0.00004	0.001	0.000
Carbonyl sulfide	60.07	0.183	0.022	0.023	98.0%	0.0005	0.010	0.002
Chlorobenzene	112.56	0.227	0.052	0.052	98.0%	0.0010	0.023	0.005
Chloroethane (ethyl chloride)	64.52	0.239	0.031	0.032	98.0%	0.0006	0.014	0.003
Chloroform	119.39	0.021	0.005	0.005	98.0%	0.0001	0.002	0.001
Chloromethane (methyl chloride)	50.49	0.249	0.025	0.026	98.0%	0.0005	0.011	0.003
Dichlorobenzene (1,4-Dichlorobenzene)	147.00	1.607	0.478	0.484	98.0%	0.0097	0.213	0.049
Dichloromethane (Methylene Chloride)	84.94	3.395	0.583	0.590	98.0%	0.0118	0.261	0.059
Ethylbenzene	106.16	6.789	1.458	1.476	98.0%	0.0295	0.651	0.149
Ethylene dibromide (1,2-Dibromoethane)	187.88	0.046	0.017	0.018	98.0%	0.0004	0.008	0.002
Hexane	86.18	2.324	0.405	0.410	98.0%	0.0082	0.181	0.041
Mercury*	200.61	2.92E-04	-	-	-	0.00012	-	-
Methyl ethyl ketone	72.11	10.557	1.540	1.559	98.0%	0.0312	0.688	0.157
Methyl isobutyl ketone	100.16	0.750	0.152	0.154	98.0%	0.0031	0.068	0.015
Perchloroethylene (tetrachloroethylene)	165.83	1.193	0.400	0.405	98.0%	0.0081	0.179	0.041
Toluene	92.13	25.400	4.734	4.791	98.0%	0.0958	2.114	0.483
Trichloroethylene (trichloroethene)	131.40	0.681	0.181	0.183	98.0%	0.0037	0.081	0.018
Vinyl chloride	62.50	1.077	0.136	0.138	98.0%	0.0028	0.061	0.014
Xylenes	106.16	16.582	3.561	3.604	98.0%	0.0721	1.590	0.363
Hydrochloric Acid (HCl) (7)	36.45	42.000	-	-	-	3.1346	-	-
Total HAPs	**-**	**-**	**14.256**	**14.429**	**-**	**3.423**	**6.366**	**1.454**
Criteria Air Pollutants								
Total VOCs (8)	86.18	389.5	67.909	68.730	98.0%	1.375	30.33	6.92
Sulfur Dioxide (SO_2) (7)	64.1	46.9	-	-	-	6.152	-	-
Carbon Monoxide (CO) (10)	-	-	-	-	-	123.668	-	-
Nitrogen Oxides (NO_x) (10)	-	-	-	-	-	27.127	-	-
Particulates (PM_{10}) (10)	-	-	-	-	-	0.406	-	-
Other Regulated Air Pollutants								
Ethane	30.07	889	54.081	54.735	98.0%	1.095	24.15	5.51
Hydrogen sulfide (13)	34.08	20.0	1.379	-	-	-	0.62	0.14
NMOCs as Hexane (9)	86.18	999	174.126	176.231	98.0%	3.525	77.76	17.75

NOTES TO TABLE 6.4:

(1) Listed Hazardous Air Pollutants (HAPs) are among compounds commonly found in landfill gas (LFG), as presented in AP-42, Tables 2.4-1and 2.4-2.

(2) Average concentrations of pollutants in LFG are based on Waste Industry Air Coalition Values, except Mercury (marked with an *), which use a value listed on AP-42, Table 2.4-1.

(3) Based on average concentrations of compounds found in LFG and an estimated LFG generation of 2,964 scfm (2082), based on EPA's LandGEM 3.02 and calibrated on-site recovery using the site-specific k value from the 1999 Tier 3 Testing (0.007 1/year) and Lo value recommended in AP-42 (100 m3/Mg).

(4) The percentage of LFG generated that is assumed collected and routed to the flare. Assumed to be at flare capacity for conservativeness in case landfill gas generation higher than anticipated.

(5) Typical control efficiency for flares, as found in AP-42, Table 2.4-3. Although many compounds have a listed destruction efficiency higher than 98 percent, 98 percent was used for conservativeness.

(6) (LFG to flare) * (1-control efficiency) = LFG emissions from flare.

(7) Concentrations of HCl and SO2 are from AP-42, Section 2.4.4.

(8) According to AP-42, Table 2.4-2, Note C, VOC content at MSW sites with no co-disposal equals 39% by weight of total NMOC concentration.

(9) Based on site-specific NMOC concentration from 2016 Tier 2 sampling (SCS Engineers).

(10) Open Flare Emission factors for PM10 (in lb/hr/dscfm CH4) are from AP-42, Table 2.4-5. Emission factors for CO and NOx (in lb/mmBtu) are from AP-42 section on industrial flares.

(11) Fugitive Landfill Emissions represent the 25% of generation that cannot be reasonably collected per EPA guidance and AP-42 collection efficiency guidance.

(12) Maximum landfill emissions are based on the scenario of no GCCS operation through 2018 prior to the landfill being subject to the control requirements of NSPS, Subpart WWW. Based on the estimated LFG generation of 882.5 (2018), based on EPA's LandGEM 3.02 and calibrated on-site recovery using the site-specific k value from the 1999 Tier 3 Testing (0.007 1/year) and Lo value recommended in AP-42 (100 m3/Mg). As factor-of-safety of 1.5 was applied to the landfill gas projection of 882.5 (to yield 1,324 scfm) for conservativeness.

(13) Concentration of Hydrogen Sulfide based on the latest site-specific gas component analysis is 1.3 ppmv. However the concentration is set to 20 ppmv for conservativeness.

TABLE 6.4
EMISSIONS FROM UNITS 3 & 5 - LANDFILL & FLARE STACK
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

MODEL INPUT VARIABLES:

Methane Content of LFG assumed to be	50.0%	based on a 1,012 Btu/scf heating value of methane
Collection Efficiency (4)	100.0%	
Maximum Landfill Gas Generation Rate in 2082 (3)	2,964	scfm
Landfill Gas Generation Rate in 2018 (12)	1,324	scfm
Landfill Gas To Open Flare	3,000	scfm

OPEN FLARE EMISSIONS FACTORS:

Pollutant	Emissions factor (10)	
CO	0.3100	lb/MMBtu
NO_x	0.0680	lb/MMBtu
PM	0.0010	lb/hr/dscfm

EXAMPLE CALCULATIONS

(HAPs, VOCs, NMOCs)
LFG Generation [tons/year] = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Generation Rate [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

LFG To Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

LFG Emissions From Flare = (LFG To Flare [tons/yr])*(1 - Control Efficiency)

Emissions From Landfill = (LFG Generation [tons/year])

(SO_2, HCl)
LFG Emissions from Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

(CO, NO_x)
LFG Emissions from Flare = (Methane Flow Rate to Flare [cfm])*(Emission Factor)*(1,012 Btu / cubic ft of methane)

(PM)
LFG Emissions from Flare = (Methane Flow Rate to Flare [cfm])*(Emission Factor)

TABLE 6.5
CAMINO REAL LANDFILL
EMISSIONS FROM PORTABLE INTERNAL COMBUSTION ENGINES

Emission Source:
25-HP Portable Diesel Light Towers (2 @ 25-HP Each)

Regulated Pollutants for both 25-HP Diesel Engines	Individual Engine Rating (hp)	Emissions Factor (1) (lb/hp-hr)	Year-Round Operation (8,760 hours/year) Emissions Both Engines Combined (lbs/day)	Emissions Both Engines Combined (lbs/hr)	Emissions Both Engines Combined (tons/yr)
VOCs	25.0	1.23E-02	14.82	0.62	2.70
HAPs	25.0	2.65E-05	0.03	0.001	0.006
NO_x	25.0	1.23E-02	14.82	0.62	2.70
SO_x	25.0	2.05E-03	2.46	0.10	0.45
CO	25.0	9.04E-03	10.85	0.45	1.98
PM_{10} (2)	25.0	9.92E-04	1.19	0.05	0.22

NOTES:
(1) Emissions factors for criteria pollutants for diesel engines are from EPA Tier 3 Emissions Standards except for HAPs and SOx (from AP-42 Tables 3.3-1 and 3.3-2).
(2) For the purposes of calculating particulate, PM10 = PM.
(3) Emissions (tons/year and lbs/day) represent both engines combined.
(4) HAP Emission factor combines all HAPs in AP-42 Table 3.3-2 and converts to lb/hp-hr using 7,000 Btu/hp-hr conversion shown in Table 3.3-1, Note a.

Emission Source:
75-hp Portable Compressor Engine

Regulated Pollutants for 75-HP Diesel Engine	Engine Rating (hp)	Emissions Factor (1) (lb/hp-hr)	Year-Round Operation (8,760 hours/year) Emissions (lbs/day)	Emissions (lbs/hr)	Emissions (tons/yr)
VOCs	75.0	7.72E-03	13.889	0.579	2.535
HAPs	75.0	2.65E-05	0.048	0.002	0.009
NO_x	75.0	0.00772	13.889	0.579	2.535
SO_x	75.0	2.05E-03	3.690	0.154	0.673
CO	75.0	8.16E-03	14.683	0.612	2.680
PM_{10} (2)	75.0	6.61E-04	1.190	0.050	0.217

NOTES:
(1) Emissions factors for criteria pollutants for diesel engines are from EPA Tier 3 Emissions Standards except for HAPs and SOx (from AP-42 Tables 3.3-1 and 3.3-2).
(2) For the purposes of calculating particulate, PM10 = PM.
(3) HAP Emission factor combines all HAPs in AP-42 Table 3.3-2 and converts to lb/hp-hr using 7,000 Btu/hp-hr conversion shown in Table 3.3-1, Note a.

Emission Source:
100-hp Portable Diesel Engines (2 @ 100-hp each)

Regulated Pollutants for 100-HP Diesel Engines	Individual Engine Rating (hp)	Emissions Factor (1) (lb/hp-hr)	Year-Round Operation (8,760 hours/year) Emissions Both Engines Combined (lbs/day)	Emissions Both Engines Combined (lbs/hr)	Emissions Both Engines Combined (tons/yr)
VOCs	100.0	7.72E-03	37.038	1.543	6.759
HAPs	100.0	2.65E-05	0.127	0.005	0.023
NO_x	100.0	0.00772	37.038	1.543	6.759
SO_x	100.0	2.05E-03	9.840	0.410	1.796
CO	100.0	8.16E-03	39.154	1.631	7.146
PM_{10} (2)	100.0	6.61E-04	3.175	0.132	0.579

NOTES:
(1) Emissions factors for criteria pollutants for diesel engines are from EPA Tier 3 Emissions Standards except for HAPs and SOx (from AP-42 Tables 3.3-1 and 3.3-2).
(2) For the purposes of calculating particulate, PM10 = PM.
(3) Emissions (tons/year and lbs/day) represent both engines combined.
(4) HAP Emission factor combines all HAPs in AP-42 Table 3.3-2 and converts to lb/hp-hr using 7,000 Btu/hp-hr conversion shown in Table 3.3-1, Note a.

TABLE 6.6
GHG EMISSIONS FROM UNITS 3 & 5 - LANDFILL & FLARE STACK
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Estimated Uncontrolled Landfill Gas GHG Emissions
Camino Real Landfill - Emissions Unit 3

A	Total CH4 Generation (2018 prior to NSPS Controls)	4,381	Mg/yr
B	Percent of Fugitive Landfill Gas	25%	
C	Tons/Mg	1.102	tons/Mg
D	Total Fugitive CH4 Generation	1,207	tons/yr
E	Total Non-Fugitive CH4 Generation	3,622	tons/yr
F	Oxidation Factor	10%	
G	Non-Fugitive CH4 Oxidized Through Cover	362	tons/yr
H	Total Non-Fugitive CH4 Emissions	3,260	tons/yr
I	CO2e Conversion	25	ton CO2/ton CH4
J	Total Non-Fugitive Anthropogenic CH4 Emissions	**81,495**	**tons/yr CO2e**
K	Total CO2 Generation (2018 prior to NSPS Controls)	12,021	Mg/yr
L	Total Fugitive CO2 Generation	3,313	tons/yr
M	Total Non-Fugitive CO2 Generation	9,938	tons/yr
N	Oxidized CH4 to CO2 Conversion Factor	2.75	
O	Non-Fugitive CO2 Emitted Through Cover (Oxidized CH4)	996	tons/yr
P	Total Non-Fugitive Biogenic CO2 Emissions	**10,934**	**tons/yr**

Estimated Controlled Landfill Gas GHG Emissions
Camino Real Landfill - Emissions Unit 5

A	Flare Throughput =	3,000	cfm
B	Flare Throughput =	1576.8	mmscf
C	Flare Methane Throughput =	788.4	mmscf
D	Flare Carbon Dioxide Throughput =	788.4	mmscf
E	Heat Rate =	91.08	MMBTU/hr
F	Combustion CO2 =	41,545	metric tpy
G	Passthrough CO2 =	41,481	metric tpy
H	Total Biogenic CO2 =	83,026	metric tpy
I	Total Biogenic CO2 =	**91,520**	**tons/yr**
J	Total Anthropogenic N2O =	0.503	metric tpy
K	Total Anthropogenic N2O =	0.554	tons/yr
L	Total Anthropogenic CH4 =	2.553	metric tpy
M	Total Anthropogenic CH4 =	2.814	tons/yr
N	Global Warming Potential of N2O =	298	
O	Global Warming Potential of CH4 =	25	
P	Total Anthropogenic Emissions =	**235.47**	**tpy CO2e**

Section 7

Information Used To Determine Emissions

<u>Information Used to Determine Emissions</u> shall include the following:

- ☐ If manufacturer data are used, include specifications for emissions units <u>and</u> control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
- ☐ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
- ☑ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
- ☐ If an older version of AP-42 is used, include a complete copy of the section.
- ☐ If an EPA document or other material is referenced, include a complete copy.
- ☐ Fuel specifications sheet.
- ☑ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.

Multiple sources of equipment and activity-specific data, equations and emissions factors were used in determining potential emissions produced by activities at CRLF. Information used to determine emissions is included in the following attachments:

- Attachment 7.1 – AP-42, Section 13.2.2 Unpaved Roads;
- Attachment 7.2 – AP-42, Section 11.9 Western Surface Coal Mining;
- Attachment 7.3 – AP-42, Section 13.2.4 Aggregate Handling and Storage Piles;
- Attachment 7.4 – AP-42, Section 2.4 Municipal Solid Waste Landfills;
- Attachment 7.5 – Waste Industry Air Coalition Values;
- Attachment 7.6 – LandGEM Model Output for Landfill Gas Generation (done in two parts due to site life since each model can only process 80 years);
- Attachment 7.7 – AP-42, Section 3.3 Gasoline and Diesel Industrial Engines;
- Attachment 7.8 – Heavy Equipment Manufacturer's Specification Sheets;
- Attachment 7.9 – AP-42, Section 13.5 Industrial Flares;
- Attachment 7.10 – Dust Control Plan;
- Attachment 7.11 – Site-Specific Hydrogen Sulfide Analysis; and
- Attachment 7.12 – Tier 1-3 Engine Emissions Factor Reference.

ATTACHMENT 7.1

AP-42, SECTION 13.2.2 UNPAVED ROADS

13.2.2 Unpaved Roads

13.2.2.1 General

When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The particulate emission factors presented in the previous draft version of this section of AP-42, dated October 2001, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material[25]. EPA included these sources in the emission factor equation for unpaved public roads (equation 1b in this section) since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the unpaved public road emission factor equation only estimates particulate emissions from resuspended road surface material [23, 26]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOBILE6.2 [24]. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOBILE6.2 to estimate particulate emissions from vehicle traffic on unpaved public roads. It also incorporates the decrease in exhaust emissions that has occurred since the unpaved public road emission factor equation was developed. The previous version of the unpaved public road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.2.2 Emissions Calculation And Correction Parameters[1-6]

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Field investigations also have shown that emissions depend on source parameters that characterize the condition of a particular road and the associated vehicle traffic. Characterization of these source parameters allow for "correction" of emission estimates to specific road and traffic conditions present on public and industrial roadways.

Dust emissions from unpaved roads have been found to vary directly with the fraction of silt (particles smaller than 75 micrometers [µm] in diameter) in the road surface materials.[1] The silt fraction is determined by measuring the proportion of loose dry surface dust that passes a 200-mesh screen, using the ASTM-C-136 method. A summary of this method is contained in Appendix C of AP-42. Table 13.2.2-1 summarizes measured silt values for industrial unpaved roads. Table 13.2.2-2 summarizes measured silt values for public unpaved roads. It should be noted that the ranges of silt content vary over two orders of magnitude. Therefore, the use of data from this table can potentially introduce considerable error. Use of this data is strongly discouraged when it is feasible to obtain locally gathered data.

Since the silt content of a rural dirt road will vary with geographic location, it should be measured for use in projecting emissions. As a conservative approximation, the silt content of the parent soil in the area can be used. Tests, however, show that road silt content is normally lower than in the surrounding parent soil, because the fines are continually removed by the vehicle traffic, leaving a higher percentage of coarse particles.

Other variables are important in addition to the silt content of the road surface material. For example, at industrial sites, where haul trucks and other heavy equipment are common, emissions are highly correlated with vehicle weight. On the other hand, there is far less variability in the weights of cars and pickup trucks that commonly travel publicly accessible unpaved roads throughout the United States. For those roads, the moisture content of the road surface material may be more dominant in determining differences in emission levels between, for example a hot, desert environment and a cool, moist location.

The PM-10 and TSP emission factors presented below are the outcomes from stepwise linear regressions of field emission test results of vehicles traveling over unpaved surfaces. Due to a limited amount of information available for PM-2.5, the expression for that particle size range has been scaled against the result for PM-10. Consequently, the quality rating for the PM-2.5 factor is lower than that for the PM-10 expression.

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL ON INDUSTRIAL UNPAVED ROADS[a]

Industry	Road Use Or Surface Material	Plant Sites	No. Of Samples	Silt Content (%)	
				Range	Mean
Copper smelting	Plant road	1	3	16 - 19	17
Iron and steel production	Plant road	19	135	0.2 - 19	6.0
Sand and gravel processing	Plant road	1	3	4.1 - 6.0	4.8
	Material storage area	1	1	-	7.1
Stone quarrying and processing	Plant road	2	10	2.4 - 16	10
	Haul road to/from pit	4	20	5.0-15	8.3
Taconite mining and processing	Service road	1	8	2.4 - 7.1	4.3
	Haul road to/from pit	1	12	3.9 - 9.7	5.8
Western surface coal mining	Haul road to/from pit	3	21	2.8 - 18	8.4
	Plant road	2	2	4.9 - 5.3	5.1
	Scraper route	3	10	7.2 - 25	17
	Haul road (freshly graded)	2	5	18 - 29	24
Construction sites	Scraper routes	7	20	0.56-23	8.5
Lumber sawmills	Log yards	2	2	4.8-12	8.4
Municipal solid waste landfills	Disposal routes	4	20	2.2 - 21	6.4

[a]References 1,5-15.

The following empirical expressions may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$\boxed{E = k\ (s/12)^{a}(W/3)^{b}} \tag{1a}$$

and, for vehicles traveling on publicly accessible roads, dominated by light duty vehicles, emissions may be estimated from the following:

$$E = \frac{k\ (s/12)^{a}(S/30)^{d}}{(M/0.5)^{c}} - C \tag{1b}$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)
S = mean vehicle speed (mph)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The source characteristics s, W and M are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

1 lb/VMT = 281.9 g/VKT

The constants for Equations 1a and 1b based on the stated aerodynamic particle sizes are shown in Tables 13.2.2-2 and 13.2.2-4. The PM-2.5 particle size multipliers (k-factors) are taken from Reference 27.

Table 13.2.2-2. CONSTANTS FOR EQUATIONS 1a AND 1b

Constant	Industrial Roads (Equation 1a)			Public Roads (Equation 1b)		
	PM-2.5	PM-10	PM-30*	PM-2.5	PM-10	PM-30*
k (lb/VMT)	0.15	1.5	4.9	0.18	1.8	6.0
a	0.9	0.9	0.7	1	1	1
b	0.45	0.45	0.45	-	-	-
c	-	-	-	0.2	0.2	0.3
d	-	-	-	0.5	0.5	0.3
Quality Rating	B	B	B	B	B	B

*Assumed equivalent to total suspended particulate matter (TSP)
"-" = not used in the emission factor equation

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1a and 1b. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b

Emission Factor	Surface Silt Content, %	Mean Vehicle Weight		Mean Vehicle Speed		Mean No. of Wheels	Surface Moisture Content, %
		Mg	ton	km/hr	mph		
Industrial Roads (Equation 1a)	1.8-25.2	1.8-260	2-290	8-69	5-43	4-17[a]	0.03-13
Public Roads (Equation 1b)	1.8-35	1.4-2.7	1.5-3	16-88	10-55	4-4.8	0.03-13

[a] See discussion in text.

As noted earlier, the models presented as Equations 1a and 1b were developed from tests of traffic on unpaved surfaces. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

The emission factors for the exhaust, brake wear and tire wear of a 1980's vehicle fleet (*C*) was obtained from EPA's MOBILE6.2 model [23]. The emission factor also varies with aerodynamic size range as shown in Table 13.2.2-4

Table 13.2.2-4. EMISSION FACTOR FOR 1980'S VEHICLE FLEET EXHAUST, BRAKE WEAR AND TIRE WEAR

Particle Size Range[a]	*C*, Emission Factor for Exhaust, Brake Wear and Tire Wear[b] lb/VMT
$PM_{2.5}$	0.00036
PM_{10}	0.00047
PM_{30}[c]	0.00047

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.
[b] Units shown are pounds per vehicle mile traveled (lb/VMT).
[c] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

It is important to note that the vehicle-related source conditions refer to the average weight, speed, and number of wheels for all vehicles traveling the road. For example, if 98 percent of traffic on the road are 2-ton cars and trucks while the remaining 2 percent consists of 20-ton trucks, then the mean weight is 2.4 tons. More specifically, Equations 1a and 1b are *not* intended to be used to calculate a separate emission factor for each vehicle class within a mix of traffic on a given unpaved road. That is, in the example, one should *not* determine one factor for the 2-ton vehicles and a second factor for the 20-ton trucks. Instead, only one emission factor should be calculated that represents the "fleet" average of 2.4 tons for all vehicles traveling the road.

Moreover, to retain the quality ratings when addressing a group of unpaved roads, it is necessary that reliable correction parameter values be determined for the road in question. The field and laboratory procedures for determining road surface silt and moisture contents are given in AP-42 Appendices C.1 and C.2. Vehicle-related parameters should be developed by recording visual observations of traffic. In some cases, vehicle parameters for industrial unpaved roads can be determined by reviewing maintenance records or other information sources at the facility.

In the event that site-specific values for correction parameters cannot be obtained, then default values may be used.In the absence of site-specific silt content information, an appropriate mean value from Table 13.2.2-1 may be used as a default value, but the quality rating of the equation is reduced by two letters. Because of significant differences found between different types of road surfaces and between different areas of the country, use of the default moisture content value of 0.5 percent in Equation 1b is discouraged. The quality rating should be downgraded two letters when the default moisture content value is used. (It is assumed that readers addressing industrial roads have access to the information needed to develop average vehicle information in Equation 1a for their facility.)

The effect of routine watering to control emissions from unpaved roads is discussed below in Section 13.2.2.3, “Controls”. However, all roads are subject to some natural mitigation because of rainfall and other precipitation. The Equation 1a and 1b emission factors can be extrapolated to annual average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual average emissions are inversely proportional to the number of days with measurable (more than 0.254 mm [0.01 inch]) precipitation:

$$E_{ext} = E\ [(365 - P)/365] \tag{2}$$

where:

E_{ext} = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT

E = emission factor from Equation 1a or 1b

P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation (see below)

Figure 13.2.2-1 gives the geographical distribution for the mean annual number of "wet" days for the United States.

Equation 2 provides an estimate that accounts for precipitation on an annual average basis for the purpose of inventorying emissions. It should be noted that Equation 2 does not account for differences in the temporal distributions of the rain events, the quantity of rain during any event, or the potential for the rain to evaporate from the road surface. In the event that a finer temporal and spatial resolution is desired for inventories of public unpaved roads, estimates can be based on a more complex set of assumptions. These assumptions include:

1. The moisture content of the road surface material is increased in proportion to the quantity of water added;
2. The moisture content of the road surface material is reduced in proportion to the Class A pan evaporation rate;
3. The moisture content of the road surface material is reduced in proportion to the traffic volume; and
4. The moisture content of the road surface material varies between the extremes observed in the area. The CHIEF Web site (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html) has a file which contains a spreadsheet program for calculating emission factors which are temporally and spatially resolved. Information required for use of the spreadsheet program includes monthly Class A pan evaporation values, hourly meteorological data for precipitation, humidity and snow cover, vehicle traffic information, and road surface material information.

It is emphasized that <u>the simple assumption underlying Equation 2 and the more complex set of assumptions underlying the use of the procedure which produces a finer temporal and spatial resolution</u> have not been verified in any rigorous manner. For this reason, the quality ratings for either approach should be downgraded one letter from the rating that would be applied to Equation 1.

13.2.2.3 Controls[18-22]

A wide variety of options exist to control emissions from unpaved roads. Options fall into the following three groupings:

1. <u>Vehicle restrictions</u> that limit the speed, weight or number of vehicles on the road;

2. Surface improvement, by measures such as (a) paving or (b) adding gravel or slag to a dirt road; and

3. Surface treatment, such as watering or treatment with chemical dust suppressants.

Available control options span broad ranges in terms of cost, efficiency, and applicability. For example, traffic controls provide moderate emission reductions (often at little cost) but are difficult to enforce. Although paving is highly effective, its high initial cost is often prohibitive. Furthermore, paving is not feasible for industrial roads subject to very heavy vehicles and/or spillage of material in transport. Watering and chemical suppressants, on the other hand, are potentially applicable to most industrial roads at moderate to low costs. However, these require frequent reapplication to maintain an acceptable level of control. Chemical suppressants are generally more cost-effective than water but not in cases of temporary roads (which are common at mines, landfills, and construction sites). In summary, then, one needs to consider not only the type and volume of traffic on the road but also how long the road will be in service when developing control plans.

Vehicle restrictions. These measures seek to limit the amount and type of traffic present on the road or to lower the mean vehicle speed. For example, many industrial plants have restricted employees from driving on plant property and have instead instituted bussing programs. This eliminates emissions due to employees traveling to/from their worksites. Although the heavier average vehicle weight of the busses increases the base emission factor, the decrease in vehicle-miles-traveled results in a lower overall emission rate.

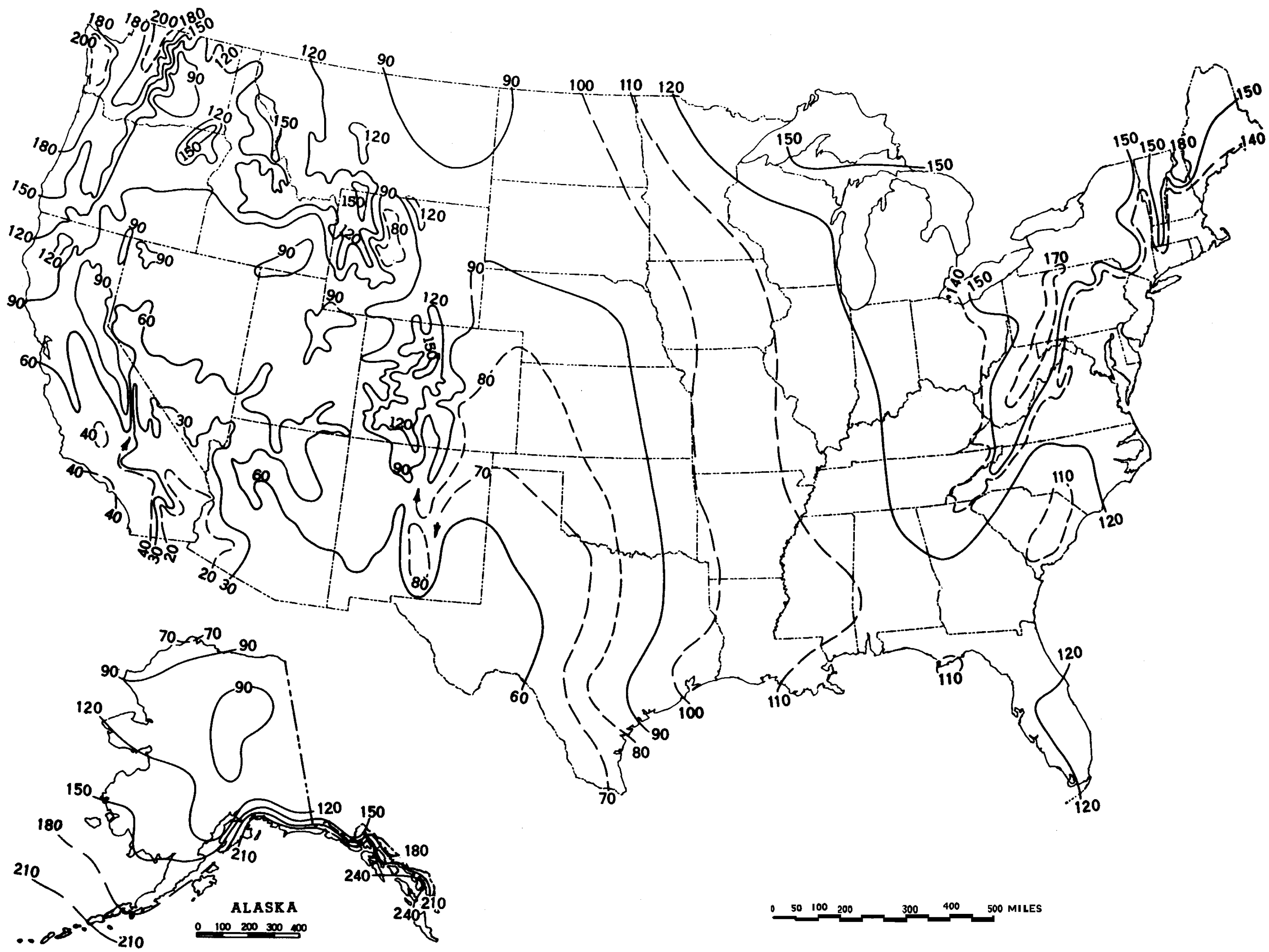


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

Surface improvements. Control options in this category alter the road surface. As opposed to the "surface treatments" discussed below, improvements are relatively "permanent" and do not require periodic retreatment.

The most obvious surface improvement is paving an unpaved road. This option is quite expensive and is probably most applicable to relatively short stretches of unpaved road with at least several hundred vehicle passes per day. Furthermore, if the newly paved road is located near unpaved areas or is used to transport material, it is essential that the control plan address routine cleaning of the newly paved road surface.

The control efficiencies achievable by paving can be estimated by comparing emission factors for unpaved and paved road conditions. The predictive emission factor equation for paved roads, given in Section 13.2.1, requires estimation of the silt loading on the traveled portion of the paved surface, which in turn depends on whether the pavement is periodically cleaned. Unless curbing is to be installed, the effects of vehicle excursion onto unpaved shoulders (berms) also must be taken into account in estimating the control efficiency of paving.

Other improvement methods cover the road surface with another material that has a lower silt content. Examples include placing gravel or slag on a dirt road. Control efficiency can be estimated by comparing the emission factors obtained using the silt contents before and after improvement. The silt content of the road surface should be determined after 3 to 6 months rather than immediately following placement. Control plans should address regular maintenance practices, such as grading, to retain larger aggregate on the traveled portion of the road.

Surface treatments refer to control options which require periodic reapplication. Treatments fall into the two main categories of (a) "wet suppression" (i. e., watering, possibly with surfactants or other additives), which keeps the road surface wet to control emissions and (b) "chemical stabilization/ treatment", which attempts to change the physical characteristics of the surface. The necessary reapplication frequency varies from several minutes for plain water under summertime conditions to several weeks or months for chemical dust suppressants.

Watering increases the moisture content, which conglomerates particles and reduces their likelihood to become suspended when vehicles pass over the surface. The control efficiency depends on how fast the road dries after water is added. This in turn depends on (a) the amount (per unit road surface area) of water added during each application; (b) the period of time between applications; (c) the weight, speed and number of vehicles traveling over the watered road during the period between applications; and (d) meteorological conditions (temperature, wind speed, cloud cover, etc.) that affect evaporation during the period.

Figure 13.2.2-2 presents a simple bilinear relationship between the instantaneous control efficiency due to watering and the resulting increase in surface moisture. The moisture ratio "M" (i.e., the x-axis in Figure 13.2.2-2) is found by dividing the surface moisture content of the watered road by the surface moisture content of the uncontrolled road. As the watered road surface dries, both the ratio M and the predicted instantaneous control efficiency (i.e., the y-axis in the figure) decrease. The figure shows that between the uncontrolled moisture content and a value twice as large, a small increase in moisture content results in a large increase in control efficiency. Beyond that, control efficiency grows slowly with increased moisture content.

Given the complicated nature of how the road dries, characterization of emissions from watered roadways is best done by collecting road surface material samples at various times between water truck passes. (Appendices C.1 and C.2 present the sampling and analysis procedures.) The moisture content measured can then be associated with a control efficiency by use of Figure 13.2.2-2. Samples that reflect average conditions during the watering cycle can take the form of either a series of samples between water applications or a single sample at the midpoint. It is essential that samples be collected during periods with active traffic on the road. Finally, because of different evaporation rates, it is recommended that samples be collected at various times during the year. If only one set of samples is to be collected, these must be collected during hot, summertime conditions.

When developing watering control plans for roads that do not yet exist, it is strongly recommended that the moisture cycle be established by sampling similar roads in the same geographic area. If the moisture cycle cannot be established by similar roads using established watering control plans, the more complex methodology used to estimate the mitigation of rainfall and other precipitation can be used to estimate the control provided by routine watering. An estimate of the maximum daytime Class A pan evaporation (based upon daily evaporation data published in the monthly Climatological Data for the state by the National Climatic Data Center) should be used to insure that adequate watering capability is available during periods of highest evaporation. The hourly precipitation values in the spreadsheet should be replaced with the equivalent inches of precipitation (where the equivalent of 1 inch of precipitation is provided by an application of 5.6 gallons of water per square yard of road). Information on the long term average annual evaporation and on the percentage that occurs between May and October was published in the Climatic Atlas (Reference 16). Figure 13.2.2-3 presents the geographical distribution for "Class A pan evaporation" throughout the United States. Figure 13.2.2-4 presents the geographical distribution of the percentage of this evaporation that occurs between May and October. The U. S. Weather Bureau Class A evaporation pan is a cylindrical metal container with a depth of 10 inches and a diameter of 48 inches. Periodic measurements are made of the changes of the water level.

The above methodology should be used <u>only for prospective analyses</u> and for designing watering programs for existing roadways. The quality rating of an emission factor for a watered road that is based on this methodology should be downgraded two letters. Periodic road surface samples should be collected and analyzed to verify the efficiency of the watering program.

As opposed to watering, chemical dust suppressants have much less frequent reapplication requirements. These materials suppress emissions by changing the physical characteristics of the existing road surface material. Many chemical unpaved road dust suppressants form a hardened surface that binds particles together. After several applications, a treated road often resembles a paved road except that the surface is not uniformly flat. Because the improved surface results in more grinding of small particles, the silt content of loose material on a highly controlled surface may be substantially higher than when the surface was uncontrolled. For this reason, the models presented as Equations 1a and 1b cannot be used to estimate emissions from chemically stabilized roads. Should the road be allowed to return to an uncontrolled state with no visible signs of large-scale cementing of material, the Equation 1a and 1b emission factors could then be used to obtain conservatively high emission estimates.

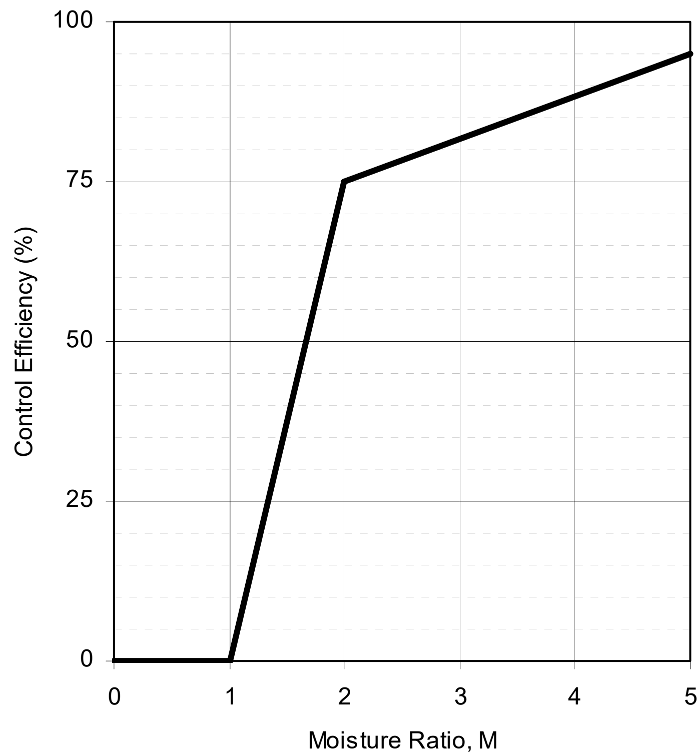


Figure 13.2.2-2. Watering control effectiveness for unpaved travel surfaces

The control effectiveness of chemical dust suppressants appears to depend on (a) the dilution rate used in the mixture; (b) the application rate (volume of solution per unit road surface area); (c) the time between applications; (d) the size, speed and amount of traffic during the period between applications; and (e) meteorological conditions (rainfall, freeze/thaw cycles, etc.) during the period. Other factors that affect the performance of dust suppressants include other traffic characteristics (e. g., cornering, track-on from unpaved areas) and road characteristics (e. g., bearing strength, grade). The variabilities in the above factors and differences between individual dust control products make the control efficiencies of chemical dust suppressants difficult to estimate. Past field testing of emissions from controlled unpaved roads has shown that chemical dust suppressants provide a PM-10 control efficiency of about 80 percent when applied at regular intervals of 2 weeks to 1 month.

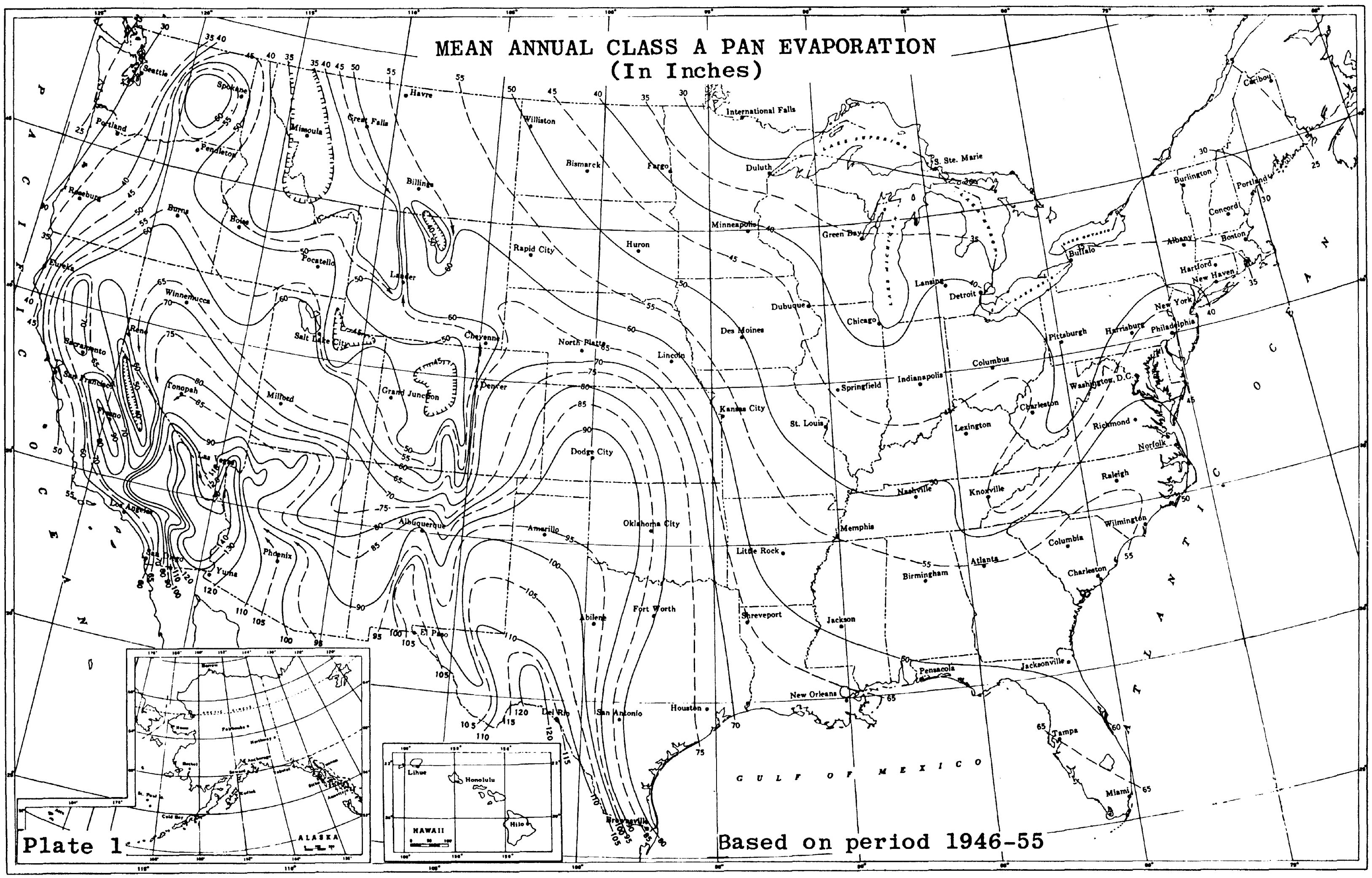


Figure 13.2.2-3. Annual evaporation data.

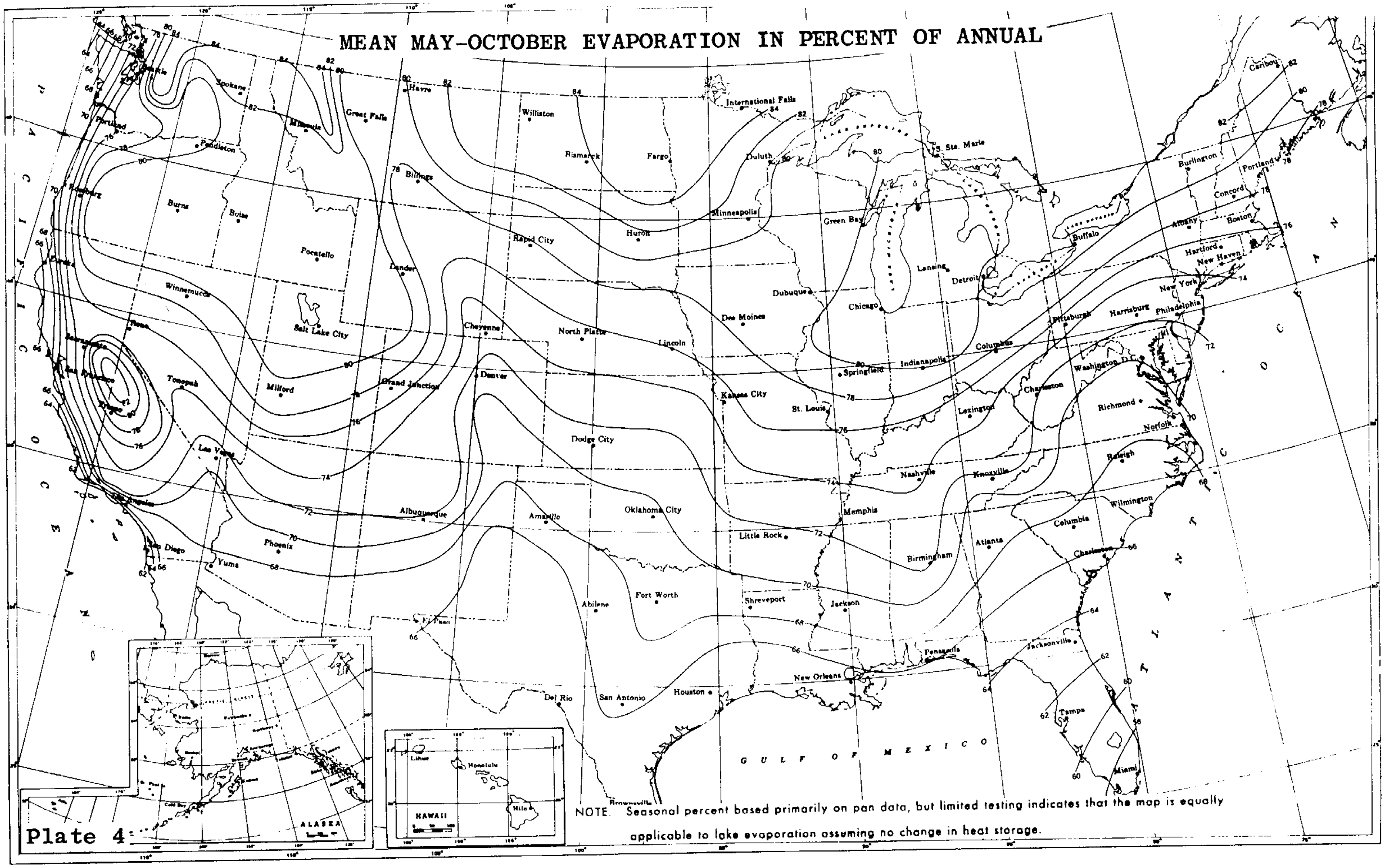


Figure 13.2.2-4. Geographical distribution of the percentage of evaporation occurring between May and October.

Petroleum resin products historically have been the dust suppressants (besides water) most widely used on industrial unpaved roads. Figure 13.2.2-5 presents a method to estimate average control efficiencies associated with petroleum resins applied to unpaved roads.[20] Several items should be noted:

1. The term "ground inventory" represents the total volume (per unit area) of petroleum resin concentrate (*not solution*) applied since the start of the dust control season.

2. Because petroleum resin products must be periodically reapplied to unpaved roads, the use of a time-averaged control efficiency value is appropriate. Figure 13.2.2-5 presents control efficiency values averaged over two common application intervals, 2 weeks and 1 month. Other application intervals will require interpolation.

3. Note that zero efficiency is assigned until the ground inventory reaches 0.05 gallon per square yard (gal/yd^2). Requiring a minimum ground inventory ensures that one must apply a reasonable amount of chemical dust suppressant to a road before claiming credit for emission control. Recall that the ground inventory refers to the amount of petroleum resin concentrate rather than the total solution.

As an example of the application of Figure 13.2.2-5, suppose that Equation 1a was used to estimate an emission factor of 7.1 lb/VMT for PM-10 from a particular road. Also, suppose that, starting on May 1, the road is treated with 0.221 gal/yd^2 of a solution (1 part petroleum resin to 5 parts water) on the first of each month through September. Then, the average controlled emission factors, shown in Table 13.2.2-5, are found.

Table 13.2-2-5. EXAMPLE OF AVERAGE CONTROLLED EMISSION FACTORS FOR SPECIFIC CONDITIONS

Period	Ground Inventory, gal/yd^2	Average Control Efficiency, %[a]	Average Controlled Emission Factor, lb/VMT
May	0.037	0	7.1
June	0.073	62	2.7
July	0.11	68	2.3
August	0.15	74	1.8
September	0.18	80	1.4

[a] From Figure 13.2.2-5, $\leq$10 µm. Zero efficiency assigned if ground inventory is less than 0.05 gal/yd^2. 1 lb/VMT = 281.9 g/VKT. 1 gal/yd^2 = 4.531 L/m^2.

Besides petroleum resins, other newer dust suppressants have also been successful in controlling emissions from unpaved roads. Specific test results for those chemicals, as well as for petroleum resins and watering, are provided in References 18 through 21.

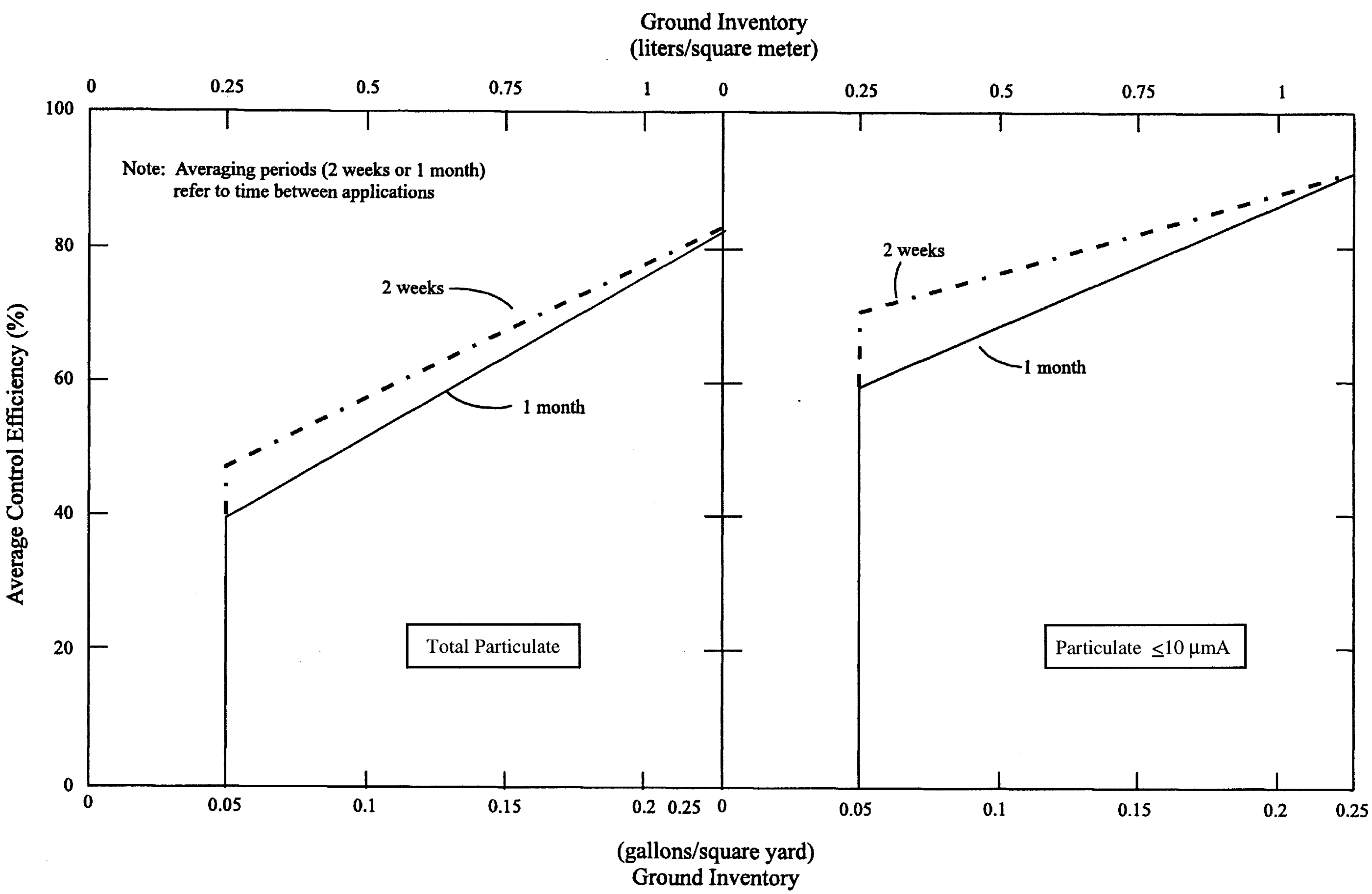


Figure 13.2.2-5. Average control efficiencies over common application intervals.

13.2.2.4 Updates Since The Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the background report for this section (Reference 6).

October 1998 (Supplement E)– This was a major revision of this section. Significant changes to the text and the emission factor equations were made.

October 2001 – Separate emission factors for unpaved surfaces at industrial sites and publicly accessible roads were introduced. Figure 13.2.2-2 was included to provide control effectiveness estimates for watered roads.

December 2003 – The public road emission factor equation (equation 1b) was adjusted to remove the component of particulate emissions from exhaust, brake wear, and tire wear. The parameter *C* in the new equation varies with aerodynamic size range of the particulate matter. Table 13.2.2-4 was added to present the new coefficients.

January 2006 – The PM-2.5 particle size multipliers (i.e., factors) in Table 13.2.2-2 were modified and the quality ratings were upgraded from C to B based on the wind tunnel studies of a variety of dust emitting surface materials.

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ATTACHMENT 7.2

AP-42, SECTION 11.9 WESTERN SURFACE COAL MINING

11.9 Western Surface Coal Mining

11.9.1 General[1]

There are 12 major coal fields in the western states (excluding the Pacific Coast and Alaskan fields), as shown in Figure 11.9-1. Together, they account for more than 64 percent of the surface minable coal reserves in the United States.[2] The 12 coal fields have varying characteristics that may influence fugitive dust emission rates from mining operations including overburden and coal seam thicknesses and structure, mining equipment, operating procedures, terrain, vegetation, precipitation and surface moisture, wind speeds, and temperatures. The operations at a typical western surface mine are shown in Figure 11.9-2. All operations that involve movement of soil or coal, or exposure of erodible surfaces, generate some amount of fugitive dust.

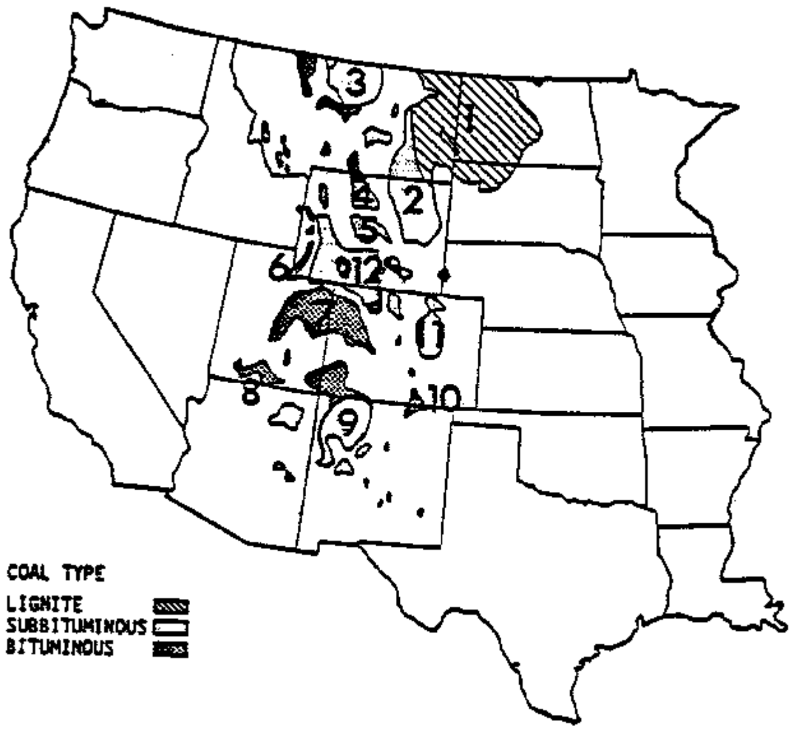
The initial operation is removal of topsoil and subsoil with large scrapers. The topsoil is carried by the scrapers to cover a previously mined and regraded area as part of the reclamation process or is placed in temporary stockpiles. The exposed overburden, the earth that is between the topsoil and the coal seam, is leveled, drilled, and blasted. Then the overburden material is removed down to the coal seam, usually by a dragline or a shovel and truck operation. It is placed in the adjacent mined cut, forming a spoils pile. The uncovered coal seam is then drilled and blasted. A shovel or front end loader loads the broken coal into haul trucks, and it is taken out of the pit along graded haul roads to the tipple, or truck dump. Raw coal sometimes may be dumped onto a temporary storage pile and later rehandled by a front end loader or bulldozer.

At the tipple, the coal is dumped into a hopper that feeds the primary crusher, then is conveyed through additional coal preparation equipment such as secondary crushers and screens to the storage area. If the mine has open storage piles, the crushed coal passes through a coal stacker onto the pile. The piles, usually worked by bulldozers, are subject to wind erosion. From the storage area, the coal is conveyed to a train loading facility and is put into rail cars. At a captive mine, coal will go from the storage pile to the power plant.

During mine reclamation, which proceeds continuously throughout the life of the mine, overburden spoils piles are smoothed and contoured by bulldozers. Topsoil is placed on the graded spoils, and the land is prepared for revegetation by furrowing, mulching, etc. From the time an area is disturbed until the new vegetation emerges, all disturbed areas are subject to wind erosion.

11.9.2 Emissions

Predictive emission factor equations for open dust sources at western surface coal mines are presented in Tables 11.9-1 and 11.9-2. Each equation applies to a single dust-generating activity, such as vehicle traffic on haul roads. The predictive equation explains much of the observed variance in emission factors by relating emissions to three sets of source parameters: (1) measures of source activity or energy expended (e. g., speed and weight of a vehicle traveling on an unpaved road); (2) properties of the material being disturbed (e. g., suspendable fines in the surface material of an unpaved road); and (3) climate (in this case, mean wind speed).



	Coal field	Strippable reserves (10^6 tons)
1	Fort Union	23,529
2	Powder River	56,727
3	North Central	All underground
4	Bighorn Basin	All underground
5	Wind River	3
6	Hams Fork	1,000
7	Uinta	308
8	Southwestern Utah	224
9	San Juan River	2,318
10	Raton Mesa	All underground
11	Denver	All underground
12	Green River	2,120

Figure 11.9-1. Coal fields of the western United States.[3]

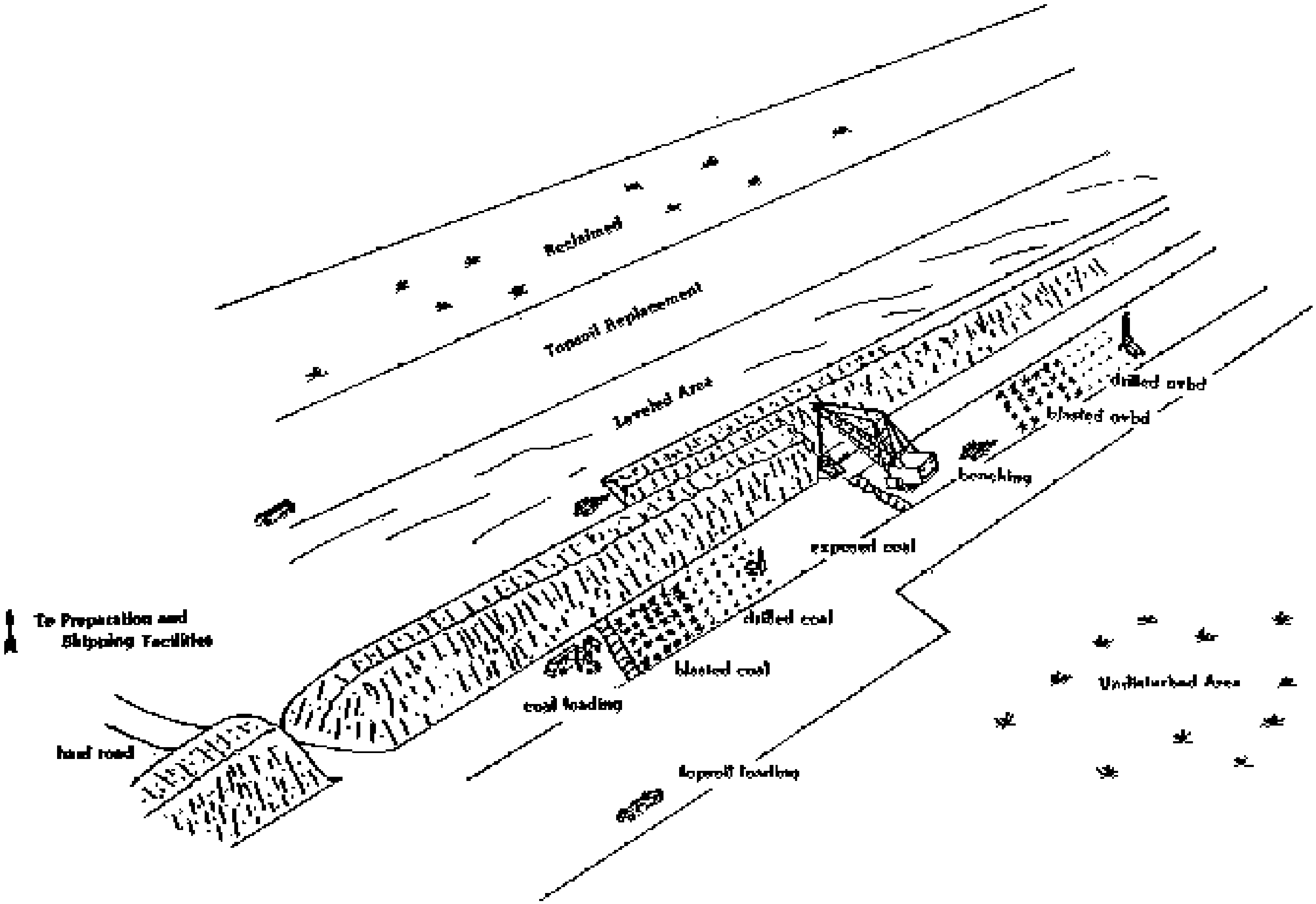


Figure 11.9-2. Operations at typical western surface coal mines.

The equations may be used to estimate particulate emissions generated per unit of source extent or activity (e. g., distance traveled by a haul truck or mass of material transferred). The equations were developed through field sampling of various western surface mine types and are thus applicable to any of the surface coal mines located in the western United States.

In Tables 11.9-1 and 11.9-2, the assigned quality ratings apply within the ranges of source conditions that were tested in developing the equations given in Table 11.9-3. However, the equations should be derated 1 letter value (e. g., A to B) if applied to eastern surface coal mines.

In using the equations to estimate emissions from sources found in a specific western surface mine, it is necessary that reliable values for correction parameters be determined for the specific sources of interest if the assigned quality ratings of the equations are to be applicable. For example, actual silt content of coal or overburden measured at a facility should be used instead of estimated values. In the event that site-specific values for correction parameters cannot be obtained, the appropriate geometric mean values from Table 11.9-3 may be used, but the assigned quality rating of each emission factor equation should be reduced by 1 level (e. g., A to B).

Emission factors for open dust sources not covered in Table 11.9-3 are in Table 11.9-4. These factors were determined through source testing at various western coal mines.

The factors in Table 11.9-4 for mine locations I through V were developed for specific geographical areas. Tables 11.9-5 and 11.9-6 present characteristics of each of these mines (areas). A “mine-specific” emission factor should be used only if the characteristics of the mine for which an emissions estimate is needed are very similar to those of the mine for which the emission factor was developed. The other (nonspecific) emission factors were developed at a variety of mine types and thus are applicable to any western surface coal mine.

As an alternative to the single valued emission factors given in Table 11.9-4 for train or truck loading and for truck or scraper unloading, two empirically derived emission factor equations are presented in Section 13.2.4 of this document. Each equation was developed for a source operation (i. e., batch drop and continuous drop, respectively) comprising a single dust-generating mechanism that crosses industry lines.

Because the predictive equations allow emission factor adjustment to specific source conditions, the equations should be used in place of the single-valued factors in Table 11.9-4 for the sources identified above, if emission estimates for a specific western surface coal mine are needed. However, the generally higher quality ratings assigned to the equations are applicable only if: (1) reliable values of correction parameters have been determined for the specific sources of interest, and (2) the correction parameter values lie within the ranges tested in developing the equations. Caution must be exercised so that only the unbound (sorbed) moisture (i. e., not any bound moisture) is used in determining the moisture content for input to the Chapter 13 equations.

Table 11.9-1 (English Units). EMISSION FACTOR EQUATIONS FOR UNCONTROLLED OPEN DUST SOURCES AT WESTERN SURFACE COAL MINES[a]

Operation	Material	Emissions By Particle Size Range (Aerodynamic Diameter)[b,c]: Emission Factor Equations: TSP ≤30 µm	Emission Factor Equations: ≤15 µm	Scaling Factors: ≤10 µm[d]	Scaling Factors: ≤2.5 µm/TSP[e]	Units	EMISSION FACTOR RATING
Blasting[f]	Coal or overburden	$0.000014(A)^{1.5}$	ND	0.52[e]	0.03	lb/blast	C_DD
Truck loading	Coal	$\frac{1.16}{(M)^{1.2}}$	$\frac{0.119}{(M)^{0.9}}$	0.75	0.019	lb/ton	BBCC
Bulldozing	Coal	$\frac{78.4\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{18.6\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.022	lb/hr	CCDD
	Overburden	$\frac{5.7\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{1.0\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.105	lb/hr	BCDD
Dragline	Overburden	$\frac{0.0021\ (d)^{1.1}}{(M)^{0.3}}$	$\frac{0.0021\ (d)^{0.7}}{(M)^{0.3}}$	0.75	0.017	lb/yd^3	BCDD
Vehicle traffic[g]							
Grading		$0.040\ (S)^{2.5}$	$0.051\ (S)^{2.0}$	0.60	0.031	lb/VMT	CCDD
Active storage pile[h] (wind erosion and maintenance)	Coal	0.72 u	ND	ND	ND	$\frac{lb}{(acre)(hr)}$	C[i]_ _ _

[a] Reference 1, except as noted. VMT = vehicle miles traveled. ND = no data. Quality ratings coded where "Q, X, Y, Z" are ratings for ≤30 µm, ≤15 µm, ≤10 µm, and ≤2.5 µm, respectively. See also note below.

[b] Particulate matter less than or equal to 30 µm in aerodynamic diameter is sometimes termed "suspendable particulate" and is often used as a surrogate for TSP (total suspended particulate). TSP denotes what is measured by a standard high volume sampler (see Section 13.2).

[c] Symbols for equations:

- A = horizontal area (ft^2), with blasting depth ≤ 70 ft. Not for vertical face of a bench.
- M = material moisture content (%)
- s = material silt content (%)
- u = wind speed (mph)
- d = drop height (ft)
- W = mean vehicle weight (tons)
- S = mean vehicle speed (mph)
- w = mean number of wheels

Table 11.9-1 (cont.).

[d] Multiply the $\leq$15-µm equation by this fraction to determine emissions, except as noted.
[e] Multiply the TSP predictive equation by this fraction to determine emissions.
[f] Blasting factor taken from a reexamination of field test data reported in Reference 1. See Reference 4.
[g] To estimate emissions from traffic on unpaved surfaces by vehicles such as haul trucks, light-to-medium duty vehicles, or scrapers in the travel mode, see the unpaved road emission factor equation in AP-42 Section 13.2.2.
[h] Coal storage pile factor taken from Reference 5. To estimate emissions on a shorter time scale (e. g., worst-case day), see the procedure presented in Section 13.2.5.
[i] Rating applicable to mine types I, II, and IV (see Tables 11.9-5 and 11.9-6).

Note: Section 234 of the Clean Air Act of 1990 required EPA to review and revise the emission factors in this Section (and models used to evaluate ambient air quality impact), to ensure that they did not overestimate emissions from western surface coal mines. Due to resource and technical limitations, the haul road emission factors were isolated to receive the most attention during these studies, as the largest contributor to emissions. Resultant model evaluation with revised emission factors have improved model prediction for total suspended particulate (TSP); however, there is still a tendency for overprediction of particulate matter impact for PM-10, for as yet undetermined causes, prompting the Agency to make a policy decision not to use them for regulatory applications to these sources. However, the technical consideration exists that no better alternative data are currently available and the information should be made known. Users should accordingly use these factors with caution and awareness of their likely limitations.

Table 11.9-2 (Metric Units). EMISSION FACTOR EQUATIONS FOR UNCONTROLLED OPEN DUST SOURCES AT WESTERN SURFACE COAL MINES[a]

		Emissions By Particle Size Range (Aerodynamic Diameter)[b,c]					
		Emission Factor Equations		Scaling Factors			EMISSION FACTOR RATING
Operation	Material	TSP ≤30 µm	≤15 µm	≤10 µm[d]	≤2.5 µm/TSP[e]	Units	
Blasting[f]	Coal or overburden	$0.00022(A)^{1.5}$	ND	0.52[e]	0.03	kg/blast	C_DD
Truck loading	Coal	$\frac{0.580}{(M)^{1.2}}$	$\frac{0.0596}{(M)^{0.9}}$	0.75	0.019	kg/Mg	BBCC
Bulldozing	Coal	$\frac{35.6\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{8.44\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.022	kg/hr	CCDD
	Overburden	$\frac{2.6\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{0.45\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.105	kg/hr	BCDD
Dragline	Overburden	$\frac{0.0046\ (d)^{1.1}}{(M)^{0.3}}$	$\frac{0.0029\ (d)^{0.7}}{(M)^{0.3}}$	0.75	0.017	kg/m^3	BCDD
Vehicle traffic[g]							
Grading		$0.0034\ (S)^{2.5}$	$0.0056\ (S)^{2.0}$	0.60	0.031	kg/VKT	CCDD
Active storage pile[h] (wind erosion and maintenance)	Coal	1.8 u	ND	ND	ND	$\frac{kg}{(hectare)(hr)}$	C[i]_ _ _

[a] Reference 1, except as noted. VKT = vehicle kilometers traveled. ND = no data. Quality ratings coded as "QXYZ", where Q, X, Y, and Z are quality ratings for ≤30 µm, ≤15 µm, ≤10 µm, and ≤2.5 µm, respectively. See also note below.

[b] Particulate matter less than or equal to 30 µm in aerodynamic diameter is sometimes termed "suspendable particulate" and is often used as a surrogate for TSP (total suspended particulate). TSP denotes what is measured by a standard high volume sampler (see Section 13.2).

[c] Symbols for equations:

A = horizontal area (m^2), with blasting depth ≤ 21 m. Not for vertical face of a bench.
M = material moisture content (%)
s = material silt content (%)
u = wind speed (m/sec)
d = drop height (m)
W = mean vehicle weight (Mg)
S = mean vehicle speed (kph)
w = mean number of wheels

Table 11.9-2 (cont.).

[d] Multiply the $\leq$ 15-µm equation by this fraction to determine emissions, except as noted.
[e] Multiply the TSP predictive equation by this fraction to determine emissions.
[f] Blasting factor taken from a reexamination of field test data reported in Reference 1. See Reference 4.
[g] To estimate emissions from traffic on unpaved surfaces by vehicles such as haul trucks, light-to-medium duty vehicles, or scrapers in the travel mode, see the unpaved road emission factor equation in AP-42 Section 13.2.2
[h] Coal storage pile factor taken from Reference 5. To estimate emissions on a shorter time scale (e. g., worst-case day), see the procedure presented in Section 13.2.5.
[i] Rating applicable to mine types I, II, and IV (see Tables 11.9-5 and 11.9-6).

Note: Section 234 of the Clean Air Act of 1990 required EPA to review and revise the emission factors in this Section (and models used to evaluate ambient air quality impact), to ensure that they did not overestimate emissions from western surface coal mines. Due to resource and technical limitations, the haul road emission factors were isolated to receive the most attention during these studies, as the largest contributor to emissions. Resultant model evaluation with revised emission factors have improved model prediction for total suspended particulate (TSP); however, there is still a tendency for overprediction of particulate matter impact for PM-10, for as yet undetermined causes, prompting the Agency to make a policy decision not to use them for regulatory applications to these sources. However, the technical consideration exists that no better alternative data are currently available and the information should be made known. Users should accordingly use these factors with caution and awareness of their likely limitations.

Table 11.9-3 (Metric And English Units). TYPICAL VALUES FOR CORRECTION FACTORS APPLICABLE TO THE PREDICTIVE EMISSION FACTOR EQUATIONS[a]

Source	Correction Factor	Number Of Test Samples	Range	Geometric Mean	Units
Blasting	Area blasted	17	100 - 6,800	1,590	m^2
	Area blasted	17	1100 - 73,000	17,000	ft^2
Coal loading	Moisture	7	6.6 - 38	17.8	%
Bulldozers					
Coal	Moisture	3	4.0 - 22.0	10.4	%
	Silt	3	6.0 - 11.3	8.6	%
Overburden	Moisture	8	2.2 - 16.8	7.9	%
	Silt	8	3.8 - 15.1	6.9	%
Dragline	Drop distance	19	1.5 - 30	8.6	m
	Drop distance	19	5 - 100	28.1	ft
	Moisture	7	0.2 - 16.3	3.2	%
Scraper	Silt	10	7.2 - 25.2	16.4	%
	Weight	15	33 - 64	48.8	Mg
	Weight	15	36 - 70	53.8	ton
Grader	Speed	7	8.0 - 19.0	11.4	kph
	Speed		5.0 - 11.8	7.1	mph
Haul truck	Silt content	61	1.2 - 19.2	4.3	%
	Moisture	60	0.3 - 20.1	2.4	%
	Weight	61	20.9 - 260	110	mg
	Weight	61	23.0 - 290	120	ton

[a] Reference 1,6.

Table 11.9-4 (English And Metric Units). UNCONTROLLED PARTICULATE EMISSION FACTORS FOR OPEN DUST SOURCES AT WESTERN SURFACE COAL MINES

Source	Material	Mine Location[a]	TSP Emission Factor[b]	Units	EMISSION FACTOR RATING
Drilling	Overburden	Any	1.3 0.59	lb/hole kg/hole	C C
	Coal	V	0.22 0.10	lb/hole kg/hole	E E
Topsoil removal by scraper	Topsoil	Any	0.058 0.029	lb/ton kg/Mg	E E
		IV	0.44 0.22	lb/ton kg/Mg	E E
Overburden replacement	Overburden	Any	0.012 0.0060	lb/ton kg/Mg	C C
Truck loading by power shovel (batch drop)[c]	Overburden	V	0.037 0.018	lb/ton kg/Mg	E E
Train loading (batch or continuous drop)[c]	Coal	Any	0.028 0.014	lb/ton kg/Mg	E E
		III	0.0002 0.0001	lb/ton kg/Mg	E E
Bottom dump truck unloading (batch drop)[c]	Overburden	V	0.002 0.001	lb/ton kg/Mg	E E
	Coal	IV	0.027 0.014	lb/ton kg/Mg	E E
		III	0.005 0.002	lb/ton kg/Mg	E E
		II	0.020 0.010	lb/ton kg/Mg	E E
		I	0.014 0.0070	lb/T kg/Mg	E E
		Any	0.066 0.033	lb/T kg/Mg	D D

Table 11.9-4 (cont.).

Source	Material	Mine Location[a]	TSP Emission Factor[b]	Units	EMISSION FACTOR RATING
End dump truck unloading (batch drop)[c]	Coal	V	0.007 0.004	lb/T kg/Mg	E E
Scraper unloading (batch drop)[c]	Topsoil	IV	0.04 0.02	lb/T kg/Mg	E E
Wind erosion of exposed areas[d]	Seeded land, stripped overburden, graded overburden	Any	0.38	$\frac{T}{(acre)(yr)}$	C
			0.85	$\frac{Mg}{(hectare)(yr)}$	C

[a] Roman numerals I through V refer to specific mine locations for which the corresponding emission factors were developed (Reference 5). Tables 11.9-4 and 11.9-5 present characteristics of each of these mines. See text for correct use of these “mine-specific” emission factors. The other factors (from Reference 7, except for overburden drilling from Reference 1) can be applied to any western surface coal mine.

[b] Total suspended particulate (TSP) denotes what is measured by a standard high volume sampler (see Section 13.2).

[c] Predictive emission factor equations, which generally provide more accurate estimates of emissions, are presented in Chapter 13.

[d] To estimate wind erosion on a shorter time scale (e. g., worst-case day), see Section 13.2.5.

Table 11.9-5 (Metric And English Units). GENERAL CHARACTERISTICS OF SURFACE COAL MINES REFERRED TO IN TABLE 11.9-4[a]

Mine	Location	Type Of Coal Mined	Terrain	Vegetative Cover	Surface Soil Type And Erodibility Index	Mean Wind Speed		Mean Annual Precipitation	
						m/s	mph	cm	in.
I	N.W. Colorado	Subbitum.	Moderately steep	Moderate, sagebrush	Clayey loamy (71)	2.3	5.1	38	15
II	S.W. Wyoming	Subbitum.	Semirugged	Sparse, sagebrush	Arid soil with clay and alkali or carbonate accumulation (86)	6.0	13.4	36	14
III	S.E. Montana	Subbitum.	Gently rolling to semirugged	Sparse, moderate, prairie grassland	Shallow clay loamy deposits on bedrock (47)	4.8	10.7	28 - 41	11 - 16
IV	Central North Dakota	Lignite	Gently rolling	Moderate, prairie grassland	Loamy, loamy to sandy (71)	5.0	11.2	43	17
V	N.E. Wyoming	Subbitum.	Flat to gently rolling	Sparse, sagebrush	Loamy, sandy, clayey, and clay loamy (102)	6.0	13.4	36	14

[a] Reference 4.

Table 11.9-6 (English Units). OPERATING CHARACTERISTICS OF THE COAL MINES REFERRED TO IN TABLE 11.9-4[a]

Parameter	Required Information	Units	Mine I	Mine II	Mine III	Mine IV	Mine V
Production rate	Coal mined	10^6 ton/yr	1.13	5.0	9.5	3.8	12.0[b]
Coal transport	Avg. unit train frequency	per day	NA	NA	2	NA	2
Stratigraphic data	Overburden thickness	ft	21	80	90	65	35
	Overburden density	lb/yd^3	4000	3705	3000	ND	ND
	Coal seam thicknesses	ft	9,35	15,9	27	2,4,8	70
	Parting thicknesses	ft	50	15	NA	32,16	NA
	Spoils bulking factor	%	22	24	25	20	ND
	Active pit depth	ft	52	100	114	80	105
Coal analysis data	Moisture	%	10	18	24	38	30
	Ash	%, wet	8	10	8	7	6
	Sulfur	%, wet	0.46	0.59	0.75	0.65	0.48
	Heat content	Btu/lb	11000	9632	8628	8500	8020
Surface disposition	Total disturbed land	acre	168	1030	2112	1975	217
	Active pit	acre	34	202	87	ND	71
	Spoils	acre	57	326	144	ND	100
	Reclaimed	acre	100	221	950	ND	100
	Barren land	acre	ND	30	455	ND	ND
	Associated disturbances	acre	12	186	476	ND	46
Storage	Capacity	ton	NA	NA	ND	NA	48000
Blasting	Frequency, total	per week	4	4	3	7	7[b]
	Frequency, overburden	per week	3	0.5	3	NA	7[b]
	Area blasted, coal	ft^2	16000	40000	ND	30000	ND
	Area blasted, overburden	ft^2	20000	ND	ND	NA	ND

[a] Reference 5. NA = not applicable. ND = no data.
[b] Estimate.

11.9.3 Updates Since the Fifth Edition

The Fifth Edition which was released in January 1995 reformatted the section that was dated September 1988. Revisions to this section since these dates are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section. These and other documents can be found on the CHIEF WEB site (home page http://www.epa.gov/ttn/chief/).

Supplement E

- The predictive equations for emission factors for haul trucks and light/medium duty vehicles were removed and replaced with a footnote refering users to the recently revised unpaved road section in the Miscellaneous Sources chapter.

- The emission factor quality ratings were revised based upon a revised predictive equation and single value criteria.

- The typographical errors for the TSP equation and the omission of the PM-2.5 scaling factor for blasting were corrected.

References For Section 11.9

1. K. Axetell and C. Cowherd, *Improved Emission Factors For Fugitive Dust From Western Surface Coal Mining Sources*, 2 Volumes, EPA Contract No. 68-03-2924, U. S. Environmental Protection Agency, Cincinnati, OH, July 1981.

2. *Reserve Base Of U. S. Coals By Sulfur Content: Part 2, The Western States*, IC8693, Bureau Of Mines, U. S. Department Of The Interior, Washington, DC, 1975.

3. *Bituminous Coal And Lignite Production And Mine Operations - 1978*, DOE/EIA-0118(78), U. S. Department Of Energy, Washington, DC, June 1980.

4. G. E. Muleski, *Update Of AP-42 Emission Factors For Western Surface Coal Mines And Related Sections*, Summary Report, Prepared for Emission Factors And Inventory Group (MD-14), Emissions, Modeling And Analysis Division, Office Of Air Quality, Planning, And Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711.

5. K. Axetell, *Survey Of Fugitive Dust From Coal Mines*, EPA-908/1-78-003, U. S. Environmental Protection Agency, Denver, CO, February 1978.

6. G. E. Muleski, *et al.*, *Surface Coal Mine Emission Factor Field Study*, EPA-454/R-95-010, U. S. Environmental Protection Agency, Research Triangle Park, NC, January 1994.

7. D. L. Shearer, *et al.*, *Coal Mining Emission Factor Development And Modeling Study*, Amax Coal Company, Carter Mining Company, Sunoco Energy Development Company, Mobil Oil Corporation, and Atlantic Richfield Company, Denver, CO, July 1981.

ATTACHMENT 7.3

AP-42, SECTION 13.2.4 AGGREGATE HANDLING AND STORAGE PILES

13.2.4 Aggregate Handling And Storage Piles

13.2.4.1 General

Inherent in operations that use minerals in aggregate form is the maintenance of outdoor storage piles. Storage piles are usually left uncovered, partially because of the need for frequent material transfer into or out of storage.

Dust emissions occur at several points in the storage cycle, such as material loading onto the pile, disturbances by strong wind currents, and loadout from the pile. The movement of trucks and loading equipment in the storage pile area is also a substantial source of dust.

13.2.4.2 Emissions And Correction Parameters

The quantity of dust emissions from aggregate storage operations varies with the volume of aggregate passing through the storage cycle. Emissions also depend on 3 parameters of the condition of a particular storage pile: age of the pile, moisture content, and proportion of aggregate fines.

When freshly processed aggregate is loaded onto a storage pile, the potential for dust emissions is at a maximum. Fines are easily disaggregated and released to the atmosphere upon exposure to air currents, either from aggregate transfer itself or from high winds. As the aggregate pile weathers, however, potential for dust emissions is greatly reduced. Moisture causes aggregation and cementation of fines to the surfaces of larger particles. Any significant rainfall soaks the interior of the pile, and then the drying process is very slow.

Silt (particles equal to or less than 75 micrometers [µm] in diameter) content is determined by measuring the portion of dry aggregate material that passes through a 200-mesh screen, using ASTM-C-136 method.[1] Table 13.2.4-1 summarizes measured silt and moisture values for industrial aggregate materials.

Table 13.2.4-1. TYPICAL SILT AND MOISTURE CONTENTS OF MATERIALS AT VARIOUS INDUSTRIES[a]

Industry	No. Of Facilities	Material	Silt Content (%)			Moisture Content (%)		
			No. Of Samples	Range	Mean	No. Of Samples	Range	Mean
Iron and steel production	9	Pellet ore	13	1.3 - 13	4.3	11	0.64 - 4.0	2.2
		Lump ore	9	2.8 - 19	9.5	6	1.6 - 8.0	5.4
		Coal	12	2.0 - 7.7	4.6	11	2.8 - 11	4.8
		Slag	3	3.0 - 7.3	5.3	3	0.25 - 2.0	0.92
		Flue dust	3	2.7 - 23	13	1	—	7
		Coke breeze	2	4.4 - 5.4	4.9	2	6.4 - 9.2	7.8
		Blended ore	1	—	15	1	—	6.6
		Sinter	1	—	0.7	0	—	—
		Limestone	3	0.4 - 2.3	1.0	2	ND	0.2
Stone quarrying and processing	2	Crushed limestone	2	1.3 - 1.9	1.6	2	0.3 - 1.1	0.7
		Various limestone products	8	0.8 - 14	3.9	8	0.46 - 5.0	2.1
Taconite mining and processing	1	Pellets	9	2.2 - 5.4	3.4	7	0.05 - 2.0	0.9
		Tailings	2	ND	11	1	—	0.4
Western surface coal mining	4	Coal	15	3.4 - 16	6.2	7	2.8 - 20	6.9
		Overburden	15	3.8 - 15	7.5	0	—	—
		Exposed ground	3	5.1 - 21	15	3	0.8 - 6.4	3.4
Coal-fired power plant	1	Coal (as received)	60	0.6 - 4.8	2.2	59	2.7 - 7.4	4.5
Municipal solid waste landfills	4	Sand	1	—	2.6	1	—	7.4
		Slag	2	3.0 - 4.7	3.8	2	2.3 - 4.9	3.6
		Cover	5	5.0 - 16	9.0	5	8.9 - 16	12
		Clay/dirt mix	1	—	9.2	1	—	14
		Clay	2	4.5 - 7.4	6.0	2	8.9 - 11	10
		Fly ash	4	78 - 81	80	4	26 - 29	27
		Misc. fill materials	1	—	12	1	—	11

[a] References 1-10. ND = no data.

13.2.4.3 Predictive Emission Factor Equations

Total dust emissions from aggregate storage piles result from several distinct source activities within the storage cycle:

1. Loading of aggregate onto storage piles (batch or continuous drop operations).
2. Equipment traffic in storage area.
3. Wind erosion of pile surfaces and ground areas around piles.
4. Loadout of aggregate for shipment or for return to the process stream (batch or continuous drop operations).

Either adding aggregate material to a storage pile or removing it usually involves dropping the material onto a receiving surface. Truck dumping on the pile or loading out from the pile to a truck with a front-end loader are examples of batch drop operations. Adding material to the pile by a conveyor stacker is an example of a continuous drop operation.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \text{(kg/megagram [Mg])}$$

$$\boxed{E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \text{(pound [lb]/ton)}} \tag{1}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

Ranges Of Source Conditions For Equation 1			
Silt Content (%)	Moisture Content (%)	Wind Speed	
		m/s	mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

To retain the quality rating of the equation when it is applied to a specific facility, reliable correction parameters must be determined for specific sources of interest. The field and laboratory procedures for aggregate sampling are given in Reference 3. In the event that site-specific values for correction parameters cannot be obtained, the appropriate mean from Table 13.2.4-1 may be used, but the quality rating of the equation is reduced by 1 letter.

For emissions from equipment traffic (trucks, front-end loaders, dozers, etc.) traveling between or on piles, it is recommended that the equations for vehicle traffic on unpaved surfaces be used (see Section 13.2.2). For vehicle travel between storage piles, the silt value(s) for the areas among the piles (which may differ from the silt values for the stored materials) should be used.

Worst-case emissions from storage pile areas occur under dry, windy conditions. Worst-case emissions from materials-handling operations may be calculated by substituting into the equation appropriate values for aggregate material moisture content and for anticipated wind speeds during the worst case averaging period, usually 24 hours. The treatment of dry conditions for Section 13.2.2, vehicle traffic, "Unpaved Roads", follows the methodology described in that section centering on parameter p. A separate set of nonclimatic correction parameters and source extent values corresponding to higher than normal storage pile activity also may be justified for the worst-case averaging period.

13.2.4.4 Controls[12-13]

Watering and the use of chemical wetting agents are the principal means for control of aggregate storage pile emissions. Enclosure or covering of inactive piles to reduce wind erosion can also reduce emissions. Watering is useful mainly to reduce emissions from vehicle traffic in the storage pile area. Watering of the storage piles themselves typically has only a very temporary slight effect on total emissions. A much more effective technique is to apply chemical agents (such as surfactants) that permit more extensive wetting. Continuous chemical treating of material loaded onto piles, coupled with watering or treatment of roadways, can reduce total particulate emissions from aggregate storage operations by up to 90 percent.[12]

References For Section 13.2.4

1. C. Cowherd, Jr., *et al., Development Of Emission Factors For Fugitive Dust Sources*, EPA-450/3-74-037, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

2. R. Bohn, *et al., Fugitive Emissions From Integrated Iron And Steel Plants*, EPA-600/2-78-050, U. S. Environmental Protection Agency, Cincinnati, OH, March 1978.

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ATTACHMENT 7.4

AP-42, SECTION 2.4 MUNICIPAL SOLID WASTE LANDFILLS

2.4 MUNICIPAL SOLID WASTE LANDFILLS

2.4.1 General[1-4]

A municipal solid waste (MSW) landfill unit is a discrete area of land or an excavation that receives household waste, and that is not a land application unit, surface impoundment, injection well, or waste pile. An MSW landfill unit may also receive other types of wastes, such as commercial solid waste, nonhazardous sludge, and industrial solid waste. The municipal solid waste types potentially accepted by MSW landfills include (most landfills accept only a few of the following categories):

- MSW,
- Household hazardous waste,
- Municipal sludge,
- Municipal waste combustion ash,
- Infectious waste,
- Waste tires,
- Industrial non-hazardous waste,
- Conditionally exempt small quantity generator (CESQG) hazardous waste,
- Construction and demolition waste,
- Agricultural wastes,
- Oil and gas wastes, and
- Mining wastes.

In the United States, approximately 57 percent of solid waste is landfilled, 16 percent is incinerated, and 27 percent is recycled or composted. There were an estimated 2,500 active MSW landfills in the United States in 1995. These landfills were estimated to receive 189 million megagrams (Mg) (208 million tons) of waste annually, with 55 to 60 percent reported as household waste, and 35 to 45 percent reported as commercial waste.

2.4.2 Process Description[2,5]

There are three major designs for municipal landfills. These are the area, trench, and ramp methods. All of these methods utilize a three step process, which includes spreading the waste, compacting the waste, and covering the waste with soil. The trench and ramp methods are not commonly used, and are not the preferred methods when liners and leachate collection systems are utilized or required by law. The area fill method involves placing waste on the ground surface or landfill liner, spreading it in layers, and compacting with heavy equipment. A daily soil cover is spread over the compacted waste. The trench method entails excavating trenches designed to receive a day's worth of waste. The soil from the excavation is often used for cover material and wind breaks. The ramp method is typically employed on sloping land, where waste is spread and compacted similar to the area method, however, the cover material obtained is generally from the front of the working face of the filling operation.

Modern landfill design often incorporates liners constructed of soil (i.e., recompacted clay), or synthetics (i.e., high density polyethylene), or both to provide an impermeable barrier to leachate (i.e., water that has passed through the landfill) and gas migration from the landfill.

2.4.3 Control Technology[1,2,6]

The Resource Conservation and Recovery Act (RCRA) Subtitle D regulations promulgated on October 9, 1991 require that the concentration of methane generated by MSW landfills not exceed 25 percent of the lower explosive limit (LEL) in on-site structures, such as scale houses, or the LEL at the facility property boundary.

The New Source Performance Standards (NSPS) and Emission Guidelines for air emissions from MSW landfills for certain new and existing landfills were published in the Federal Register on March 1, 1996. The regulation requires that Best Demonstrated Technology (BDT) be used to reduce MSW landfill emissions from affected new and existing MSW landfills emitting greater than or equal to 50 Mg/yr (55 tons/yr) of non-methane organic compounds (NMOCs). The MSW landfills that are affected by the NSPS/Emission Guidelines are each new MSW landfill, and each existing MSW landfill that has accepted waste since November 8, 1987, or that has capacity available for future use. The NSPS/Emission Guidelines affect landfills with a design capacity of 2.5 million Mg (2.75 million tons) or more. Control systems require: (1) a well-designed and well-operated gas collection system, and (2) a control device capable of reducing NMOCs in the collected gas by 98 weight-percent.

Landfill gas (LFG) collection systems are either active or passive systems. Active collection systems provide a pressure gradient in order to extract LFG by use of mechanical blowers or compressors. Passive systems allow the natural pressure gradient created by the increase in pressure created by LFG generation within the landfill to mobilize the gas for collection.

LFG control and treatment options include (1) combustion of the LFG, and (2) purification of the LFG. Combustion techniques include techniques that do not recover energy (i.e., flares and thermal incinerators), and techniques that recover energy (i.e., gas turbines and internal combustion engines) and generate electricity from the combustion of the LFG. Boilers can also be employed to recover energy from LFG in the form of steam. Flares involve an open combustion process that requires oxygen for combustion, and can be open or enclosed. Thermal incinerators heat an organic chemical to a high enough temperature in the presence of sufficient oxygen to oxidize the chemical to carbon dioxide (CO_2) and water. Purification techniques can also be used to process raw landfill gas to pipeline quality natural gas by using adsorption, absorption, and membranes.

2.4.4 Emissions[2,7]

Methane (CH_4) and CO_2 are the primary constituents of landfill gas, and are produced by microorganisms within the landfill under anaerobic conditions. Transformations of CH_4 and CO_2 are mediated by microbial populations that are adapted to the cycling of materials in anaerobic environments. Landfill gas generation, including rate and composition, proceeds through four phases. The first phase is aerobic [i.e., with oxygen (O_2) available] and the primary gas produced is CO_2. The second phase is characterized by O_2 depletion, resulting in an anaerobic environment, where large amounts of CO_2 and some hydrogen (H_2) are produced. In the third phase, CH_4 production begins, with an accompanying reduction in the amount of CO_2 produced. Nitrogen (N_2) content is initially high in landfill gas in the first phase, and declines sharply as the landfill proceeds through the second and third phases. In the fourth phase, gas production of CH_4, CO_2, and N_2 becomes fairly steady. The total time and phase duration of gas generation varies with landfill conditions (i.e., waste composition, design management, and anaerobic state).

Typically, LFG also contains a small amount of non-methane organic compounds (NMOC). This NMOC fraction often contains various organic hazardous air pollutants (HAP), greenhouse gases (GHG), and compounds associated with stratospheric ozone depletion. The NMOC fraction also contains volatile organic compounds (VOC). The weight fraction of VOC can be determined by subtracting the weight fractions of individual compounds that are non-photochemically reactive (i.e., negligibly-reactive organic compounds as defined in 40 CFR 51.100).

Other emissions associated with MSW landfills include combustion products from LFG control and utilization equipment (i.e., flares, engines, turbines, and boilers). These include carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), hydrogen chloride (HCl), particulate matter (PM) and other combustion products (including HAPs). PM emissions can also be generated in the form of fugitive dust created by mobile sources (i.e., garbage trucks) traveling along paved and unpaved surfaces. The reader should consult AP-42 Volume I Sections 13.2.1 and 13.2.2 for information on estimating fugitive dust emissions from paved and unpaved roads.

The rate of emissions from a landfill is governed by gas production and transport mechanisms. Production mechanisms involve the production of the emission constituent in its vapor phase through vaporization, biological decomposition, or chemical reaction. Transport mechanisms involve the transportation of a volatile constituent in its vapor phase to the surface of the landfill, through the air boundary layer above the landfill, and into the atmosphere. The three major transport mechanisms that enable transport of a volatile constituent in its vapor phase are diffusion, convection, and displacement.

2.4.4.1 Uncontrolled Emissions — To estimate uncontrolled emissions of the various compounds present in landfill gas, total landfill gas emissions must first be estimated. Uncontrolled CH_4 emissions may be estimated for individual landfills by using a theoretical first-order kinetic model of methane production developed by the EPA.[8] This model is known as the Landfill Air Emissions Estimation model, and can be accessed from the Office of Air Quality Planning and Standards Technology Transfer Network Website (OAQPS TTN Web) in the Clearinghouse for Inventories and Emission Factors (CHIEF) technical area (URL http://www.epa.gov/ttn/chief). The Landfill Air Emissions Estimation model equation is as follows:

$$Q_{CH_4} = L_o \, R \, (e^{-kc} - e^{-kt}) \tag{1}$$

where:

Q_{CH_4}	=	Methane generation rate at time t, m^3/yr;
L_o	=	Methane generation potential, m^3 CH_4/Mg refuse;
R	=	Average annual refuse acceptance rate during active life, Mg/yr;
e	=	Base log, unitless;
k	=	Methane generation rate constant, yr^{-1};
c	=	Time since landfill closure, yrs (c = 0 for active landfills); and
t	=	Time since the initial refuse placement, yrs.

It should be noted that the model above was designed to estimate LFG generation and not LFG emissions to the atmosphere. Other fates may exist for the gas generated in a landfill, including capture and subsequent microbial degradation within the landfill's surface layer. Currently, there are no data that adequately address this fate. It is generally accepted that the bulk of the gas generated will be emitted through cracks or other openings in the landfill surface.

Site-specific landfill information is generally available for variables R, c, and t. When refuse acceptance rate information is scant or unknown, R can be determined by dividing the refuse in place by the age of the landfill. If a facility has documentation that a certain segment (cell) of a landfill received *only* nondegradable refuse, then the waste from this segment of the landfill can be excluded from the calculation of R. Nondegradable refuse includes concrete, brick, stone, glass, plaster, wallboard, piping, plastics, and metal objects. The average annual acceptance rate should only be estimated by this method when there is inadequate information available on the actual average acceptance rate. The time variable, t, includes the total number of years that the refuse has been in place (including the number of years that the landfill has accepted waste and, if applicable, has been closed).

Values for variables L_o and k must be estimated. Estimation of the potential CH_4 generation capacity of refuse (L_o) is generally treated as a function of the moisture and organic content of the refuse. Estimation of the CH_4 generation constant (k) is a function of a variety of factors, including moisture, pH, temperature, and other environmental factors, and landfill operating conditions. Specific CH_4 generation constants can be computed by the use of EPA Method 2E (40 CFR Part 60 Appendix A).

The Landfill Air Emission Estimation model includes both regulatory default values and recommended AP-42 default values for L_o and k. The regulatory defaults were developed for compliance purposes (NSPS/Emission Guideline). As a result, the model contains conservative L_o and k default values in order to protect human health, to encompass a wide range of landfills, and to encourage the use of site-specific data. Therefore, different L_o and k values may be appropriate in estimating landfill emissions for particular landfills and for use in an emissions inventory.

Recommended AP-42 defaults include a k value of 0.04/yr for areas recieving 25 inches or more of rain per year. A default k of 0.02/yr should be used in drier areas (<25 inches/yr). An L_o value of 100 m^3/Mg (3,530 ft^3/ton) refuse is appropriate for most landfills. Although the recommended default k and L_o are based upon the best fit to 21 different landfills, the predicted methane emissions ranged from 38 to 492% of actual, and had a relative standard deviation of 0.85. It should be emphasized that in order to comply with the NSPS/Emission Guideline, the regulatory defaults for k and L_o must be applied as specified in the final rule.

When gas generation reaches steady state conditions, LFG consists of approximately 40 percent by volume CO_2, 55 percent CH_4, 5 percent N_2 (and other gases), and trace amounts of NMOCs. Therefore, the estimate derived for CH_4 generation using the Landfill Air Emissions Estimation model can also be used to represent CO_2 generation. Addition of the CH_4 and CO_2 emissions will yield an estimate of total landfill gas emissions. If site-specific information is available to suggest that the CH_4 content of landfill gas is not 55 percent, then the site-specific information should be used, and the CO_2 emission estimate should be adjusted accordingly.

Most of the NMOC emissions result from the volatilization of organic compounds contained in the landfilled waste. Small amounts may be created by biological processes and chemical reactions within the landfill. The current version of the Landfill Air Emissions Estimation model contains a proposed regulatory default value for total NMOC of 4,000 ppmv, expressed as hexane. However, available data show that there is a range of over 4,400 ppmv for total NMOC values from landfills. The proposed regulatory default value for NMOC concentration was developed for regulatory compliance purposes and to provide the most cost-effective default values on a national basis. For emissions inventory purposes, site-specific information should be taken into account when determining the total NMOC concentration. In the absence of site-specific information, a value of 2,420 ppmv as hexane is suggested for landfills known to have co-disposal of MSW and non-residential waste. If the landfill is known to contain only MSW or have very little organic commercial/industrial wastes, then a total NMOC value of 595 ppmv as hexane should be used. In addition, as with the landfill model defaults, the regulatory default value for NMOC content must be used in order to comply with the NSPS/Emission Guideline.

If a site-specific total pollutant concentration is available (i.e., as measured by EPA Reference Method 25C), it must be corrected for air infiltration which can occur by two different mechanisms: LFG sample dilution, and air intrusion into the landfill. These corrections require site-specific data for the LFG CH_4,

CO_2, nitrogen (N_2), and oxygen (O_2) content. If the ratio of N_2 to O_2 is less than or equal to 4.0 (as found in ambient air), then the total pollutant concentration is adjusted for sample dilution by assuming that CO_2 and CH_4 are the primary (100 percent) constituents of landfill gas, and the following equation is used:

$$C_P \text{ (ppmv) (corrected for air infiltration)} = \frac{C_P \text{ (ppmv) } (1 \times 10^6)}{C_{CO_2} \text{ (ppmv)} + C_{CH_4} \text{ (ppmv)}} \tag{2}$$

where:

C_P	=	Concentration of pollutant P in landfill gas (i.e., NMOC as hexane), ppmv;
C_{CO_2}	=	CO_2 concentration in landfill gas, ppmv;
C_{CH_4}	=	CH_4 Concentration in landfill gas, ppmv; and
1×10^6	=	Constant used to correct concentration of P to units of ppmv.

If the ratio of N_2 to O_2 concentrations (i.e., C_{N_2}, C_{O_2}) is greater than 4.0, then the total pollutant concentration should be adjusted for air intrusion into the landfill by using equation 2 and adding the concentration of N_2 (i.e., C_{N_2}) to the denominator. Values for C_{CO_2}, C_{CH_4}, C_{N_2}, C_{O_2}, can usually be found in the source test report for the particular landfill along with the total pollutant concentration data.

To estimate emissions of NMOC or other landfill gas constituents, the following equation should be used:

$$Q_P = 1.82 \; Q_{CH_4} * \frac{C_P}{(1 \times 10^6)} \tag{3}$$

where:

Q_P	=	Emission rate of pollutant P (i.e. NMOC), m^3/yr;
Q_{CH_4}	=	CH_4 generation rate, m^3/yr (from the Landfill Air Emissions Estimation model);
C_P	=	Concentration of P in landfill gas, ppmv; and
1.82	=	Multiplication factor (assumes that approximately 55 percent of landfill gas is CH_4 and 45 percent is CO_2, N_2, and other constituents).

Uncontrolled mass emissions per year of total NMOC (as hexane), CO_2, CH_4, and speciated organic and inorganic compounds can be estimated by the following equation:

$$UM_P = Q_P * \left[\frac{MW_P * 1 \text{ atm}}{(8.205 \times 10^{-5} \text{ m}^3\text{-atm/gmol-}^\circ\text{K})(1000\text{g/kg})(273 + T\,^\circ\text{K})} \right] \tag{4}$$

where:

UM_P	=	Uncontrolled mass emissions of pollutant P (i.e., NMOC), kg/yr;
MW_P	=	Molecular weight of P, g/gmol (i.e., 86.18 for NMOC as hexane);
Q_P	=	NMOC emission rate of P, m^3/yr; and
T	=	Temperature of landfill gas, ^oC.

This equation assumes that the operating pressure of the system is approximately 1 atmosphere. If the temperature of the landfill gas is not known, a temperature of 25^oC (77^oF) is recommended.

Uncontrolled default concentrations of speciated organics along with some inorganic compounds are presented in Table 2.4-1. These default concentrations have already been corrected for air infiltration and can be used as input parameters to equation 3 or the Landfill Air Emission Estimation model for estimating speciated emissions from landfills when site-specific data are not available. An analysis of the data, based on the co-disposal history (with non-residential wastes) of the individual landfills from which the concentration data were derived, indicates that for benzene, NMOC, and toluene, there is a difference in the uncontrolled concentrations. Table 2.4-2 presents the corrected concentrations for benzene, NMOC, and toluene to use based on the site's co-disposal history.

It is important to note that the compounds listed in Tables 2.4-1 and 2.4-2 are not the only compounds likely to be present in LFG. The listed compounds are those that were identified through a review of the available literature. The reader should be aware that additional compounds are likely present, such as those associated with consumer or industrial products. Given this information, extreme caution should be exercised in the use of the default VOC weight fractions and concentrations given at the bottom of Table 2.4-2. These default VOC values are heavily influenced by the ethane content of the LFG. Available data have shown that there is a range of over 1,500 ppmv in LFG ethane content among landfills.

2.4.4.2 Controlled Emissions — Emissions from landfills are typically controlled by installing a gas collection system, and combusting the collected gas through the use of internal combustion engines, flares, or turbines. Gas collection systems are not 100 percent efficient in collecting landfill gas, so emissions of CH_4 and NMOC at a landfill with a gas recovery system still occur. To estimate controlled emissions of CH_4, NMOC, and other constituents in landfill gas, the collection efficiency of the system must first be estimated. Reported collection efficiencies typically range from 60 to 85 percent, with an average of 75 percent most commonly assumed. Higher collection efficiencies may be achieved at some sites (i.e., those engineered to control gas emissions). If site-specific collection efficiencies are available (i.e., through a comprehensive surface sampling program), then they should be used instead of the 75 percent average.

Controlled emission estimates also need to take into account the control efficiency of the control device. Control efficiencies based on test data for the combustion of CH_4, NMOC, and some speciated organics with differing control devices are presented in Table 2.4-3. Emissions from the control devices need to be added to the uncollected emissions to estimate total controlled emissions.

Controlled CH_4, NMOC, and speciated emissions can be calculated with equation 5. It is assumed that the landfill gas collection and control system operates 100 percent of the time. Minor durations of system downtime associated with routine maintenance and repair (i.e., 5 to 7 percent) will not appreciably effect emission estimates. The first term in equation 5 accounts for emissions from uncollected landfill gas, while the second term accounts for emissions of the pollutant that were collected but not combusted in the control or utilization device:

$$CM_P = \left[UM_P * \left(1 - \frac{\eta_{col}}{100}\right)\right] + \left[UM_P * \frac{\eta_{col}}{100} * \left(1 - \frac{\eta_{cnt}}{100}\right)\right] \qquad (5)$$

where:

CM_P = Controlled mass emissions of pollutant P, kg/yr;
UM_P = Uncontrolled mass emissions of P, kg/yr (from equation 4 or the Landfill Air Emissions Estimation Model);
η_{col} = Collection efficiency of the landfill gas collection system, percent; and
η_{cnt} = Control efficiency of the landfill gas control or utilization device, percent.

Emission factors for the secondary compounds, CO and NO_x, exiting the control device are presented in Tables 2.4-4 and 2.4-5. These emission factors should be used when equipment vendor guarantees are not available.

Controlled emissions of CO_2 and sulfur dioxide (SO_2) are best estimated using site-specific landfill gas constituent concentrations and mass balance methods.[68] If site-specific data are not available, the data in tables 2.4-1 through 2.4-3 can be used with the mass balance methods that follow.

Controlled CO_2 emissions include emissions from the CO_2 component of landfill gas (equivalent to uncontrolled emissions) and additional CO_2 formed during the combustion of landfill gas. The bulk of the CO_2 formed during landfill gas combustion comes from the combustion of the CH_4 fraction. Small quantities will be formed during the combustion of the NMOC fraction, however, this typically amounts to less than 1 percent of total CO_2 emissions by weight. Also, the formation of CO through incomplete combustion of landfill gas will result in small quantities of CO_2 not being formed. This contribution to the overall mass balance picture is also very small and does not have a significant impact on overall CO_2 emissions.[68]

The following equation which assumes a 100 percent combustion efficiency for CH_4 can be used to estimate CO_2 emissions from controlled landfills:

$$CM_{CO_2} = UM_{CO_2} + \left[UM_{CH_4} * \frac{\eta_{col}}{100} * 2.75 \right] \qquad (6)$$

where:

CM_{CO_2}	=	Controlled mass emissions of CO_2, kg/yr;
UM_{CO_2}	=	Uncontrolled mass emissions of CO_2, kg/yr (from equation 4 or the Landfill Air Emission Estimation Model);
UM_{CH_4}	=	Uncontrolled mass emissions of CH_4, kg/yr (from equation 4 on the Landfill Air Emission Estimation Model);
η_{col}	=	Efficiency of the landfill gas collection system, percent; and
2.75	=	Ratio of the molecular weight of CO_2 to the molecular weight of CH_4.

To prepare estimates of SO_2 emissions, data on the concentration of reduced sulfur compounds within the landfill gas are needed. The best way to prepare this estimate is with site-specific information on the total reduced sulfur content of the landfill gas. Often these data are expressed in ppmv as sulfur (S). Equations 3 and 4 should be used first to determine the uncontrolled mass emission rate of reduced sulfur compounds as sulfur. Then, the following equation can be used to estimate SO_2 emissions:

$$CM_{SO_2} = UM_S * \frac{\eta_{col}}{100} * 2.0 \qquad (7)$$

where:

CM_{SO_2}	=	Controlled mass emissions of SO_2, kg/yr;
UM_S	=	Uncontrolled mass emissions of reduced sulfur compounds as sulfur, kg/yr (from equations 3 and 4);
η_{col}	=	Efficiency of the landfill gas collection system, percent; and
2.0	=	Ratio of the molecular weight of SO_2 to the molecular weight of S.

The next best method to estimate SO_2 concentrations, if site-specific data for total reduced sulfur compounds as sulfur are not available, is to use site-specific data for speciated reduced sulfur compound concentrations. These data can be converted to ppmv as S with equation 8. After the total reduced sulfur as S has been obtained from equation 8, then equations 3, 4, and 7 can be used to derive SO_2 emissions.

$$C_S = \sum_{i=1}^{n} C_P * S_P \quad (8)$$

where:

C_S	=	Concentration of total reduced sulfur compounds, ppmv as S (for use in equation 3);
C_P	=	Concentration of each reduced sulfur compound, ppmv;
S_P	=	Number of moles of S produced from the combustion of each reduced sulfur compound (i.e., 1 for sulfides, 2 for disulfides); and
n	=	Number of reduced sulfur compounds available for summation.

If no site-specific data are available, a value of 46.9 ppmv can be assumed for C_S (for use in equation 3). This value was obtained by using the default concentrations presented in Table 2.4-1 for reduced sulfur compounds and equation 8.

Hydrochloric acid [Hydrogen Chloride (HCl)] emissions are formed when chlorinated compounds in LFG are combusted in control equipment. The best methods to estimate emissions are mass balance methods that are analogous to those presented above for estimating SO_2 emissions. Hence, the best source of data to estimate HCl emissions is site-specific LFG data on total chloride [expressed in ppmv as the chloride ion (Cl^-)]. If these data are not available, then total chloride can be estimated from data on individual chlorinated species using equation 9 below. However, emission estimates may be underestimated, since not every chlorinated compound in the LFG will be represented in the laboratory report (i.e., only those that the analytical method specifies).

$$C_{Cl} = \sum_{i=1}^{n} C_P * Cl_P \quad (9)$$

where:

C_{Cl}	=	Concentration of total chloride, ppmv as Cl^- (for use in equation 3);
C_P	=	Concentration of each chlorinated compound, ppmv;
Cl_P	=	Number of moles of Cl^- produced from the combustion of each chlorinated compound (i.e., 3 for 1,1,1-trichloroethane); and
n	=	Number of chlorinated compounds available for summation.

After the total chloride concentration (C_{Cl}) has been estimated, equations 3 and 4 should be used to determine the total uncontrolled mass emission rate of chlorinated compounds as chloride ion (UM_{Cl}). This value is then used in equation 10 below to derive HCl emission estimates:

$$CM_{HCl} = UM_{Cl} * \frac{\eta_{col}}{100} * 1.03 * \left(\frac{\eta_{cnt}}{100}\right) \quad (10)$$

where:

CM_{HCl}	=	Controlled mass emissions of HCl, kg/yr;
UM_{Cl}	=	Uncontrolled mass emissions of chlorinated compounds as chloride, kg/yr (from equations 3 and 4);
η_{col}	=	Efficiency of the landfill gas collection system, percent;
1.03	=	Ratio of the molecular weight of HCl to the molecular weight of Cl^-; and
η_{cnt}	=	Control efficiency of the landfill gas control or utilization device, percent.

In estimating HCl emissions, it is assumed that all of the chloride ion from the combustion of chlorinated LFG constituents is converted to HCl. If an estimate of the control efficiency, η_{cnt}, is not available, then the high end of the control efficiency range for the equipment listed in Table 9 should be used. This assumption is recommended to assume that HCl emissions are not under-estimated.

If site-specific data on total chloride or speciated chlorinated compounds are not available, then a default value of 42.0 ppmv can be used for C_{Cl}. This value was derived from the default LFG constituent concentrations presented in Table 2.4-1. As mentioned above, use of this default may produce underestimates of HCl emissions since it is based only on those compounds for which analyses have been performed. The constituents listed in Table 2.4-1are likely not all of the chlorinated compounds present in LFG.

The reader is referred to Sections 11.2-1 (Unpaved Roads, SCC 50100401), and 11-2.4 (Heavy Construction Operations) of Volume I, and Section II-7 (Construction Equipment) of Volume II, of the AP-42 document for determination of associated fugitive dust and exhaust emissions from these emission sources at MSW landfills.

2.4.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Supplemnt D (8/98) is a major revision of the text and recommended emission factors conained in the section. The most significant revisions to this section since publication in the Fifth Edition are summarized below.

- The equations to calculate the CH_4, CO_2 and other constituents were simplified.
- The default L_0 and k were revised based upon an expanded base of gas generation data.
- The default ratio of CO_2 to CH_4 was revised based upon averages observed in available source test reports.
- The default concentrations of LFG constituents were revised based upon additional data.
- Additional control efficiencies were included and existing efficiencies were revised based upon additional emission test data.
- Revised and expanded the recommended emission factors for secondary compounds emitted from typical control devices.

Supplement E (11/98) includes correction in equation 10 and a very minor change in the molecular weights for 1,1,1-Trichloroethane (methyl chloroform), 1,1-Dichloroethane, 1,2-Dichloropropane and Trichloroethylene (trichloroethene) presented in Table 2.4-1 to agree with values presented in Perry's Handbook.

Table 2.4-1. DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS[a]

(SCC 50100402, 50300603)

Compound	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
1,1,1-Trichloroethane (methyl chloroform)[a]	133.41	0.48	B
1,1,2,2-Tetrachloroethane[a]	167.85	1.11	C
1,1-Dichloroethane (ethylidene dichloride)[a]	98.97	2.35	B
1,1-Dichloroethene (vinylidene chloride)[a]	96.94	0.20	B
1,2-Dichloroethane (ethylene dichloride)[a]	98.96	0.41	B
1,2-Dichloropropane (propylene dichloride)[a]	112.99	0.18	D
2-Propanol (isopropyl alcohol)	60.11	50.1	E
Acetone	58.08	7.01	B
Acrylonitrile[a]	53.06	6.33	D
Bromodichloromethane	163.83	3.13	C
Butane	58.12	5.03	C
Carbon disulfide[a]	76.13	0.58	C
Carbon monoxide[b]	28.01	141	E
Carbon tetrachloride[a]	153.84	0.004	B
Carbonyl sulfide[a]	60.07	0.49	D
Chlorobenzene[a]	112.56	0.25	C
Chlorodifluoromethane	86.47	1.30	C
Chloroethane (ethyl chloride)[a]	64.52	1.25	B
Chloroform[a]	119.39	0.03	B
Chloromethane	50.49	1.21	B
Dichlorobenzene[c]	147	0.21	E
Dichlorodifluoromethane	120.91	15.7	A
Dichlorofluoromethane	102.92	2.62	D
Dichloromethane (methylene chloride)[a]	84.94	14.3	A
Dimethyl sulfide (methyl sulfide)	62.13	7.82	C
Ethane	30.07	889	C
Ethanol	46.08	27.2	E
Ethyl mercaptan (ethanethiol)	62.13	2.28	D
Ethylbenzene[a]	106.16	4.61	B
Ethylene dibromide	187.88	0.001	E
Fluorotrichloromethane	137.38	0.76	B
Hexane[a]	86.18	6.57	B
Hydrogen sulfide	34.08	35.5	B
Mercury (total)[a,d]	200.61	2.92×10^{-4}	E

Table 2.4-1. (Concluded)

Compound	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
Methyl ethyl ketone[a]	72.11	7.09	A
Methyl isobutyl ketone[a]	100.16	1.87	B
Methyl mercaptan	48.11	2.49	C
Pentane	72.15	3.29	C
Perchloroethylene (tetrachloroethylene)[a]	165.83	3.73	B
Propane	44.09	11.1	B
t-1,2-dichloroethene	96.94	2.84	B
Trichloroethylene (trichloroethene)[a]	131.40	2.82	B
Vinyl chloride[a]	62.50	7.34	B
Xylenes[a]	106.16	12.1	B

NOTE: This is not an all-inclusive list of potential LFG constituents, only those for which test data were available at multiple sites. References 10-67. Source Classification Codes in parentheses.

[a] Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments.

[b] Carbon monoxide is not a typical constituent of LFG, but does exist in instances involving landfill (underground) combustion. Therefore, this default value should be used with caution. Of 18 sites where CO was measured, only 2 showed detectable levels of CO.

[c] Source tests did not indicate whether this compound was the para- or ortho- isomer. The para isomer is a Title III-listed HAP.

[d] No data were available to speciate total Hg into the elemental and organic forms.

Table 2.4-2. DEFAULT CONCENTRATIONS OF BENZENE, NMOC, AND TOLUENE BASED ON WASTE DISPOSAL HISTORY[a]

(SCC 50100402, 50300603)

Pollutant	Molecular Weight	Default Concentration (ppmv)	Emission Factor Rating
Benzene[b]	78.11		
Co-disposal		11.1	D
No or Unknown co-disposal		1.91	B
NMOC (as hexane)[c]	86.18		
Co-disposal		2420	D
No or Unknown co-disposal		595	B
Toluene[b]	92.13		
Co-disposal		165	D
No or Unknown co-disposal		39.3	A

[a] References 10-54. Source Classification Codes in parentheses.
[b] Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments.
[c] For NSPS/Emission Guideline compliance purposes, the default concentration for NMOC as specified in the final rule must be used. For purposes not associated with NSPS/Emission Guideline compliance, the default VOC content at co-disposal sites = 85 percent by weight (2,060 ppmv as hexane); at No or Unknown sites = 39 percent by weight 235 ppmv as hexane).

Table 2.4-3. CONTROL EFFICIENCIES FOR LFG CONSTITUENTS[a]

Control Device	Constituent[b]	Control Efficiency (%) Typical	Range	Rating
Boiler/Steam Turbine (50100423)	NMOC	98.0	96-99+	D
	Halogenated Species	99.6	87-99+	D
	Non-Halogenated Species	99.8	67-99+	D
Flare[c] (50100410) (50300601)	NMOC	99.2	90-99+	B
	Halogenated Species	98.0	91-99+	C
	Non-Halogenated Species	99.7	38-99+	C
Gas Turbine (50100420)	NMOC	94.4	90-99+	E
	Halogenated Species	99.7	98-99+	E
	Non-Halogenated Species	98.2	97-99+	E
IC Engine (50100421)	NMOC	97.2	94-99+	E
	Halogenated Species	93.0	90-99+	E
	Non-Halogenated Species	86.1	25-99+	E

[a] References 10-67. Source Classification Codes in parentheses.
[b] Halogenated species are those containing atoms of chlorine, bromine, fluorine, or iodine. For any equipment, the control efficiency for mercury should be assumed to be 0. See section 2.4.4.2 for methods to estimate emissions of SO_2, CO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.

Table 2.4-4. (Metric Units) EMISSION FACTORS FOR SECONDARY COMPOUNDS EXITING CONTROL DEVICES[a]

Control Device	Pollutant[b]	$kg/10^6$ dscm Methane	Emission Factor Rating
Flare[c] (50100410) (50300601)	Nitrogen dioxide	650	C
	Carbon monoxide	12,000	C
	Particulate matter	270	D
IC Engine (50100421)	Nitrogen dioxide	4,000	D
	Carbon monoxide	7,500	C
	Particulate matter	770	E
Boiler/Steam Turbine[d] (50100423)	Nitrogen dioxide	530	D
	Carbon monoxide	90	E
	Particulate matter	130	D
Gas Turbine (50100420)	Nitrogen dioxide	1,400	D
	Carbon monoxide	3,600	E
	Particulate matter	350	E

[a] Source Classification Codes in parentheses. Divide $kg/10^6$ dscm by 16,700 to obtain kg/hr/dscmm.
[b] No data on PM size distributions were available, however for other gas-fired combustion sources, most of the particulate matter is less than 2.5 microns in diameter. Hence, this emission factor can be used to provide estimates of PM-10 or PM-2.5 emissions. See section 2.4.4.2 for methods to estimate CO_2, SO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.
[d] All source tests were conducted on boilers, however emission factors should also be representative of steam turbines. Emission factors are representative of boilers equipped with low-NO_x burners and flue gas recirculation. No data were available for uncontrolled NO_x emissions.

Table 2.4-5. (English Units) EMISSION RATES FOR SECONDARY COMPOUNDS EXITING CONTROL DEVICES[a]

Control Device	Pollutant[b]	$lb/10^6$ dscf Methane	Emission Factor Rating
Flare[c] (50100410) (50300601)	Nitrogen dioxide	40	C
	Carbon monoxide	750	C
	Particulate matter	17	D
IC Engine (50100421)	Nitrogen dioxide	250	D
	Carbon monoxide	470	C
	Particulate matter	48	E
Boiler/Steam Turbine[d] (50100423)	Nitrogen dioxide	33	E
	Carbon monoxide	5.7	E
	Particulate matter	8.2	E
Gas Turbine (50100420)	Nitrogen dioxide	87	D
	Carbon monoxide	230	D
	Particulate matter	22	E

[a] Source Classification Codes in parentheses. Divide $lb/10^6$ dscf by 16,700 to obtain lb/hr/dscfm.
[b] Based on data for other combustion sources, most of the particulate matter will be less than 2.5 microns in diameter. Hence, this emission rate can be used to provide estimates of PM-10 or PM-2.5 emissions. See section 2.4.4.2 for methods to estimate CO_2, SO_2, and HCl.
[c] Where information on equipment was given in the reference, test data were taken from enclosed flares. Control efficiencies are assumed to be equally representative of open flares.
[d] All source tests were conducted on boilers, however emission factors should also be representative of steam turbines. Emission factors are representative of boilers equipped with low-NO_x burners and flue gas recirculation. No data were available for uncontrolled NO_x emissions.

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ATTACHMENT 7.5

WASTE INDUSTRY AIR COALITION VALUES

Waste Industry Air Coalition
Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values

by

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January 2001

Summary

The Waste Industry Air Coalition (WIAC) is comprised of the Solid Waste Association of North America (SWANA) and the National Solid Wastes Management Association. Members of these associations have reported that the AP-42 landfill gas (LFG) defaults, derived from analyses made on average 13 years ago, overestimate the current trace LFG constituent levels.

The WIAC previously submitted three reports addressing LFG trace constituents. An initial report submitted in August 1999[1] showed a continuous long term hazardous air pollutants (HAP) decline at six California landfills (see LFG Constituent Declines below). HAP levels typically declined five fold or more over a ten year period. A second WIAC report was submitted November 1999[2] showing that Hydrogen Chloride levels in recent source tests are more than four times less that the AP-42 default. A third WIAC report was submitted in May 2000[3] showing that the average of recent non-methane organic compound (NMOC) analyses at 144 landfills was 30% less than the current AP-42 defaults.

This fourth report presents a nationwide WIAC survey of recent trace LFG constituent analyses. The WIAC obtained test results from 75 landfills that were made on average within the last two years. The WIAC survey found that the current trace constituent levels are two to four times less than the AP-42 defaults. For the compounds associated with greater health risk at high concentrations, the differences were yet larger. These findings support those from the previous three reports that the AP-42 defaults substantially overstate current LFG constituent levels.

The decline in LFG constituent levels over time may be due to a variety of factors including:

- improvement of analytical methodologies that better identify and quantify trace constituents;
- federal introduction of waste management regulations that strictly regulate hazardous waste disposal;
- federal introduction of municipal solid waste landfill regulations that detect and prevent disposal of unacceptable hazardous wastes; and
- industry transition to processes and products requiring less or no hazardous materials.

In view of the detected decline, it is strongly recommended that the AP-42 defaults be revised to reflect the current LFG constituent levels. From the California landfill results, showing a continuous long term declining trend in the LFG constituents, it can be reasonably anticipated that additional declines will occur. As a result, two further recommendations are offered. First, older AP-42 data should be purged, to eliminate unrepresentative results, and replaced with current data. The most recent AP-42 revision in 1995 only added new but did not purge older values. Second, U.S. EPA should recognize landfills as a unique source for which its AP-42 defaults will need to change over time. U.S. EPA should consider additional future updates of the AP-42 to address the anticipated declines.

[1] "Documentation of Large MSW Landfill Gas Constituent Declines From US EPA AP-42 Default Values", Ray Huitric, County Sanitation Districts of Los Angeles County, and submitted by John Skinner, Executive Director and CEO, SWANA, on August 30, 1999.
[2] Correspondence titled "Submission of Hydrogen Chloride Test Data from Landfill Gas Fired Combustion Devices" dated November 1999 from Edwin P. Valis, Jr., Project Manager, EMCON to Roy Huntley, Emission Factor and Inventory Group, OAQPS, U.S. Environmental Protection Agency.
[3] Correspondence titled "Preliminary Data on Non-Methane Organic Compound (NMOC) Concentrations in Landfill Gas" dated May 9, 2000 from Edward W. Repa, Director of Environmental Programs, NSWMA to Roy Huntley, Emission Factor and Inventory Group, OAQPS, U.S. Environmental Protection Agency.

The WIAC will provide the analyses it collected to U.S. EPA for use in developing new AP-42 values. Since it is recognized that this process will require time, it is recommended that the U.S. EPA make the results contained in this report available on its Internet site as an interim reference.

Report Objectives

This report documents actual landfill gas concentrations for compounds of concern using a national database derived from laboratory analyses employing U.S. EPA standard methods. Herein we establish that differences between the data presented in this report and the current AP-42 default values warrant their full-scale review by U.S. EPA. WIAC believes that the data presented here far better represent current conditions for many compounds and that such a review is well warranted.

Procedures and Results

AP-42 data management procedures were applied to the portion of the WIAC data set having AP-42 default values. The data management procedures address, for example, data screening, air dilution, and data averaging methods. The results of these procedures follow.

Data Collection and Screening

WIAC collected LFG analyses from 75 landfills in sixteen states. This information was processed using U.S. EPA's AP-42 data management procedures. U.S. EPA uses a screening process to remove analytically unacceptable, poorly documented or questionable results.[4] A review of the collected data indicated that the sample analyses would likely pass the AP-42 data screening process. The reported samples were normal, untreated LFG derived from typical gas collection systems. The analytical methodologies appeared to be consistent with those accepted by U.S. EPA.

The analytical results were corrected for air dilution using fixed gas analyses (specifically, methane and carbon dioxide). Several samples lacked either or both methane and carbon dioxide and were excluded. Additionally, some results appeared to be default values (e.g., 50% methane and 50% carbon dioxide) or were unusually high; these were excluded as well. In all, analyses from 27 landfills were omitted from subsequent evaluations.

Data Rating

The data for compounds from the remaining 48 landfills were rated from "A" (strongest) to "E" (weakest) using U.S. EPA's rating system. This process largely depends on the number of 'good' results (A for 20 and up, B for 10 to 19, C for 6 to 9, D for 3 to 5, E for 1 to 2). U.S. EPA also adjusts the rating for a compound's variability. If the arithmetic standard deviation is twice or greater than EPA's default value, then the rating is decreased by one letter. Table 1 summarizes the WIAC rating results and compares these with U.S. EPA's AP-42 data set for 43 compounds.

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[4] "EMISSION FACTOR DOCUMENTATION FOR AP-42 SECTION 2.4 MUNICIPAL SOLID WASTE LANDFILLS REVISED" Office of Air Quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, August 1997; see Table 4-1

Table 1. Count of AP-42 compounds at each rating level (A is strongest; total of 43 compounds).

	Count	
Rating	WIAC	AP-42
A	12	4
B	14	21
C	2	8
D	6	6
E	9	4

The overall rating of the WIAC database is essentially the same as that for U.S. EPA's. For example when the letter grade is expressed as a numeric value (e.g., A = 1, B =2, etc.), the average ratings for the WIAC and U.S. EPA data sets are identical.

Nondetects

AP-42 directs that in general nondetect values should be halved then treated as "real" data. However if a nondetect exceeds by two times the maximum of the detects for a compound, then it should be discarded. It appears that the AP-42 guidance directs that this should be done on a facility-by-facility basis as well as on an emission category basis. However the guidance is unclear. A conservative approach was taken by eliminating only nondetects that were more than double the maximum detection among all facilities.

AP-42 also directs that if all values are nondetects then the result should be clearly indicated as such. U.S. EPA does not indicate which values reported within the LFG portion of AP-42 are nondetects.

Data Averaging

AP-42 specifies that data from a single landfill are to be arithmetically averaged. The result from each landfill is then further averaged using an arithmetic average, geometric mean, or median depending on whether the landfill data are normally distributed, lognormally distributed, or neither, respectively. The distribution type was determined for each compound using the probability plot correlation coefficient method.[5] Where fewer than four landfills reported a compound, the distribution type could not be determined. Instead, the distribution type originally used by U.S. EPA in AP-42 was employed. The distribution type was found to differ from U.S. EPA's for sixteen compounds.

The WIAC data set was averaged using both U.S. EPA's original and the newer WIAC's distribution types (see Table 2). The original distribution types were applied so that an "apples to apples" comparison was possible. Doing otherwise could either create or obscure differences between the data sets. The averages calculated based on U.S. EPA's and WIAC's averaging types are shown in the WIAC column labeled "1" and "2", respectively. Values in WIAC column 2 having a different distribution type are highlighted in gray. The results using the two data averaging methods are discussed in Data Summary below.

Codisposal Landfills

Because of detected statistical differences, EPA developed separate codisposal and municipal solid waste (MSW) only default AP-42 levels for toluene and benzene. All other default values

[5] This test was developed by J.J. Filliben in 1975 as reported in "Statistical Training Course for Ground-Water Monitoring Data Analysis", sponsored by the U.S. Environmental Protection Agency Office of Solid Waste, 1992.

were developed from the combined data sets. WIAC surveyed five codisposal sites and 70 MSW-only sites. The WIAC toluene and benzene data were separately analyzed by disposal site type. No significant differences were found between types of disposal sites for other compounds with one exception. Carbon tetrachloride was detected at one codisposal site but at none of the MSW-only disposal sites. The WIAC value for carbon tetrachloride includes the codisposal sites as these had only a slight effect on the calculated value. The value is reported in Table 2 as a 'nondetect' with a footnote indicating that it was found at one codisposal site.

Data Summary

The WIAC results are compared with AP-42 default concentrations in Table 2. WIAC 1 and 2 show the data prepared using past AP-42 and WIAC updated averaging methods, respectively (see Data Averaging above). The WIAC 1 and 2 concentrations are similarly reduced from AP-42 values by 76% and 80%, respectively. However simple alkane and alcohol compounds for which relatively few analyses were available disproportionately skewed the results. Omitting these compounds shows identical 56% overall reductions. Nearly identical reductions are also noted for aromatic (58%) and chlorinated (79%) compounds. Even though the AP-42 and WIAC averaging methods do not have any large overall effect, the two methods did lead to very significant differences for individual compounds (e.g., note those for 1,1,2,2-Tetrachloroethane).

Discussion

AP-42 and WIAC Differences

The differences between the AP-42 default values and the WIAC survey results may be traced to various factors. It was noted above that there are differences in the age of analyses between the AP-42 and WIAC data sets. Trends in LFG constituents have been well documented and are addressed in the next section. Apart from differences in the age of analyses, it was found that procedures used in U.S. EPA's preparation of the AP-42 defaults departed from the AP-42 guidance[6] in its use of nondetects and the minimum number of sources used for developing default values.

The guidance specifies that nondetects should be used in the development of default values. However all nondetects were discarded in at least one AP-42 update.[7] Nondetects may be discarded under certain circumstances specified by the guidance where these are much greater in magnitude than detects (doing otherwise would bias the default values high). However, the AP-42 documentation does not identify which values are detects or nondetects making it impossible to implement this procedure. Finally, the guidance states that default values developed entirely from nondetects should be clearly identified as such. Since nondetects are not documented, this procedure cannot be carried out.

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[6] "Procedures for Preparing Emission Factor Documents" Office of Air quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1997 (EPA-454/R-95-015 REVISED).

[7] Phone communication (June 2000) with Stephen Roe, U.S. EPA contractor for past AP-42 revisions.

Table 2. WIAC results compared with AP-42 defaults. WIAC-1 values use AP-42 averaging methods. Some WIAC-2 values, grayed in column 2, use different methods (see text).

Compound	WIAC Sites	Concentration, ppmv AP-42	WIAC-1	WIAC-2
1,1,1-Trichloroethane (methyl chloroform)	46	0.48	0.168	0.168
1,1,2,2-Tetrachloroethane	19	1.11	0.070	0.005
1,1-Dichloroethane (ethylidene dichloride)	45	2.35	0.741	0.741
1,1-Dichloroethene (vinylidene chloride)	45	0.2	0.092	0.092
1,2-Dichloroethane (ethylene dichloride)	47	0.41	0.120	0.120
1,2-Dichloropropane (propylene dichloride)	17	0.18	0.023	0.023
2-Propanol (isopropyl alcohol)	3	50.1	7.908	7.908
Acetone	8	7.01	6.126	7.075
Acrylonitrile	3	6.33	<0.036	<0.036
Benzene (Co-Disposal)	3	11.1	10.376	10.376
Benzene (No Co-Disposal)	44	1.91	0.972	0.972
Bromodichloromethane	7	3.13	<0.311	<0.264
Carbon disulfide	31	0.58	0.320	0.221
Carbon tetrachloride	37	0.004	<0.007*	<0.007*
Carbonyl sulfide	29	0.49	0.183	0.183
Chlorobenzene	46	0.25	0.227	0.227
Chlorodifluoromethane (Freon 22)	1	1.3	0.355	0.355
Chloroethane (ethyl chloride)	21	1.25	0.239	0.448
Chloroform	45	0.03	0.021	0.010
Chloromethane	8	1.21	0.249	0.136
Dichlorobenzene	34	0.21	1.607	1.448
Dichlorodifluoromethane (Freon 12)	19	15.7	1.751	0.964
Dichloromethane (Methylene Chloride)	47	14.3	3.395	3.395
Dimethyl sulfide (methyl sulfide)	34	7.82	6.809	6.809
Ethane	1	889	7.943	7.943
Ethanol	4	27.2	118.618	64.425
Ethyl mercaptan (Ethanethiol)	36	2.28	1.356	0.226
Ethylbenzene	26	4.61	6.789	6.789
Ethylene dibromide	30	0.001	<0.046	<0.005
Fluorotrichloromethane (Freon 11)	25	0.76	0.327	0.327
Hexane	4	6.57	2.324	2.063
Hydrogen sulfide	40	35.5	23.578	23.578
Methyl ethyl ketone	8	7.09	10.557	12.694
Methyl isobutyl ketone	7	1.87	0.750	0.750
Methyl mercaptan	36	2.49	1.292	1.266
Perchloroethylene (tetrachloroethylene)	48	3.73	1.193	1.193
Propane	1	11.1	14.757	19.858
Toluene (Co-Disposal)	3	165	37.456	37.456
Toluene (No Co-Disposal)	43	39.3	25.405	25.405
trans-1,2 Dichlorethene	1	2.84	0.051	0.051
Trichloroethylene (trichloroethene)	48	2.82	0.681	0.681
Vinyl Chloride	46	7.34	1.077	1.077
Xylenes	45	12.1	16.582	16.582

Note: "<" indicates that the compound was detected at none of the WIAC sites.
[*] Carbon Tetrachloride was detected at one codisposal site but at none of 35 MSW-only disposal sites.

The guidance also states that a minimum of ten sources should be used in developing a default value (use of fewer sources results in unreliable values). However several of the AP-42 defaults were developed from many fewer samples and sometimes just one sample. In view of the high variability observed between landfill test results, it is recommended that U.S. EPA carefully review its practices in developing AP-42 defaults with fewer than ten samples. At a minimum, defaults derived from limited data should be clearly identified and users cautioned as to their questionable reliability.

LFG Constituent Declines

Large, long term declines in LFG HAP values were documented in the August 1999 WIAC report. This report focused on four active and two closed landfills in Southern California. The decline at the active landfills was concurrent with implementation of waste-screening programs that prevented the disposal of incidental amounts of hazardous wastes present in the municipal solid waste stream starting in the early 1980's. U.S. EPA's Resource Conservation and Recovery Act (RCRA) rules for MSW landfills, implemented starting October 9, 1991 (40 CFR 258.20) also began requiring such exclusion programs on a nationwide basis. Additionally, the U.S. EPA established Subtitle C requirements per the 1984 RCRA amendments that set minimum treatment standards for listed wastes. This program ensured that the treatment residuals were placed in Subtitle C landfills. The combination of these programs likely reduced or eliminated incidental hazardous waste disposal in active MSW landfills.

An attempt was made to determine whether a similar long term decline could be detected at other active landfills represented in the AP-42 database. A comparison was made of those sites that were reported by both EPA and WIAC. However it was found that many of the AP-42 landfills had coded names. The only active sites identifiably the same were those already reported in the August 1999 report. It is recommended that U.S. EPA identify the coded AP-42 landfills so that a meaningful comparison could be made with the WIAC results.

The LFG HAP decline for the two closed landfills in the August 1999 report would be unrelated to improved hazardous waste management practices. However the anaerobic decomposition processes at these sites are likely to have brought about such declines through one or more mechanism. HAP compounds will tend to volatilize into newly generated anaerobic gases; the gases together with the trace constituents will ultimately exit the landfill, removing the HAP compounds. Additionally, anaerobic processes may destroy or transform some HAP compounds.

Another factor to consider in the decline of HAP compounds is the effect of improved laboratory methodologies in recent years. Areas of improvement include utilization of more sophisticated equipment and adoption of standardized procedures for all analytical aspects. Some of the improved procedures include sample container preparation, instrument calibration, and quality assurance acceptance criteria.

Equipment and procedure improvements reduce the scatter of data, increase data reliability, minimize compound misidentifications, and lower detection limits. Detection limits are especially important since several of the AP-42 compounds have few or no detections; improved detection limits would tend to lower the calculated AP-42 defaults. One laboratory submitting data for this report indicated that detection limits were more than halved in the last five years.

Urban Air Toxics Strategy

The U.S. EPA used AP-42 defaults for the recently completed Urban Air Toxics (UAT) Strategy. A review of the UAT findings based on the newer WIAC results is presented in Table 3. For all compounds detected in LFG, municipal landfills dropped in rank among industrial sources. The drop was typically from sixth to at least thirteenth or more. Four of the nine compounds dropped from the ranking and rank no more than 17th. The average MSW landfill contribution per compound dropped from 13% to 1.5%. One of the more dramatic findings concerns U.S. EPA's original attribution of 84% of all 1,1,2,2-Tetrachloroethane emissions to landfills; the WIAC findings show that the landfill emission level is about 2% of all sources. These findings indicate that municipal landfills have markedly less emissions, compared to other industrial sources, than U.S. EPA previously estimated.

Table 3. Summary of changes to Urban Air Toxic (UAT) emission estimates based on changes from AP-42 defaults to current compound levels measured by WIAC.

Compound	Annual Tons		Portion of UAT Inventory		Rank		Number of Sources
	AP-42	WIAC	AP-42	WIAC	AP-42	WIAC	
1,1,2,2-Tetrachloroethane	216	1.0	84.08%	2.37%	1	5	16
1,2-Dichloropropane	23.6	3.0	3.59%	1.48%	6	8	12
Acrylonitrile	389	2.2	15.28%	0.10%	3	15	17
Benzene	173	87.9	3.86%	2.00%	11	13	17
Chloroform	4.17	1.3	4.94%	1.63%	6	9	17
Ethylene Dichloride	47	13.7	1.15%	0.34%	10	*	17
Methylene Chloride	1550	367	1.67%	0.40%	11	*	17
Tetrachloroethylene	717	229	0.59%	0.19%	6	*	17
Trichloroethylene	429	104	0.64%	0.16%	13	*	17
Vinyl Chloride	531	77.9	19.65%	3.46%	2	4	17
Vinylidene Chloride	22.5	10.3	10.10%	3.45%	4	5	14

* Landfill emissions are less than for other ranked sources.

Conclusions

WIAC conducted a national survey of recent LFG analyses. Recent results from 75 landfills were analyzed using AP-42 methodologies. The AP-42 defaults were found to typically overestimate current levels by two to four hundred percent. For some of the more health significant compounds, the differences were larger yet. The overestimated AP-42 values may potentially misdirect U.S. EPA's policy development. For example, the recently completed Urban Air Toxics Strategy appears to have substantially overestimated actual landfill emissions. Furthermore, the existing AP-42 default values may adversely impact individual landfills required to use these values.

As a result, WIAC believes that the AP-42 defaults should be revised to reflect the decline in LFG constituents. The most recent AP-42 revision in 1995 added new data to older values and averaged the combined data sets. This approach is appropriate only for data that does not trend. It is recommended that older data be purged and replaced using current data presented in this paper.

ATTACHMENT 7.6

LANDGEM MODEL OUT FOR LANDFILL GAS GENERATION

SUMMARY OF LANDGEM MODEL OUTPUTS FOR TOTAL LANDFILL GAS GENERATION

Two models were required to estimate total landfill gas generation from the landfill as the LandGEM Model cannot accpet a waste intake of more than 80 years. Therefore the first model encompasses gas generated from waste intake between 1977 and 2056, and the second model represents the gas generated from waste intake between 2057 and 2081. The following table represents the summation of the LandGEM model results predicted for both models.

Year	Waste-In-Place (in tons)	LandGEM1	LandGEM2	LandGEM Total
1977	0	0		0
1978	3,650	0.3		0.3
1979	7,350	1		1
1980	11,100	1		1
1981	14,850	1		1
1982	18,650	2		2
1983	22,500	2		2
1984	26,350	2		2
1985	30,250	3		3
1986	34,200	3		3
1987	38,150	3		3
1988	343,490	29		29
1989	648,830	55		55
1990	954,170	81		81
1991	1,179,083	99		99
1992	1,424,772	119		119
1993	1,710,484	143		143
1994	1,996,196	166		166
1995	2,281,908	190		190
1996	2,567,620	213		213
1997	2,868,831	237		237
1998	3,161,906	260		260
1999	3,407,062	279		279
2000	3,672,479	300		300
2001	3,944,184	321		321
2002	4,205,712	341		341
2003	4,476,494	362		362
2004	4,812,942	388		388
2005	5,158,101	415		415
2006	5,458,922	437		437
2007	6,043,887	484		484
2008	6,654,732	533		533
2009	7,210,143	576		576
2010	7,636,743	609		609
2011	8,147,138	648		648
2012	8,636,551	685		685
2013	9,065,648	717		717
2014	9,446,598	745		745
2015	9,904,711	778		778
2016	10,405,920	816		816
2017	10,864,380	849		849
2018	11,325,132	882		882
2019	11,788,188	916		916
2020	12,253,560	949		949
2021	12,721,258	982		982
2022	13,191,294	1,016		1,016
2023	13,663,681	1,049		1,049
2024	14,138,430	1,082		1,082
2025	14,615,553	1,115		1,115
2026	15,095,061	1,148		1,148
2027	15,576,967	1,181		1,181
2028	16,061,282	1,214		1,214

2029	16,548,019	1,247		1,247
2030	17,037,189	1,280		1,280
2031	17,528,805	1,313		1,313
2032	18,022,880	1,346		1,346
2033	18,519,425	1,379		1,379
2034	19,018,452	1,412		1,412
2035	19,519,975	1,445		1,445
2036	20,024,005	1,478		1,478
2037	20,530,556	1,511		1,511
2038	21,039,639	1,544		1,544
2039	21,551,267	1,576		1,576
2040	22,065,454	1,609		1,609
2041	22,582,212	1,642		1,642
2042	23,101,553	1,675		1,675
2043	23,623,491	1,708		1,708
2044	24,148,039	1,740		1,740
2045	24,675,210	1,773		1,773
2046	25,205,016	1,806		1,806
2047	25,737,472	1,839		1,839
2048	26,272,589	1,872		1,872
2049	26,810,383	1,904		1,904
2050	27,350,865	1,937		1,937
2051	27,894,050	1,970		1,970
2052	28,439,951	2,003		2,003
2053	28,988,581	2,036		2,036
2054	29,539,954	2,068		2,068
2055	30,094,084	2,101		2,101
2056	30,650,985	2,134		2,134
2057	30,650,985	2,167	0	2,167
2058	31,213,469	2,152	48	2,200
2059	31,778,765	2,137	96	2,233
2060	32,346,888	2,122	144	2,265
2061	32,917,851	2,107	191	2,298
2062	33,491,669	2,092	239	2,331
2063	34,068,356	2,078	286	2,364
2064	34,647,927	2,063	334	2,397
2065	35,230,395	2,049	381	2,430
2066	35,815,776	2,035	428	2,463
2067	36,404,084	2,020	475	2,496
2068	36,995,333	2,006	523	2,529
2069	37,589,538	1,992	570	2,562
2070	38,186,715	1,978	616	2,595
2071	38,786,877	1,965	663	2,628
2072	39,390,041	1,951	710	2,661
2073	39,996,220	1,937	757	2,694
2074	40,605,429	1,924	804	2,727
2075	41,217,685	1,910	850	2,760
2076	41,833,003	1,897	897	2,794
2077	42,451,397	1,884	943	2,827
2078	43,072,882	1,871	989	2,860
2079	43,697,476	1,858	1,036	2,893
2080	44,325,192	1,845	1,082	2,927
2081	44,956,047	1,832	1,128	2,960
2082	45,245,910	1,819	1,145	**2,964**
2083	45,245,910	1,806	1,137	2,943
2084	45,245,910	1,794	1,129	2,923
2085	45,245,910	1,781	1,121	2,903
2086	45,245,910	1,769	1,114	2,882
2087	45,245,910	1,756	1,106	2,862
2088	45,245,910	1,744	1,098	2,842

Summary Report

Landfill Name or Identifier: Camino Real Landfill LandGEM (1977-2056)

Date: Friday, November 23, 2018

Description/Comments:
The NMOC concentration is from AP-42 for sites with no co-disposal, and the site-specific methane generation rate (k) was taken from the August 1999 Tier III.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,
Q_{CH_4} = annual methane generation in the year of the calculation (*m^3/year*)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1977**	
Landfill Closure Year (with 80-year limit)	**2056**	
Actual Closure Year (without limit)	***2056***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.007**	*year^{-1}*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**999**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1: **Total landfill gas**
Gas / Pollutant #2: **NMOC**
Gas / Pollutant #3: **Carbon dioxide**
Gas / Pollutant #4: **Methane**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1977	3,318	3,650	0	0
1978	3,364	3,700	3,318	3,650
1979	3,409	3,750	6,682	7,350
1980	3,409	3,750	10,091	11,100
1981	3,455	3,800	13,500	14,850
1982	3,500	3,850	16,955	18,650
1983	3,500	3,850	20,455	22,500
1984	3,545	3,900	23,955	26,350
1985	3,591	3,950	27,500	30,250
1986	3,591	3,950	31,091	34,200
1987	277,582	305,340	34,682	38,150
1988	277,582	305,340	312,264	343,490
1989	277,582	305,340	589,845	648,830
1990	204,466	224,913	867,427	954,170
1991	223,354	245,690	1,071,893	1,179,083
1992	259,738	285,712	1,295,248	1,424,772
1993	259,738	285,712	1,554,986	1,710,484
1994	259,738	285,712	1,814,724	1,996,196
1995	259,738	285,712	2,074,462	2,281,908
1996	273,828	301,211	2,334,200	2,567,620
1997	266,432	293,076	2,608,028	2,868,831
1998	222,869	245,156	2,874,460	3,161,906
1999	241,288	265,417	3,097,329	3,407,062
2000	247,004	271,705	3,338,617	3,672,479
2001	237,753	261,528	3,585,621	3,944,184
2002	246,165	270,782	3,823,374	4,205,712
2003	305,862	336,449	4,069,540	4,476,494
2004	313,780	345,158	4,375,402	4,812,942
2005	273,474	300,821	4,689,182	5,158,101
2006	531,787	584,966	4,962,656	5,458,922
2007	555,313	610,845	5,494,443	6,043,887
2008	504,919	555,411	6,049,756	6,654,732
2009	387,818	426,600	6,554,675	7,210,143
2010	463,996	510,396	6,942,494	7,636,743
2011	444,920	489,412	7,406,490	8,147,138
2012	390,089	429,098	7,851,410	8,636,551
2013	346,318	380,950	8,241,498	9,065,648
2014	416,466	458,113	8,587,816	9,446,598
2015	455,645	501,209	9,004,283	9,904,711
2016	416,782	458,460	9,459,927	10,405,920

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2017	418,866	460,752	9,876,709	10,864,380
2018	420,960	463,056	10,295,575	11,325,132
2019	423,065	465,371	10,716,535	11,788,188
2020	425,180	467,698	11,139,600	12,253,560
2021	427,306	470,037	11,564,780	12,721,258
2022	429,443	472,387	11,992,086	13,191,294
2023	431,590	474,749	12,421,528	13,663,681
2024	433,748	477,123	12,853,118	14,138,430
2025	435,917	479,508	13,286,866	14,615,553
2026	438,096	481,906	13,722,783	15,095,061
2027	440,287	484,315	14,160,879	15,576,967
2028	442,488	486,737	14,601,165	16,061,282
2029	444,700	489,170	15,043,653	16,548,019
2030	446,924	491,616	15,488,354	17,037,189
2031	449,159	494,074	15,935,278	17,528,805
2032	451,404	496,545	16,384,436	18,022,880
2033	453,661	499,028	16,835,841	18,519,425
2034	455,930	501,523	17,289,502	19,018,452
2035	458,209	504,030	17,745,432	19,519,975
2036	460,500	506,550	18,203,641	20,024,005
2037	462,803	509,083	18,664,141	20,530,556
2038	465,117	511,629	19,126,944	21,039,639
2039	467,442	514,187	19,592,061	21,551,267
2040	469,780	516,758	20,059,504	22,065,454
2041	472,129	519,341	20,529,283	22,582,212
2042	474,489	521,938	21,001,412	23,101,553
2043	476,862	524,548	21,475,901	23,623,491
2044	479,246	527,171	21,952,763	24,148,039
2045	481,642	529,806	22,432,009	24,675,210
2046	484,050	532,455	22,913,651	25,205,016
2047	486,471	535,118	23,397,702	25,737,472
2048	488,903	537,793	23,884,172	26,272,589
2049	491,348	540,482	24,373,075	26,810,383
2050	493,804	543,185	24,864,423	27,350,865
2051	496,273	545,901	25,358,227	27,894,050
2052	498,755	548,630	25,854,500	28,439,951
2053	501,248	551,373	26,353,255	28,988,581
2054	503,755	554,130	26,854,504	29,539,954
2055	506,273	556,901	27,358,258	30,094,084
2056	508,805	559,685	27,864,532	30,650,985

Results

Year	Total landfill gas			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
1977	0	0	0	0	0	0
1978	5.783E+00	4.631E+03	3.111E-01	1.658E-02	4.626E+00	3.108E-04
1979	1.161E+01	9.293E+03	6.244E-01	3.328E-02	9.284E+00	6.238E-04
1980	1.747E+01	1.399E+04	9.397E-01	5.008E-02	1.397E+01	9.388E-04
1981	2.329E+01	1.865E+04	1.253E+00	6.677E-02	1.863E+01	1.252E-03
1982	2.914E+01	2.334E+04	1.568E+00	8.357E-02	2.331E+01	1.566E-03
1983	3.504E+01	2.806E+04	1.885E+00	1.005E-01	2.803E+01	1.883E-03
1984	4.090E+01	3.275E+04	2.200E+00	1.173E-01	3.271E+01	2.198E-03
1985	4.679E+01	3.747E+04	2.517E+00	1.342E-01	3.743E+01	2.515E-03
1986	5.272E+01	4.222E+04	2.837E+00	1.512E-01	4.218E+01	2.834E-03
1987	5.861E+01	4.693E+04	3.154E+00	1.681E-01	4.689E+01	3.150E-03
1988	5.420E+02	4.340E+05	2.916E+01	1.554E+00	4.336E+02	2.913E-02
1989	1.022E+03	8.184E+05	5.499E+01	2.930E+00	8.175E+02	5.493E-02
1990	1.499E+03	1.200E+06	8.063E+01	4.297E+00	1.199E+03	8.055E-02
1991	1.845E+03	1.477E+06	9.924E+01	5.289E+00	1.476E+03	9.914E-02
1992	2.221E+03	1.778E+06	1.195E+02	6.368E+00	1.777E+03	1.194E-01
1993	2.658E+03	2.129E+06	1.430E+02	7.622E+00	2.126E+03	1.429E-01
1994	3.092E+03	2.476E+06	1.664E+02	8.867E+00	2.474E+03	1.662E-01
1995	3.523E+03	2.821E+06	1.896E+02	1.010E+01	2.819E+03	1.894E-01
1996	3.952E+03	3.164E+06	2.126E+02	1.133E+01	3.161E+03	2.124E-01
1997	4.401E+03	3.524E+06	2.368E+02	1.262E+01	3.521E+03	2.366E-01
1998	4.835E+03	3.872E+06	2.601E+02	1.386E+01	3.868E+03	2.599E-01
1999	5.190E+03	4.156E+06	2.792E+02	1.488E+01	4.151E+03	2.789E-01
2000	5.574E+03	4.463E+06	2.999E+02	1.598E+01	4.459E+03	2.996E-01
2001	5.966E+03	4.777E+06	3.210E+02	1.711E+01	4.772E+03	3.206E-01
2002	6.338E+03	5.075E+06	3.410E+02	1.817E+01	5.070E+03	3.407E-01
2003	6.723E+03	5.384E+06	3.617E+02	1.928E+01	5.378E+03	3.614E-01
2004	7.209E+03	5.773E+06	3.879E+02	2.067E+01	5.767E+03	3.875E-01
2005	7.706E+03	6.170E+06	4.146E+02	2.210E+01	6.164E+03	4.142E-01
2006	8.129E+03	6.509E+06	4.373E+02	2.331E+01	6.503E+03	4.369E-01
2007	8.999E+03	7.206E+06	4.842E+02	2.580E+01	7.199E+03	4.837E-01
2008	9.904E+03	7.931E+06	5.329E+02	2.840E+01	7.923E+03	5.323E-01
2009	1.071E+04	8.580E+06	5.765E+02	3.072E+01	8.571E+03	5.759E-01
2010	1.132E+04	9.061E+06	6.088E+02	3.245E+01	9.052E+03	6.082E-01
2011	1.205E+04	9.646E+06	6.481E+02	3.454E+01	9.636E+03	6.474E-01
2012	1.274E+04	1.020E+07	6.853E+02	3.652E+01	1.019E+04	6.846E-01
2013	1.333E+04	1.067E+07	7.171E+02	3.822E+01	1.066E+04	7.164E-01
2014	1.384E+04	1.108E+07	7.446E+02	3.968E+01	1.107E+04	7.438E-01
2015	1.447E+04	1.159E+07	7.784E+02	4.149E+01	1.157E+04	7.776E-01
2016	1.516E+04	1.214E+07	8.157E+02	4.347E+01	1.213E+04	8.149E-01
2017	1.578E+04	1.264E+07	8.491E+02	4.525E+01	1.262E+04	8.483E-01
2018	1.640E+04	1.313E+07	8.825E+02	4.703E+01	1.312E+04	8.816E-01
2019	1.702E+04	1.363E+07	9.158E+02	4.881E+01	1.362E+04	9.149E-01
2020	1.764E+04	1.413E+07	9.491E+02	5.058E+01	1.411E+04	9.481E-01
2021	1.826E+04	1.462E+07	9.823E+02	5.235E+01	1.461E+04	9.813E-01
2022	1.888E+04	1.511E+07	1.016E+03	5.412E+01	1.510E+04	1.015E+00
2023	1.949E+04	1.561E+07	1.049E+03	5.589E+01	1.559E+04	1.048E+00
2024	2.011E+04	1.610E+07	1.082E+03	5.766E+01	1.609E+04	1.081E+00
2025	2.072E+04	1.659E+07	1.115E+03	5.942E+01	1.658E+04	1.114E+00
2026	2.134E+04	1.709E+07	1.148E+03	6.119E+01	1.707E+04	1.147E+00

Results (Continued)

Year	Total landfill gas			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2027	2.195E+04	1.758E+07	1.181E+03	6.295E+01	1.756E+04	1.180E+00
2028	2.257E+04	1.807E+07	1.214E+03	6.471E+01	1.805E+04	1.213E+00
2029	2.318E+04	1.856E+07	1.247E+03	6.647E+01	1.854E+04	1.246E+00
2030	2.380E+04	1.905E+07	1.280E+03	6.823E+01	1.903E+04	1.279E+00
2031	2.441E+04	1.954E+07	1.313E+03	6.999E+01	1.953E+04	1.312E+00
2032	2.502E+04	2.004E+07	1.346E+03	7.174E+01	2.002E+04	1.345E+00
2033	2.563E+04	2.053E+07	1.379E+03	7.350E+01	2.050E+04	1.378E+00
2034	2.624E+04	2.102E+07	1.412E+03	7.525E+01	2.099E+04	1.411E+00
2035	2.686E+04	2.151E+07	1.445E+03	7.701E+01	2.148E+04	1.443E+00
2036	2.747E+04	2.199E+07	1.478E+03	7.876E+01	2.197E+04	1.476E+00
2037	2.808E+04	2.248E+07	1.511E+03	8.051E+01	2.246E+04	1.509E+00
2038	2.869E+04	2.297E+07	1.544E+03	8.226E+01	2.295E+04	1.542E+00
2039	2.930E+04	2.346E+07	1.576E+03	8.401E+01	2.344E+04	1.575E+00
2040	2.991E+04	2.395E+07	1.609E+03	8.576E+01	2.393E+04	1.608E+00
2041	3.052E+04	2.444E+07	1.642E+03	8.751E+01	2.441E+04	1.640E+00
2042	3.113E+04	2.493E+07	1.675E+03	8.926E+01	2.490E+04	1.673E+00
2043	3.174E+04	2.542E+07	1.708E+03	9.101E+01	2.539E+04	1.706E+00
2044	3.235E+04	2.590E+07	1.740E+03	9.276E+01	2.588E+04	1.739E+00
2045	3.296E+04	2.639E+07	1.773E+03	9.451E+01	2.637E+04	1.772E+00
2046	3.357E+04	2.688E+07	1.806E+03	9.625E+01	2.685E+04	1.804E+00
2047	3.418E+04	2.737E+07	1.839E+03	9.800E+01	2.734E+04	1.837E+00
2048	3.479E+04	2.786E+07	1.872E+03	9.975E+01	2.783E+04	1.870E+00
2049	3.540E+04	2.834E+07	1.904E+03	1.015E+02	2.832E+04	1.903E+00
2050	3.601E+04	2.883E+07	1.937E+03	1.032E+02	2.880E+04	1.935E+00
2051	3.662E+04	2.932E+07	1.970E+03	1.050E+02	2.929E+04	1.968E+00
2052	3.723E+04	2.981E+07	2.003E+03	1.067E+02	2.978E+04	2.001E+00
2053	3.783E+04	3.030E+07	2.036E+03	1.085E+02	3.027E+04	2.034E+00
2054	3.844E+04	3.078E+07	2.068E+03	1.102E+02	3.075E+04	2.066E+00
2055	3.905E+04	3.127E+07	2.101E+03	1.120E+02	3.124E+04	2.099E+00
2056	3.966E+04	3.176E+07	2.134E+03	1.137E+02	3.173E+04	2.132E+00
2057	4.027E+04	3.225E+07	2.167E+03	1.155E+02	3.222E+04	2.165E+00
2058	3.999E+04	3.202E+07	2.152E+03	1.147E+02	3.199E+04	2.150E+00
2059	3.971E+04	3.180E+07	2.137E+03	1.139E+02	3.177E+04	2.135E+00
2060	3.944E+04	3.158E+07	2.122E+03	1.131E+02	3.155E+04	2.120E+00
2061	3.916E+04	3.136E+07	2.107E+03	1.123E+02	3.133E+04	2.105E+00
2062	3.889E+04	3.114E+07	2.092E+03	1.115E+02	3.111E+04	2.090E+00
2063	3.862E+04	3.092E+07	2.078E+03	1.107E+02	3.089E+04	2.076E+00
2064	3.835E+04	3.071E+07	2.063E+03	1.100E+02	3.068E+04	2.061E+00
2065	3.808E+04	3.049E+07	2.049E+03	1.092E+02	3.046E+04	2.047E+00
2066	3.782E+04	3.028E+07	2.035E+03	1.084E+02	3.025E+04	2.033E+00
2067	3.755E+04	3.007E+07	2.020E+03	1.077E+02	3.004E+04	2.018E+00
2068	3.729E+04	2.986E+07	2.006E+03	1.069E+02	2.983E+04	2.004E+00
2069	3.703E+04	2.965E+07	1.992E+03	1.062E+02	2.962E+04	1.990E+00
2070	3.677E+04	2.944E+07	1.978E+03	1.054E+02	2.942E+04	1.976E+00
2071	3.651E+04	2.924E+07	1.965E+03	1.047E+02	2.921E+04	1.963E+00
2072	3.626E+04	2.904E+07	1.951E+03	1.040E+02	2.901E+04	1.949E+00
2073	3.601E+04	2.883E+07	1.937E+03	1.032E+02	2.880E+04	1.935E+00
2074	3.576E+04	2.863E+07	1.924E+03	1.025E+02	2.860E+04	1.922E+00
2075	3.551E+04	2.843E+07	1.910E+03	1.018E+02	2.840E+04	1.908E+00
2076	3.526E+04	2.823E+07	1.897E+03	1.011E+02	2.821E+04	1.895E+00
2077	3.501E+04	2.804E+07	1.884E+03	1.004E+02	2.801E+04	1.882E+00

Results (Continued)

Year	Total landfill gas			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2078	3.477E+04	2.784E+07	1.871E+03	9.970E+01	2.781E+04	1.869E+00
2079	3.453E+04	2.765E+07	1.858E+03	9.900E+01	2.762E+04	1.856E+00
2080	3.429E+04	2.745E+07	1.845E+03	9.831E+01	2.743E+04	1.843E+00
2081	3.405E+04	2.726E+07	1.832E+03	9.762E+01	2.724E+04	1.830E+00
2082	3.381E+04	2.707E+07	1.819E+03	9.694E+01	2.705E+04	1.817E+00
2083	3.357E+04	2.688E+07	1.806E+03	9.627E+01	2.686E+04	1.804E+00
2084	3.334E+04	2.670E+07	1.794E+03	9.560E+01	2.667E+04	1.792E+00
2085	3.311E+04	2.651E+07	1.781E+03	9.493E+01	2.648E+04	1.779E+00
2086	3.288E+04	2.632E+07	1.769E+03	9.427E+01	2.630E+04	1.767E+00
2087	3.265E+04	2.614E+07	1.756E+03	9.361E+01	2.612E+04	1.755E+00
2088	3.242E+04	2.596E+07	1.744E+03	9.296E+01	2.593E+04	1.742E+00
2089	3.219E+04	2.578E+07	1.732E+03	9.231E+01	2.575E+04	1.730E+00
2090	3.197E+04	2.560E+07	1.720E+03	9.166E+01	2.557E+04	1.718E+00
2091	3.174E+04	2.542E+07	1.708E+03	9.102E+01	2.539E+04	1.706E+00
2092	3.152E+04	2.524E+07	1.696E+03	9.039E+01	2.522E+04	1.694E+00
2093	3.130E+04	2.507E+07	1.684E+03	8.976E+01	2.504E+04	1.683E+00
2094	3.108E+04	2.489E+07	1.672E+03	8.913E+01	2.487E+04	1.671E+00
2095	3.087E+04	2.472E+07	1.661E+03	8.851E+01	2.469E+04	1.659E+00
2096	3.065E+04	2.455E+07	1.649E+03	8.789E+01	2.452E+04	1.648E+00
2097	3.044E+04	2.437E+07	1.638E+03	8.728E+01	2.435E+04	1.636E+00
2098	3.023E+04	2.420E+07	1.626E+03	8.667E+01	2.418E+04	1.625E+00
2099	3.002E+04	2.404E+07	1.615E+03	8.607E+01	2.401E+04	1.613E+00
2100	2.981E+04	2.387E+07	1.604E+03	8.547E+01	2.384E+04	1.602E+00
2101	2.960E+04	2.370E+07	1.592E+03	8.487E+01	2.368E+04	1.591E+00
2102	2.939E+04	2.354E+07	1.581E+03	8.428E+01	2.351E+04	1.580E+00
2103	2.919E+04	2.337E+07	1.570E+03	8.369E+01	2.335E+04	1.569E+00
2104	2.898E+04	2.321E+07	1.559E+03	8.311E+01	2.319E+04	1.558E+00
2105	2.878E+04	2.305E+07	1.548E+03	8.253E+01	2.302E+04	1.547E+00
2106	2.858E+04	2.289E+07	1.538E+03	8.195E+01	2.286E+04	1.536E+00
2107	2.838E+04	2.273E+07	1.527E+03	8.138E+01	2.270E+04	1.525E+00
2108	2.818E+04	2.257E+07	1.516E+03	8.081E+01	2.255E+04	1.515E+00
2109	2.799E+04	2.241E+07	1.506E+03	8.025E+01	2.239E+04	1.504E+00
2110	2.779E+04	2.225E+07	1.495E+03	7.969E+01	2.223E+04	1.494E+00
2111	2.760E+04	2.210E+07	1.485E+03	7.913E+01	2.208E+04	1.483E+00
2112	2.740E+04	2.194E+07	1.474E+03	7.858E+01	2.192E+04	1.473E+00
2113	2.721E+04	2.179E+07	1.464E+03	7.803E+01	2.177E+04	1.463E+00
2114	2.702E+04	2.164E+07	1.454E+03	7.749E+01	2.162E+04	1.452E+00
2115	2.684E+04	2.149E+07	1.444E+03	7.695E+01	2.147E+04	1.442E+00
2116	2.665E+04	2.134E+07	1.434E+03	7.641E+01	2.132E+04	1.432E+00
2117	2.646E+04	2.119E+07	1.424E+03	7.588E+01	2.117E+04	1.422E+00

Summary Report

Landfill Name or Identifier: Camino Real Landfill LandGEM (2057-2081)

Date: Friday, November 23, 2018

Description/Comments:

The NMOC concentration is from AP-42 for sites with no co-disposal, and the site-specific methane generation rate (k) was taken from the August 1999 Tier III.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*$year^{-1}$*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2057**	
Landfill Closure Year (with 80-year limit)	**2081**	
Actual Closure Year (without limit)	***2081***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.007**	*year* $^{-1}$
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**999**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**NMOC**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Methane**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2057	511,349	562,484	0	0
2058	513,906	565,296	511,349	562,484
2059	516,475	568,123	1,025,254	1,127,780
2060	519,058	570,963	1,541,730	1,695,903
2061	521,653	573,818	2,060,787	2,266,866
2062	524,261	576,687	2,582,440	2,840,684
2063	526,882	579,571	3,106,701	3,417,371
2064	529,517	582,468	3,633,583	3,996,942
2065	532,164	585,381	4,163,100	4,579,410
2066	534,825	588,308	4,695,265	5,164,791
2067	537,499	591,249	5,230,090	5,753,099
2068	540,187	594,205	5,767,589	6,344,348
2069	542,888	597,177	6,307,776	6,938,553
2070	545,602	600,162	6,850,664	7,535,730
2071	548,330	603,163	7,396,266	8,135,892
2072	551,072	606,179	7,944,596	8,739,056
2073	553,827	609,210	8,495,668	9,345,235
2074	556,596	612,256	9,049,495	9,954,445
2075	559,379	615,317	9,606,091	10,566,700
2076	562,176	618,394	10,165,471	11,182,018
2077	564,987	621,486	10,727,647	11,800,412
2078	567,812	624,593	11,292,634	12,421,897
2079	570,651	627,716	11,860,446	13,046,491
2080	573,504	630,855	12,431,097	13,674,207
2081	263,512	289,863	13,004,601	14,305,062
2082	0	0	13,268,113	14,594,925
2083	0	0	13,268,113	14,594,925
2084	0	0	13,268,113	14,594,925
2085	0	0	13,268,113	14,594,925
2086	0	0	13,268,113	14,594,925
2087	0	0	13,268,113	14,594,925
2088	0	0	13,268,113	14,594,925
2089	0	0	13,268,113	14,594,925
2090	0	0	13,268,113	14,594,925
2091	0	0	13,268,113	14,594,925
2092	0	0	13,268,113	14,594,925
2093	0	0	13,268,113	14,594,925
2094	0	0	13,268,113	14,594,925
2095	0	0	13,268,113	14,594,925
2096	0	0	13,268,113	14,594,925

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2097	0	0	13,268,113	14,594,925
2098	0	0	13,268,113	14,594,925
2099	0	0	13,268,113	14,594,925
2100	0	0	13,268,113	14,594,925
2101	0	0	13,268,113	14,594,925
2102	0	0	13,268,113	14,594,925
2103	0	0	13,268,113	14,594,925
2104	0	0	13,268,113	14,594,925
2105	0	0	13,268,113	14,594,925
2106	0	0	13,268,113	14,594,925
2107	0	0	13,268,113	14,594,925
2108	0	0	13,268,113	14,594,925
2109	0	0	13,268,113	14,594,925
2110	0	0	13,268,113	14,594,925
2111	0	0	13,268,113	14,594,925
2112	0	0	13,268,113	14,594,925
2113	0	0	13,268,113	14,594,925
2114	0	0	13,268,113	14,594,925
2115	0	0	13,268,113	14,594,925
2116	0	0	13,268,113	14,594,925
2117	0	0	13,268,113	14,594,925
2118	0	0	13,268,113	14,594,925
2119	0	0	13,268,113	14,594,925
2120	0	0	13,268,113	14,594,925
2121	0	0	13,268,113	14,594,925
2122	0	0	13,268,113	14,594,925
2123	0	0	13,268,113	14,594,925
2124	0	0	13,268,113	14,594,925
2125	0	0	13,268,113	14,594,925
2126	0	0	13,268,113	14,594,925
2127	0	0	13,268,113	14,594,925
2128	0	0	13,268,113	14,594,925
2129	0	0	13,268,113	14,594,925
2130	0	0	13,268,113	14,594,925
2131	0	0	13,268,113	14,594,925
2132	0	0	13,268,113	14,594,925
2133	0	0	13,268,113	14,594,925
2134	0	0	13,268,113	14,594,925
2135	0	0	13,268,113	14,594,925
2136	0	0	13,268,113	14,594,925

Results

Year	Total landfill gas			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2057	0	0	0	0	0	0
2058	8.912E+02	7.136E+05	4.795E+01	2.555E+00	7.129E+02	4.790E-02
2059	1.781E+03	1.426E+06	9.580E+01	5.106E+00	1.424E+03	9.571E-02
2060	2.668E+03	2.137E+06	1.436E+02	7.651E+00	2.135E+03	1.434E-01
2061	3.554E+03	2.846E+06	1.912E+02	1.019E+01	2.843E+03	1.910E-01
2062	4.439E+03	3.554E+06	2.388E+02	1.273E+01	3.551E+03	2.386E-01
2063	5.322E+03	4.261E+06	2.863E+02	1.526E+01	4.257E+03	2.860E-01
2064	6.203E+03	4.967E+06	3.337E+02	1.779E+01	4.962E+03	3.334E-01
2065	7.082E+03	5.671E+06	3.810E+02	2.031E+01	5.666E+03	3.807E-01
2066	7.960E+03	6.374E+06	4.283E+02	2.283E+01	6.368E+03	4.279E-01
2067	8.837E+03	7.076E+06	4.755E+02	2.534E+01	7.069E+03	4.750E-01
2068	9.712E+03	7.777E+06	5.225E+02	2.785E+01	7.769E+03	5.220E-01
2069	1.059E+04	8.477E+06	5.695E+02	3.035E+01	8.468E+03	5.690E-01
2070	1.146E+04	9.175E+06	6.165E+02	3.286E+01	9.166E+03	6.159E-01
2071	1.233E+04	9.873E+06	6.633E+02	3.535E+01	9.863E+03	6.627E-01
2072	1.320E+04	1.057E+07	7.101E+02	3.785E+01	1.056E+04	7.094E-01
2073	1.407E+04	1.126E+07	7.569E+02	4.034E+01	1.125E+04	7.561E-01
2074	1.493E+04	1.196E+07	8.035E+02	4.282E+01	1.195E+04	8.027E-01
2075	1.580E+04	1.265E+07	8.501E+02	4.531E+01	1.264E+04	8.492E-01
2076	1.666E+04	1.334E+07	8.966E+02	4.778E+01	1.333E+04	8.957E-01
2077	1.753E+04	1.404E+07	9.431E+02	5.026E+01	1.402E+04	9.421E-01
2078	1.839E+04	1.473E+07	9.895E+02	5.273E+01	1.471E+04	9.885E-01
2079	1.925E+04	1.542E+07	1.036E+03	5.520E+01	1.540E+04	1.035E+00
2080	2.011E+04	1.611E+07	1.082E+03	5.767E+01	1.609E+04	1.081E+00
2081	2.097E+04	1.679E+07	1.128E+03	6.013E+01	1.678E+04	1.127E+00
2082	2.128E+04	1.704E+07	1.145E+03	6.103E+01	1.703E+04	1.144E+00
2083	2.114E+04	1.692E+07	1.137E+03	6.061E+01	1.691E+04	1.136E+00
2084	2.099E+04	1.681E+07	1.129E+03	6.018E+01	1.679E+04	1.128E+00
2085	2.084E+04	1.669E+07	1.121E+03	5.976E+01	1.667E+04	1.120E+00
2086	2.070E+04	1.657E+07	1.114E+03	5.935E+01	1.656E+04	1.112E+00
2087	2.055E+04	1.646E+07	1.106E+03	5.893E+01	1.644E+04	1.105E+00
2088	2.041E+04	1.634E+07	1.098E+03	5.852E+01	1.633E+04	1.097E+00
2089	2.027E+04	1.623E+07	1.090E+03	5.811E+01	1.621E+04	1.089E+00
2090	2.013E+04	1.612E+07	1.083E+03	5.771E+01	1.610E+04	1.082E+00
2091	1.999E+04	1.600E+07	1.075E+03	5.731E+01	1.599E+04	1.074E+00
2092	1.985E+04	1.589E+07	1.068E+03	5.691E+01	1.588E+04	1.067E+00
2093	1.971E+04	1.578E+07	1.060E+03	5.651E+01	1.576E+04	1.059E+00
2094	1.957E+04	1.567E+07	1.053E+03	5.611E+01	1.565E+04	1.052E+00
2095	1.943E+04	1.556E+07	1.046E+03	5.572E+01	1.555E+04	1.045E+00
2096	1.930E+04	1.545E+07	1.038E+03	5.533E+01	1.544E+04	1.037E+00
2097	1.916E+04	1.534E+07	1.031E+03	5.495E+01	1.533E+04	1.030E+00
2098	1.903E+04	1.524E+07	1.024E+03	5.457E+01	1.522E+04	1.023E+00
2099	1.890E+04	1.513E+07	1.017E+03	5.418E+01	1.512E+04	1.016E+00
2100	1.876E+04	1.503E+07	1.010E+03	5.381E+01	1.501E+04	1.009E+00
2101	1.863E+04	1.492E+07	1.003E+03	5.343E+01	1.491E+04	1.002E+00
2102	1.850E+04	1.482E+07	9.956E+02	5.306E+01	1.480E+04	9.946E-01
2103	1.837E+04	1.471E+07	9.886E+02	5.269E+01	1.470E+04	9.876E-01
2104	1.825E+04	1.461E+07	9.817E+02	5.232E+01	1.460E+04	9.807E-01
2105	1.812E+04	1.451E+07	9.749E+02	5.196E+01	1.449E+04	9.739E-01
2106	1.799E+04	1.441E+07	9.681E+02	5.159E+01	1.439E+04	9.671E-01

Results (Continued)

Year	Total landfill gas			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2107	1.787E+04	1.431E+07	9.613E+02	5.123E+01	1.429E+04	9.604E-01
2108	1.774E+04	1.421E+07	9.546E+02	5.088E+01	1.419E+04	9.537E-01
2109	1.762E+04	1.411E+07	9.480E+02	5.052E+01	1.409E+04	9.470E-01
2110	1.750E+04	1.401E+07	9.413E+02	5.017E+01	1.400E+04	9.404E-01
2111	1.737E+04	1.391E+07	9.348E+02	4.982E+01	1.390E+04	9.338E-01
2112	1.725E+04	1.382E+07	9.283E+02	4.947E+01	1.380E+04	9.273E-01
2113	1.713E+04	1.372E+07	9.218E+02	4.913E+01	1.371E+04	9.209E-01
2114	1.701E+04	1.362E+07	9.154E+02	4.878E+01	1.361E+04	9.144E-01
2115	1.689E+04	1.353E+07	9.090E+02	4.844E+01	1.351E+04	9.081E-01
2116	1.678E+04	1.343E+07	9.026E+02	4.811E+01	1.342E+04	9.017E-01
2117	1.666E+04	1.334E+07	8.963E+02	4.777E+01	1.333E+04	8.954E-01
2118	1.654E+04	1.325E+07	8.901E+02	4.744E+01	1.323E+04	8.892E-01
2119	1.643E+04	1.315E+07	8.839E+02	4.711E+01	1.314E+04	8.830E-01
2120	1.631E+04	1.306E+07	8.777E+02	4.678E+01	1.305E+04	8.768E-01
2121	1.620E+04	1.297E+07	8.716E+02	4.645E+01	1.296E+04	8.707E-01
2122	1.609E+04	1.288E+07	8.655E+02	4.613E+01	1.287E+04	8.646E-01
2123	1.597E+04	1.279E+07	8.595E+02	4.581E+01	1.278E+04	8.586E-01
2124	1.586E+04	1.270E+07	8.535E+02	4.549E+01	1.269E+04	8.526E-01
2125	1.575E+04	1.261E+07	8.475E+02	4.517E+01	1.260E+04	8.467E-01
2126	1.564E+04	1.253E+07	8.416E+02	4.485E+01	1.251E+04	8.408E-01
2127	1.553E+04	1.244E+07	8.357E+02	4.454E+01	1.243E+04	8.349E-01
2128	1.542E+04	1.235E+07	8.299E+02	4.423E+01	1.234E+04	8.291E-01
2129	1.532E+04	1.227E+07	8.241E+02	4.392E+01	1.225E+04	8.233E-01
2130	1.521E+04	1.218E+07	8.184E+02	4.361E+01	1.217E+04	8.175E-01
2131	1.510E+04	1.209E+07	8.127E+02	4.331E+01	1.208E+04	8.118E-01
2132	1.500E+04	1.201E+07	8.070E+02	4.301E+01	1.200E+04	8.062E-01
2133	1.489E+04	1.193E+07	8.014E+02	4.271E+01	1.191E+04	8.006E-01
2134	1.479E+04	1.184E+07	7.958E+02	4.241E+01	1.183E+04	7.950E-01
2135	1.469E+04	1.176E+07	7.902E+02	4.211E+01	1.175E+04	7.894E-01
2136	1.458E+04	1.168E+07	7.847E+02	4.182E+01	1.167E+04	7.839E-01
2137	1.448E+04	1.160E+07	7.792E+02	4.153E+01	1.159E+04	7.785E-01
2138	1.438E+04	1.152E+07	7.738E+02	4.124E+01	1.151E+04	7.730E-01
2139	1.428E+04	1.144E+07	7.684E+02	4.095E+01	1.142E+04	7.676E-01
2140	1.418E+04	1.136E+07	7.630E+02	4.067E+01	1.135E+04	7.623E-01
2141	1.408E+04	1.128E+07	7.577E+02	4.038E+01	1.127E+04	7.570E-01
2142	1.399E+04	1.120E+07	7.524E+02	4.010E+01	1.119E+04	7.517E-01
2143	1.389E+04	1.112E+07	7.472E+02	3.982E+01	1.111E+04	7.464E-01
2144	1.379E+04	1.104E+07	7.420E+02	3.954E+01	1.103E+04	7.412E-01
2145	1.369E+04	1.097E+07	7.368E+02	3.927E+01	1.095E+04	7.361E-01
2146	1.360E+04	1.089E+07	7.317E+02	3.899E+01	1.088E+04	7.309E-01
2147	1.350E+04	1.081E+07	7.266E+02	3.872E+01	1.080E+04	7.258E-01
2148	1.341E+04	1.074E+07	7.215E+02	3.845E+01	1.073E+04	7.208E-01
2149	1.332E+04	1.066E+07	7.164E+02	3.818E+01	1.065E+04	7.157E-01
2150	1.322E+04	1.059E+07	7.115E+02	3.792E+01	1.058E+04	7.107E-01
2151	1.313E+04	1.051E+07	7.065E+02	3.765E+01	1.050E+04	7.058E-01
2152	1.304E+04	1.044E+07	7.016E+02	3.739E+01	1.043E+04	7.009E-01
2153	1.295E+04	1.037E+07	6.967E+02	3.713E+01	1.036E+04	6.960E-01
2154	1.286E+04	1.030E+07	6.918E+02	3.687E+01	1.029E+04	6.911E-01
2155	1.277E+04	1.022E+07	6.870E+02	3.661E+01	1.021E+04	6.863E-01
2156	1.268E+04	1.015E+07	6.822E+02	3.636E+01	1.014E+04	6.815E-01
2157	1.259E+04	1.008E+07	6.774E+02	3.610E+01	1.007E+04	6.768E-01

Results (Continued)

Year	Total landfill gas			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2158	1.250E+04	1.001E+07	6.727E+02	3.585E+01	1.000E+04	6.720E-01
2159	1.242E+04	9.942E+06	6.680E+02	3.560E+01	9.932E+03	6.673E-01
2160	1.233E+04	9.873E+06	6.634E+02	3.535E+01	9.863E+03	6.627E-01
2161	1.224E+04	9.804E+06	6.587E+02	3.511E+01	9.794E+03	6.581E-01
2162	1.216E+04	9.736E+06	6.541E+02	3.486E+01	9.726E+03	6.535E-01
2163	1.207E+04	9.668E+06	6.496E+02	3.462E+01	9.658E+03	6.489E-01
2164	1.199E+04	9.600E+06	6.450E+02	3.438E+01	9.591E+03	6.444E-01
2165	1.191E+04	9.533E+06	6.405E+02	3.414E+01	9.524E+03	6.399E-01
2166	1.182E+04	9.467E+06	6.361E+02	3.390E+01	9.457E+03	6.354E-01
2167	1.174E+04	9.401E+06	6.316E+02	3.366E+01	9.391E+03	6.310E-01
2168	1.166E+04	9.335E+06	6.272E+02	3.343E+01	9.326E+03	6.266E-01
2169	1.158E+04	9.270E+06	6.229E+02	3.319E+01	9.261E+03	6.222E-01
2170	1.150E+04	9.205E+06	6.185E+02	3.296E+01	9.196E+03	6.179E-01
2171	1.142E+04	9.141E+06	6.142E+02	3.273E+01	9.132E+03	6.136E-01
2172	1.134E+04	9.077E+06	6.099E+02	3.251E+01	9.068E+03	6.093E-01
2173	1.126E+04	9.014E+06	6.057E+02	3.228E+01	9.005E+03	6.050E-01
2174	1.118E+04	8.951E+06	6.014E+02	3.205E+01	8.942E+03	6.008E-01
2175	1.110E+04	8.889E+06	5.972E+02	3.183E+01	8.880E+03	5.966E-01
2176	1.102E+04	8.827E+06	5.931E+02	3.161E+01	8.818E+03	5.925E-01
2177	1.095E+04	8.765E+06	5.889E+02	3.139E+01	8.756E+03	5.883E-01
2178	1.087E+04	8.704E+06	5.848E+02	3.117E+01	8.695E+03	5.842E-01
2179	1.079E+04	8.643E+06	5.807E+02	3.095E+01	8.635E+03	5.802E-01
2180	1.072E+04	8.583E+06	5.767E+02	3.073E+01	8.574E+03	5.761E-01
2181	1.064E+04	8.523E+06	5.727E+02	3.052E+01	8.515E+03	5.721E-01
2182	1.057E+04	8.464E+06	5.687E+02	3.031E+01	8.455E+03	5.681E-01
2183	1.050E+04	8.405E+06	5.647E+02	3.010E+01	8.396E+03	5.641E-01
2184	1.042E+04	8.346E+06	5.608E+02	2.989E+01	8.338E+03	5.602E-01
2185	1.035E+04	8.288E+06	5.569E+02	2.968E+01	8.280E+03	5.563E-01
2186	1.028E+04	8.230E+06	5.530E+02	2.947E+01	8.222E+03	5.524E-01
2187	1.021E+04	8.173E+06	5.491E+02	2.927E+01	8.164E+03	5.486E-01
2188	1.013E+04	8.116E+06	5.453E+02	2.906E+01	8.107E+03	5.447E-01
2189	1.006E+04	8.059E+06	5.415E+02	2.886E+01	8.051E+03	5.409E-01
2190	9.994E+03	8.003E+06	5.377E+02	2.866E+01	7.995E+03	5.372E-01
2191	9.924E+03	7.947E+06	5.340E+02	2.846E+01	7.939E+03	5.334E-01
2192	9.855E+03	7.891E+06	5.302E+02	2.826E+01	7.884E+03	5.297E-01
2193	9.786E+03	7.836E+06	5.265E+02	2.806E+01	7.829E+03	5.260E-01
2194	9.718E+03	7.782E+06	5.229E+02	2.787E+01	7.774E+03	5.223E-01
2195	9.650E+03	7.728E+06	5.192E+02	2.767E+01	7.720E+03	5.187E-01
2196	9.583E+03	7.674E+06	5.156E+02	2.748E+01	7.666E+03	5.151E-01
2197	9.516E+03	7.620E+06	5.120E+02	2.729E+01	7.612E+03	5.115E-01

ATTACHMENT 7.7

AP-42, SECTION 3.3 GASOLINE AND DIESEL INDUSTRIAL ENGINES

3.3 Gasoline And Diesel Industrial Engines

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), total organic compounds (TOC), carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides (SO_x) also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.[2]

3.3.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x, called prompt NO_x, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x.

3.3.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.[2]

3.3.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.[2-3]

3.3.3.4 Smoke and Particulate Matter -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient.[2]

3.3.3.5 Sulfur Oxides -

Sulfur oxides emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2. The oxidation of SO_2 gives sulfur trioxide (SO_3), which reacts with water to give sulfuric acid (H_2SO_4), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.[2-3]

3.3.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O_2. The most common NO_x control technique for diesel and dual-fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Controls for CO have been partly adapted from mobile sources.[4]

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio adjustments, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.[4]

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.[4]

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting the engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures, thereby lowering NO_x formation rates.[4]

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH_3) into the flue gas. The NH_3 reacts with NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.[4]

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O_2 levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.[4]

The most accurate method for calculating such emissions is on the basis of "brake-specific" emission factors (pounds per horsepower-hour [lb/hp-hr]). Emissions are the product of the brake-specific emission factor, the usage in hours, the rated power available, and the load factor (the power actually used divided by the power available). However, for emission inventory purposes, it is often easier to assess this activity on the basis of fuel used.

Once reasonable usage and duty cycles for this category were ascertained, emission values were aggregated to arrive at the factors for criteria and organic pollutants presented. Factors in Table 3.3-1 are in pounds per million British thermal unit (lb/MMBtu). Emission data for a specific design type were weighted according to estimated material share for industrial engines. The emission factors in these tables, because of their aggregate nature, are most appropriately applied to a population of industrial engines rather than to an individual power plant. Table 3.3-2 shows unweighted speciated organic compound and air toxic emission factors based upon only 2 engines. Their inclusion in this section is intended for rough order-of-magnitude estimates only.

Table 3.3-3 summarizes whether the various diesel emission reduction technologies (some of which may be applicable to gasoline engines) will generally increase or decrease the selected parameter. These technologies are categorized into fuel modifications, engine modifications, and exhaust after-treatments. Current data are insufficient to quantify the results of the modifications. Table 3.3-3 provides general information on the trends of changes on selected parameters.

3.3.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section.

Supplement A, February 1996

No changes.

Supplement B, October 1996

- Text was revised concerning emissions and controls.
- The CO_2 emission factor was adjusted to reflect 98.5 percent conversion efficiency.

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES[a]

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01) Emission Factor (lb/hp-hr) (power output)	Gasoline Fuel Emission Factor (lb/MMBtu) (fuel input)	Diesel Fuel (SCC 2-02-001-02, 2-03-001-01) Emission Factor (lb/hp-hr) (power output)	Diesel Fuel Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING
NO_x	0.011	1.63	0.031	4.41	D
CO	6.96 E-03[d]	0.99[d]	6.68 E-03	0.95	D
SO_x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10[b]	7.21 E-04	0.10	2.20 E-03	0.31	D
CO_2[c]	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC					
Exhaust	0.015	2.10	2.47 E-03	0.35	D
Evaporative	6.61 E-04	0.09	0.00	0.00	E
Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
Refueling	1.08 E-03	0.15	0.00	0.00	E

[a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[b] PM-10 = particulate matter less than or equal to 10 µm aerodynamic diameter. All particulate is assumed to be $\leq$ 1 µm in size.

[c] Assumes 99% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

[d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

Total from all HAPs above = 3.7094x10-3 lb/MMBtu
Per note in Table 3.3-1 use 7,000 Btu/hp-hr to convert from lb/MMBtu to lb/hp-hr

Conversion:
(3.7904x10-3 lb/MMBtu)(0.007 MMBtu/hp-hr) = 2.65328x10-5 lb/hp-hr

Table 3.3-3. EFFECT OF VARIOUS EMISSION CONTROL TECHNOLOGIES ON DIESEL ENGINES[a]

Technology	Affected Parameter	
	Increase	Decrease
Fuel modifications		
Sulfur content increase	PM, wear	
Aromatic content increase	PM, NO_x	
Cetane number		PM, NO_x
10% and 90% boiling point		PM
Fuel additives		PM, NO_x
Water/Fuel emulsions		NO_x
Engine modifications		
Injection timing retard	PM, BSFC	NO_x, power
Fuel injection pressure	PM, NO_x	
Injection rate control		NO_x, PM
Rapid spill nozzles		PM
Electronic timing & metering		NO_x, PM
Injector nozzle geometry		PM
Combustion chamber modifications		NO_x, PM
Turbocharging	PM, power	NO_x
Charge cooling		NO_x
Exhaust gas recirculation	PM, power, wear	NO_x
Oil consumption control		PM, wear
Exhaust after-treatment		
Particulate traps		PM
Selective catalytic reduction		NO_x
Oxidation catalysts		TOC, CO, PM

[a] Reference 8. PM = particulate matter. BSFC = brake-specific fuel consumption.

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ATTACHMENT 7.8

HEAVY EQUIPMENT MANUFACTURER’S SPECIFICATION SHEETS

Wheel Tractor-Scrapers (cont'd)

Model	Product Ident. No. Prefix	Years Built	Horse-power Max/ Rated	Capacity Struck/ Heaped m³ (yd³)	Approx. Shipping Weight kg (lb)	Dimensions m (ft) Length	Width	Height	Width of Tread	Tire Size (Standard) & ply rating Tractor & Scraper	Approx. % Weight on Drivers Loaded/ Empty	Turning Circle m (ft)
621	43H	65-72	/300	10.7/15.3 (14/20)	28 400 (62,600)	12.00 (39'5")	3.60 (11'10")	3.45 (11'4")	2.19 (7'3")	29.5 × 29-22	53/68	11.50 (37'8")
621	23H	65-74	/300	10.7/15.3 (14/20)	24 900 (55,000)	11.60 (38'1")	3.50 (11'7")	3.40 (11'2")	2.10 (6'10")	29.5 × 29-22	53/68	13.00 (42'6")
621B	45P	73-86	/330	10.7/15.3 (14/20)	30 205 (66,590)	12.7 (41'7")	3.45 (11'4")	3.63 (11'11")	2.21 (7'3")	29.5-29, 28 PR (E-3)	53/68	11.10 (36'6")
621E	6AB 2PD	86-93	/330	10.7/15.3 (14/20)	30 480 (67,195)	12.93 (42'5")	3.47 (11'4")	3.71 (12'2")	2.21 (7'3")	33.25-29, 26 PR (E-3)	53/68	10.9 (35'8")
621F	4SK	93-00	330	10.7/15.3 (14/20)	32 090 (70,740)	12.93 (42'5")	3.47 (11'4")	3.71 (12'2")	2.21 (7'3")	33.25-29 ★★ (E-2/E-3)	53/68	10.2 (33'5")
621G	ALP	00-03	330/365	10.7/15.3 (14/20)	32 250 (71,090)	12.93 (42'5")	3.47 (11'4")	3.71 (12'2")	2.20 (7'3")	33.25R29	68/53	11.7 (38'5")
621G	CEN	03-05	330/365	12/17 (15.7/22)	32 563 (71,790)	12.93 (42'5")	3.47 (11'4")	3.71 (12'2")	2.20 (7'3")	33.25R29	68/53	11.7 (38'5")
623	52U	72-74	/300	16.8 (22)	29 900 (66,000)	11.90 (39'0")	3.50 (11'7")	3.70 (12'1")	2.20 (7'3")	29.5 × 29-28	53/68	13.70 (44'11")
623B	46P	73-86	/330	16.8 (22)	32 546 (71,750)	12.5 (41'1")	3.55 (11'8")	3.81 (12'6")	2.18 (7'2")	29.5-29, 28 PR (E-2)	53/68	8.90 (29'4")
623E	6CB	86-89	/330	16.8 (22)	33 317 (73,450)	12.61 (41'4")	3.55 (11'8")	3.81 (12'6")	2.21 (7'3")	29.5-29, 34 PR (E-2)	52/65	10.9 (35'9")
623E	6YF	89-93	/365	13.8/17.6 (18/23)	35 290 (77,800)	12.61 (41'4")	3.55 (11'8")	3.94 (12'11")	2.18 (7'2")	29.5R25	51/66	10.9 (35'8")
623F	6BK	93-98	365	13.8/17.6 (18/23)	35 305 (77,830)	12.61 (41'4")	3.55 (11'8")	3.94 (12'11")	2.18 (7'2")	29.5-29, 34 PR (E-2)	51/66	10.9 (35'8")
623F Series II	5EW	98-00	365	13.8/17.6 (18/23)	37 122 (81,840)	13.28 (43'7")	3.55 (11'8")	3.55 (11'8")	2.21 (7'3")	33.25-R29 ★★ (E-2)	50/64	8.6 (28'5")
623G	ARW	00-02	330/365	13.8/17.6 (18/23)	37 120 (81,840)	13.21 (43'4")	3.55 (11'8")	3.68 (12'1")	2.2 (7'3")	33.25R29	64/50	10.9 (35'8")
623G	CES	03-05	330/365	13.8/17.6 (18/23)	37 120 (81,840)	13.21 (43'4")	3.55 (11'8")	3.68 (12'1")	2.2 (7'3")	33.25R29	64/50	10.9 (35'8")

PRODUCTION

The motor grader is used in a variety of applications in a variety of industries. Therefore, there are many ways to measure its operating capacity, or production. One method expresses a motor grader's production in relation to the area covered by the moldboard.

Formula:

$$A = S \times (L_e - L_o) \times 1000 \times E \quad \text{(Metric)}$$
$$A = S \times (L_e - L_o) \times 5280 \times E \quad \text{(English)}$$

where A: Hourly operating area (m^2/h or ft^2/h)
S: Operating speed (km/h or mph)
L_e: Effective blade length (m or ft)
L_o: Width of overlap (m or ft)
E: Job efficiency

Operating Speeds:

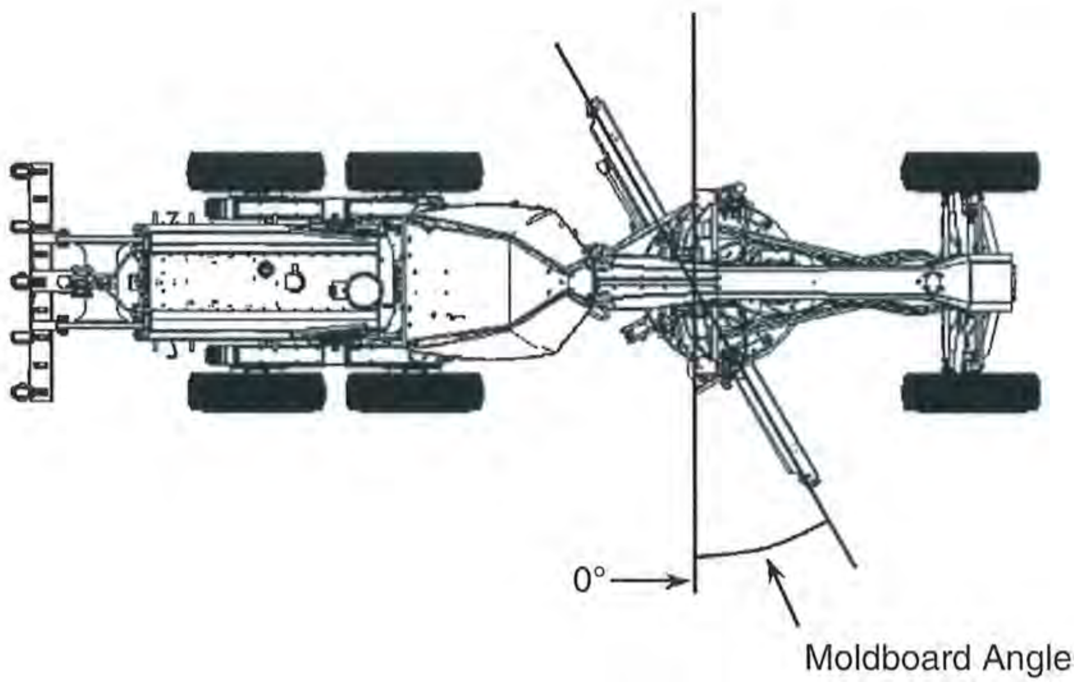
Typical operating speeds by application

Finish Grading:	0-4 km/h	(0-2.5 mph)
Heavy Blading:	0-9 km/h	(0-6 mph)
Ditch Repair:	0-5 km/h	(0-3 mph)
Ripping:	0-5 km/h	(0-3 mph)
Road Maintenance:	5-16 km/h	(3-9.5 mph)
Haul Road Maintenance:	5-16 km/h	(3-9.5 mph)
Snow Plowing:	7-21 km/h	(4-13 mph)
Snow Winging:	15-28 km/h	(9-17 mph)

Effective Blade Length:

Since the moldboard is usually angled when moving material, an effective blade length must be computed to account for this angle. This is the actual width of material swept by the moldboard.

NOTE: Angles are measured as shown below. The effective length becomes shorter as the angle increases.



BULLDOZER PRODUCTION OFF-THE-JOB

You can estimate bulldozer production using the production curves that follow and the correction factors that are applicable. Use this formula:

$$\begin{array}{c}\text{Production } (\text{Lm}^3/\text{hr}) \\ (\text{LCY/hr})\end{array} = \begin{array}{c}\text{Maximum} \\ \text{production}\end{array} \times \begin{array}{c}\text{Correction} \\ \text{factors}\end{array}$$

The bulldozer production curves give maximum uncorrected production for universal, semi-universal, and straight blades and are based on the following conditions:

1. 100% efficiency (60 minute hour — level cycle).
2. Power shift machines with 0.05 min. fixed times.
3. Machine cuts for 15 m (50 feet), then drifts blade load to dump over a high wall. (Dump time — 0 sec.)
4. Soil density of 1370 kg/Lm³ (2300 lb/LCY).
5. Coefficient of traction:*
   a. Track machines — 0.5 or better
   b. Wheel machines — 0.4 or better
6. Hydraulic controlled blades used.
7. Dig 1F**
   Carry 2F**
   Return 2R**

To obtain estimated production in bank cubic meters or bank cubic yards, appropriate load factor from the Tables section should be applied to the corrected production as calculated above.

$$\begin{array}{c}\text{Production Bm}^3/\text{hr} \\ (\text{BCY/h})\end{array} = \begin{array}{c}\text{Lm}^3/\text{hr} \times \text{LF} \\ (\text{LCY/h}) \times \text{LF}\end{array}$$

*Coefficient of traction assumed to be at least 0.4. While poor traction affects both track and wheel vehicles, causing them to take smaller blade loads, wheeled units are affected more severely and production falls much more rapidly. While no fixed rules can predict this production loss, a rough rule of thumb is that wheel dozer production falls off 4% for each one-hundredth decrease in coefficient of traction below 0.40. If, for example, coefficient of traction is 0.30, the difference is ten-hundredths (0.10), and production is 60% (10 × 4% = 40% decrease).

**This gear sequence is based on level to downhill terrain, light to medium density material, and no blade extensions such as spill plates, rock guards, etc. Exceeding these conditions may require carry in 1F, but productivity should equal or exceed "standard conditions" due to the larger loads that can be carried in 1F.

ATTACHMENT 7.9

AP-42, SECTION 13.5 INDUSTRIAL FLARES

13.5 Industrial Flares

13.5.1 General

Flaring is a high-temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. Natural gas, propane, ethylene, propylene, butadiene and butane constitute over 95 percent of the waste gases flared. In combustion, gaseous hydrocarbons react with atmospheric oxygen to form carbon dioxide (CO_2) and water. In some waste gases, carbon monoxide (CO) is the major combustible component. Presented below, as an example, is the combustion reaction of propane.

$$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$$

During a combustion reaction, several intermediate products are formed, and eventually, most are converted to CO_2 and water. Some quantities of stable intermediate products such as carbon monoxide, hydrogen, and hydrocarbons will escape as emissions.

Flares are used extensively to dispose of (1) purged and wasted products from refineries, (2) unrecoverable gases emerging with oil from oil wells, (3) vented gases from blast furnaces, (4) unused gases from coke ovens, and (5) gaseous wastes from chemical industries. Gases flared from refineries, petroleum production, chemical industries, and to some extent, from coke ovens, are composed largely of low molecular weight hydrocarbons with high heating value. Blast furnace flare gases are largely of inert species and CO, with low heating value. Flares are also used for burning waste gases generated by sewage digesters, coal gasification, rocket engine testing, nuclear power plants with sodium/water heat exchangers, heavy water plants, and ammonia fertilizer plants.

There are two types of flares, elevated and ground flares. Elevated flares, the more common type, have larger capacities than ground flares. In elevated flares, a waste gas stream is fed through a stack anywhere from 10 to over 100 meters tall and is combusted at the tip of the stack. The flame is exposed to atmospheric disturbances such as wind and precipitation. In ground flares, combustion takes place at ground level and is almost always unassisted. Ground flares vary in complexity, and they may consist either of conventional flare burners with no enclosures or of multiple burners in refractory-lined steel enclosures. Ground flares may also be known as shielded flares.[a] Ground flares should not be mistaken for thermal oxidizers or incinerators. Ground flares operate under the same principals as elevated flares and combustion is achieved through the natural draft of combustion air. Thermal oxidizers and incinerators have combustion air blowers and can be tuned to control combustion chamber temperature, thereby allowing for more effective combustion control.

The typical flare system consists of (1) a gas collection header and piping for collecting gases from processing units, (2) a knockout drum (disentrainment drum) to remove and store condensables and entrained liquids, (3) a proprietary seal, water seal, or purge gas supply to prevent flash-back, (4) a single- or multiple-burner unit and a flare stack, (5) gas pilots and an ignitor to ignite the mixture of waste gas and air, and, if required, (6) a provision for external momentum force (steam injection or forced air) for

[a] For the purposes of 40 CFR part 60 subparts OOOO and OOOOa and 40 CFR part 63 subparts HH and HHH, these units are not considered flares. The definition of flare in these subparts specifically exclude these units. In these subparts, a flare is defined as a thermal oxidation system using an open flame (without enclosure). Under these subparts, these units are considered combustion devices that must be field-tested. Alternatively, a unit tested by a manufacturer may be installed.

smokeless flaring. Natural gas, fuel gas, inert gas, or nitrogen can be used as purge gas. Figure 13.5-1 is a diagram of a typical steam-assisted elevated smokeless flare system.

Combustion requires three ingredients: fuel, an oxidizing agent (typically oxygen in air), and heat (or ignition source). Flares typically operate with pilot flames to provide the ignition source, and they use ambient air as the oxidizing agent. The waste gases to be flared typically provide the fuel necessary for combustion. Combustible gases generally have an upper and lower flammability limit. The upper flammability limit (UFL) is the highest concentration of a gas in air that is capable of burning. Above this flammability limit, the fuel is too rich to burn. The lower flammability limit (LFL) is the lowest concentration of the gas in air that is capable of burning. Below the LFL, the fuel is too lean to burn. Between the upper and lower flammability limits, combustion can occur. Flare waste gases with concentrations above the UFL will become more dilute as the waste gas mixes with ambient air above the flare tip. As this dilution occurs, the air-waste gas mixture will pass through the flammability region, and combustion will occur. However, if flare waste gas concentrations are near the LFL prior to mixing with air, the air-waste gas mixture can fall below the flammability region, and reduced combustion efficiencies can occur. If steam is added to the flare waste gas at or prior to the flare tip (i.e., prior to the "combustion zone" where the mixing with air occurs), the steam will act to dilute the waste gas. Thus, even if there are adequate concentrations of combustibles in the waste gas, if too much steam is added to the waste gas so that the combustibles concentration becomes diluted to near the LFL as the steam-waste gas mixture enters the combustion zone, reduced combustion efficiencies will result. Consequently, critical considerations of flare combustion include the net heating value and the combustibles concentration in the flare gas and in the combustion zone (e.g., accounting for the amount of dilution by steam or other assist gas that occurs to the waste gas prior to the combustion zone).

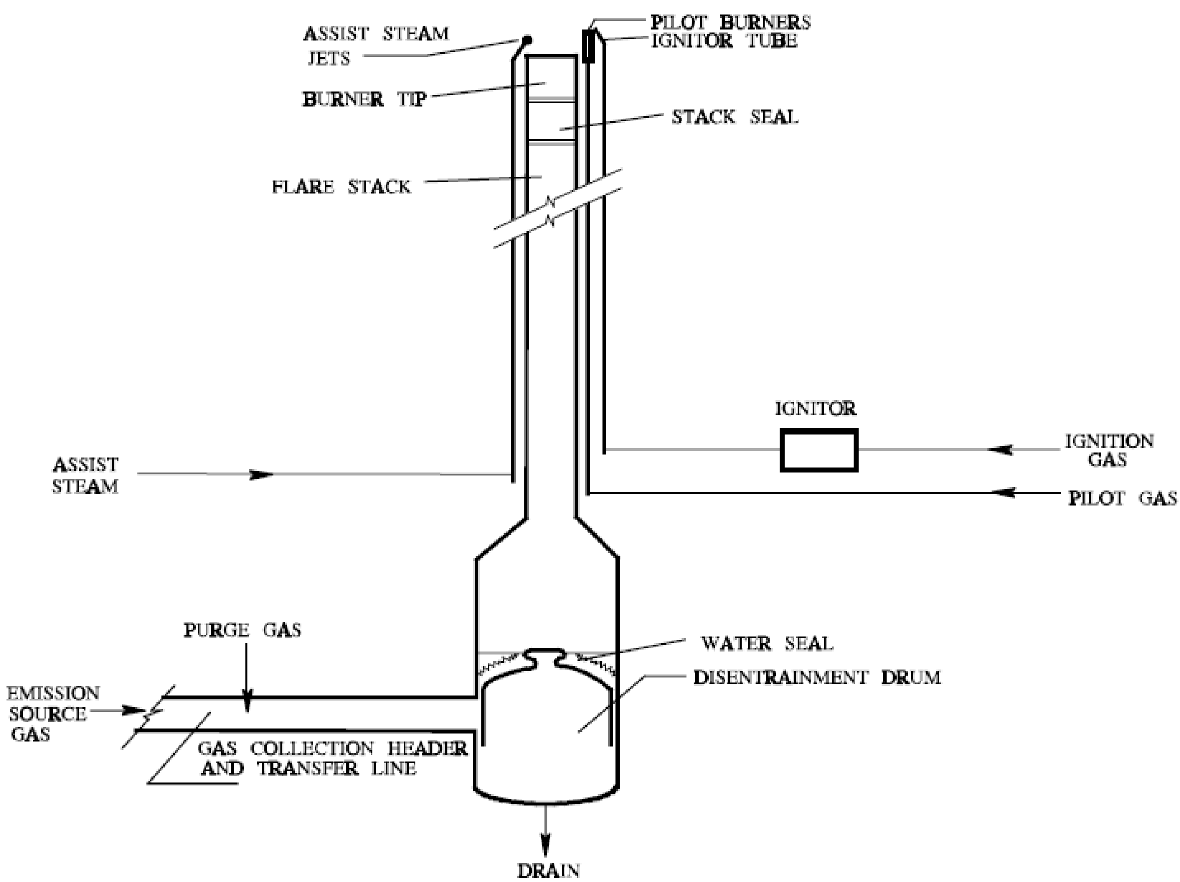


Figure 13.5-1. Diagram of a typical steam-assisted smokeless elevated flare.

Combustion efficiency is the percentage of hydrocarbon in the flare vent gas that is completely converted to CO_2 and water vapor. Destruction efficiency is the percentage of a specific pollutant in the flare vent gas that is converted to a different compound (such as CO_2, CO or other hydrocarbon intermediate). The destruction efficiency of a flare will always be greater than the combustion efficiency of a flare. It is generally estimated that a combustion efficiency of 96.5 percent is equivalent to a destruction efficiency of 98 percent.[10]

Smoking may result from combustion, depending upon waste gas components and the quantity and distribution of combustion air. Waste gases containing methane, hydrogen, CO, and ammonia usually burn without smoke. Waste gases containing heavy hydrocarbons such as paraffins above methane, olefins, and aromatics, have a higher tendency to smoke. An external momentum force, such as steam injection or blowing air, is used for efficient air/waste gas mixing and turbulence, which promotes smokeless flaring of heavy hydrocarbon waste gas. Other external forces may be used for this purpose, including water spray, high velocity vortex action, or natural gas. External momentum force is rarely required in ground flares.

Steam injection is accomplished either by nozzles on an external ring around the top of the flare tip or by a single nozzle located concentrically within the tip. At installations where waste gas flow varies, both are used. The internal nozzle provides steam at low waste gas flow rates, and the external jets are used with large waste gas flow rates. Several other special-purpose flare tips are commercially available, one of which is for injecting both steam and air.

Flares are generally designed to handle large quantities of waste gases that may be intermittently generated during plant emergencies, although they may also be used routinely to dispose of low-volume continuous or intermittent emissions from various sources at the plant. Flare gas volumes can vary from a few cubic meters per hour during regular operations up to several thousand cubic meters per hour during major upsets. Flow rates at a refinery could be 45 to 90 kilograms per hour (kg/hr) (100 - 200 pounds per hour [lb/hr]) during regular operation but could reach a full plant emergency rate of 700 megagrams per hour (Mg/hr) (750 tons/hr). Normal process blowdowns may release 450 to 900 kg/hr (1000 - 2000 lb/hr), and unit maintenance or minor failures may release 25 to 35 Mg/hr (27 - 39 tons/hr). Thus, the required flare turndown ratio can be over 15,000 to 1.

Many plants have 2 or more flares, in parallel or in series. In the former, 1 flare can be shut down for maintenance while the other serves the system. In systems of flares in series, 1 flare is intended to handle regular gas volumes and the other flare is generally intended to handle excess gas flows from emergencies.

13.5.2 Emissions

Noise, heat, and visible flame and/or smoke are the most apparent undesirable effects of flare operation. Flares are usually located away from populated areas or are sufficiently isolated, thus minimizing their effects on populations. Because the flame in a ground flare is generally not visible, and they reduce noise and thermal radiation to the surrounding area, these flares are common in populated areas. Emissions from flaring may include carbon particles (soot), unburned hydrocarbons, CO, and partially burned and altered hydrocarbons. Also emitted are nitrogen oxides (NO_x) and, if sulfur-containing material such as hydrogen sulfide or mercaptans is flared, sulfur dioxide (SO_2). The quantities of hydrocarbon emissions generated relate to the degree of combustion. The degree of combustion depends largely on the rate and extent of fuel-air mixing and on the flame temperatures achieved and maintained. Properly operated flares achieve at least 98 percent destruction efficiency in the flare plume, meaning that hydrocarbon emissions amount to less than 2 percent of the hydrocarbons in the gas stream.

The tendency of a fuel to smoke or make soot is influenced by fuel characteristics and by the amount and distribution of oxygen in the combustion zone. For complete combustion, at least the stoichiometric amount of oxygen must be provided in the combustion zone. The theoretical amount of oxygen required increases with the molecular weight of the gas burned. The oxygen supplied as air ranges from 9.6 units of air per unit of methane to 38.3 units of air per unit of pentane, by volume. Air is supplied to the flame as primary air and secondary air. Primary air is mixed with the gas before combustion, whereas secondary air is drawn into the flame. For smokeless combustion, sufficient primary air must be supplied, this varying from about 20 percent of stoichiometric air for a paraffin to about 30 percent for an olefin. If the amount of primary air is insufficient, the gases entering the base of the flame are preheated by the combustion zone, and larger hydrocarbon molecules crack to form hydrogen, unsaturated hydrocarbons, and carbon. The carbon particles may escape further combustion and cool down to form soot or smoke. Olefins and other unsaturated hydrocarbons may polymerize to form larger molecules which crack, in turn forming more carbon.

The fuel characteristics influencing soot formation include the carbon-to-hydrogen (C-to-H) ratio and the molecular structure of the gases to be burned. All hydrocarbons above methane, i. e., those with a C-to-H ratio of greater than 0.33, tend to soot. Branched chain paraffins smoke more readily than corresponding normal isomers. The more highly branched the paraffin, the greater the tendency to smoke. Unsaturated hydrocarbons tend more toward soot formation than do saturated ones. Soot is eliminated by adding steam or air; hence, most industrial flares are steam-assisted and some are air-assisted. Flare gas composition is a critical factor in determining the amount of steam necessary.

Since elevated flares do not lend themselves to conventional emission testing techniques, until recently only a few attempts have been made to characterize elevated flare emissions. Early EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m^3 (300 Btu/ft^3).[1] However, recent studies on flare performance using passive Fourier Transform Infrared (pFTIR) spectroscopy have been performed on a number of different flares.[4-8] The studies cover a number of flares at refineries, chemical plants and flare test facilities with varying waste gas compositions. The pFTIR studies support the conclusion that the combustion zone properties of the steam-waste gas mixture are predictive of proper flare combustion.[10] There have also been recent studies on sources, including flares, using differential infrared absorption LIDAR [light detection and ranging] (DIAL). To date, many of these studies do not provide the data necessary to isolate the emissions from a particular flare. But enough data existed in one study that the emissions measured by DIAL could be attributed to the flare.[9] For flares operated at petroleum refineries, EPA has determined that the net heating value of the gas in the combustion zone of the flare should be greater than or equal to 270 Btu/ft^3 to obtain a destruction efficiency of at least 98%.[b]

Table 13.5-1 presents flare emissions factors from the EPA tests[1]; Table 13.5-2 presents flare emissions factors from pFTIR and DIAL studies.[4-9] Crude propylene was used as flare gas during the early EPA tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2] Typical refinery waste gas feeds were used as flare gas during the pFTIR and DIAL studies.

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in

[b] See Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards Final Rule, December 1, 2015 (80 FR 75183). Net heating value of the combustion zone is determined on a 15-minute average, and refinery owners and operators may use a corrected heat content for hydrogen when determining the combustion zone heat value.

the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

With the promulgation of the New Source Performance Standards for Crude Oil and Natural Gas Production, Transmission, and Distribution, EPA developed a manufacturer testing program for combustion control devices. These units are generally equivalent to enclosed ground flares, although they are explicitly excluded from the definition of flare in those subpart (see footnote a to this section). The manufacturer testing program requires performance testing be conducted using pure propylene under four different test conditions. Emissions data from these manufacturer tests have been used to develop emissions factors for enclosed ground flares. Because the factors are representative of enclosed ground flares burning propylene, the factors are included in Table 13.5-1, which are the flare factors developed from the EPA testing of elevated flares using crude propylene. Two factors are representative of enclosed ground flares operating at a low percent load, and two factors are representative of enclosed ground flares operating at a normal to high percent load.[c]

Additionally, the Oil and Gas sector rules, as well as some state programs, are requiring more testing for these types of units in the field. As a result, emissions data are available from enclosed ground flares burning field gas. Table 13.5-3 presents two enclosed ground flare emissions factors for total hydrocarbons (THC) applicable to natural gas production.

Table 13.5-4 presents the description of the source classification codes (SCCs) to which the emissions factors in Tables 13.5-1 through 13.5-3 are applicable.

[c] Because it is possible to test enclosed ground flares, the EPA recommends testing sources and using site-specific data in lieu of emissions factors whenever possible.

Table 13.5-1 (English Units). THC, NOx AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS FOR CERTAIN CHEMICAL MANUFACTURING PROCESSES[a]

Pollutant	SCC[e]	Emissions Factor Value	Emissions Factor Units	Grade or Representativeness
THC, elevated flares[c]	30190099; 30119701; 30119705; 30119709; 30119741	0.14[b,f]	lb/10^6 Btu	B
THC, enclosed ground flares[g,h] Low Percent Load[i]		8.37[j] or 3.88e-3[f]	lb/10^6 scf gas burned lb/10^6 Btu heat input	Moderately
THC, enclosed ground flares[g,h] Normal to High Percent Load[i]		2.56[j] or 1.20e-3[f]	lb/10^6 scf gas burned lb/10^6 Btu heat input	Moderately
Nitrogen oxides, elevated flares[d]		0.068[b,k]	lb/10^6 Btu	B
Soot, elevated flares[d]		0 – 274[b]	μg/L	B

[a] All of the emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the THC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factors are representative of controlled emissions rates for THC. These values are not representative of the uncontrolled THC routed to the flare from the associated process, and as such, they may not be appropriate for estimating the uncontrolled THC emissions or potential to emit from the associated process.

[b] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.

[c] Measured as methane equivalent. The THC emissions factor may not be appropriate for reporting volatile organic compounds (VOC) emissions when a VOC emissions factor exists.

[d] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

[g] THC measured as propane by US EPA Method 25A.

[h] These factors apply to well operated ground flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >200 btu/scf net heating value in the vent gas and less than the specified maximum exit velocity. The emissions factor data set had an average destruction efficiency of 99.99%. Based on tests using pure propylene fuel. References 12 through 33 and 39 through 45.

[i] The dataset for these tests were broken into four different test conditions: ramping back and forth between 0 and 30% of load; ramping back and forth between 30% and 70% of load; ramping back and forth between 70% and 100% of load; and a fixed rate maximum load condition. Analyses determined that only the first condition was statistically different. Low percent load is represented by a unit operating at approximately less than 30% of maximum load.

[j] Heat input is an appropriate basis for combustion emissions factor. However, based on available data, heat input data is not always known, but gas flowrate is generally available. Therefore, the emissions factor is presented in two different forms.

[k] Factor developed using the higher (gross) heating value of the vent gas.

Table 13.5-2 (English Units). VOC and CO EMISSIONS FACTORS FOR ELEVATED FLARE OPERATIONS FOR CERTAIN REFINERY AND CHEMICAL MANUFACTURING PROCESSES[a,b]

<table>
<tr><th>Pollutant</th><th>SCC[e]</th><th>Emissions Factor ($lb/10^6$ Btu)[f]</th><th>Representativeness</th></tr>
<tr><td>Volatile organic compounds[c]</td><td rowspan="2">30190099;
30600904;
30119701;
30119705;
30119709;
30119741;
30119799;
30130115;
30600201;
30600401;
30600508;
30600903;
30600999;
30601701;
30601801;
30688801;
40600240</td><td>0.66</td><td>Poorly</td></tr>
<tr><td>Carbon monoxide[d]</td><td>0.31</td><td>Poorly</td></tr>
</table>

[a] The emissions factors in this table represent the emissions exiting the flare. Since the flare is not the originating source of the VOC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factor is representative of controlled emissions rates for VOC. This values is not representative of the uncontrolled VOC routed to the flare from the associated process, and as such, it may not be appropriate for estimating the uncontrolled VOC emissions or potential to emit from the associated process.

[b] These factors apply to well operated flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >300 btu/scf net heating value in the vent gas and less than the specified maximum flare tip velocity. The VOC emissions factor data set had an average destruction efficiency of 98.9%, and the CO emissions factor data set had an average destruction efficiency of 99.1% (based on test reports where destruction efficiency was provided). These factors are based on steam-assisted and air-assisted flares burning a variety of vent gases.

[c] References 4 through 9 and 11.

[d] References 1, 4 through 8, and 11.

[e] See Table 13.5-4 for a description of these SCCs.

[f] Factor developed using the lower (net) heating value of the vent gas.

Table 13.5-3 (English Units). THC EMISSIONS FACTOR FOR ENCLOSED GROUND FLARES AT NATURAL GAS PRODUCTION SITES[a]

Pollutant	SCC[e]	Emissions Factor[f]	Representativeness
THC[b,c,d]	31000205 31000212 31000227	332 lb/10^6 scf gas burned or 0.335 lb/10^6 Btu heat input[g]	Poorly

[a] The emissions factor in this table represents the emissions exiting the flare. Since the flare is not the originating source of the THC emissions, but rather the device controlling these pollutants routed from a process at the facility, the emissions factor is representative of controlled emissions rates for THC. This value is not representative of the uncontrolled THC routed to the flare from the associated process, and as such, it may not be appropriate for estimating the uncontrolled THC emissions or potential to emit from the associated process.

[b] THC measured as propane by US EPA Method 25A.

[c] These factors apply to well operated flares achieving at least 95% destruction efficiency, as required by the Oil and Gas sector rules in 40 CFR parts 60 and 63. Although the Oil and Gas sector rules in parts 60 and 63 do not require ground flares to operate in compliance with the current General Provisions requirements of 40 CFR Part 60 or 63, i.e. >200 btu/scf net heating value in the vent gas and less than the specified maximum exit velocity, the reference flares do meet these requirements. The emissions factor data set had an average destruction efficiency of 99.33% for the gas volume basis and an average destruction efficiency of 99.23% for the heat input basis. Based on tests using natural gas production field gas, e.g. tank vents, dehydrator vents. References 32 through 38.

[d] For enclosed ground flares with the SCCs specified in this table, the EPA recommends the use of this THC emissions factor instead of the VOC emissions factor in WebFIRE, as background documentation for this new emissions factor is available and the factor is based on field data from similar units.

[e] See Table 13.5-4 for a description of these SCCs. For the purposes of 40 CFR part 60 subparts OOOO and OOOOa and 40 CFR part 63 subparts HH and HHH, these units are not considered flares. The definition of flare in these subparts specifically exclude these units. In these subparts, a flare is defined as a thermal oxidation system using an open flame (without enclosure).

[f] Heat input is an appropriate basis for combustion emissions factor. However, based on available data, heat input data is not always known, but gas flowrate is generally available. Additionally, based on the available reports, there was a more robust dataset to develop an emissions factor on a gas volume basis. Therefore, the emissions factor is presented in two different forms.

[g] Factor developed using the lower (net) heating value of the vent gas.

Table 13.5-4. SCC Descriptions

SCC	Level 1 Description	Level 2 Description	Level 3 Description	Level 4 Description
30600903	Industrial Processes	Petroleum Industry	Flares	Natural Gas
30600904	Industrial Processes	Petroleum Industry	Flares	Process Gas
30190099	Industrial Processes	Chemical Manufacturing	Fuel Fired Equipment	User Specified
30600999	Industrial Processes	Petroleum Industry	Flares	Not Classified
30600201	Industrial Processes	Petroleum Industry	Catalytic Cracking Units	Fluid Catalytic Cracking Unit
30130115	Industrial Processes	Chemical Manufacturing	Chlorobenzene	Atmospheric Distillation Vents
30688801	Industrial Processes	Petroleum Industry	Fugitive Emissions	User Specified
30600401	Industrial Processes	Petroleum Industry	Blowdown Systems	Blowdown System with Vapor Recovery System with Flaring
30601801	Industrial Processes	Petroleum Industry	Hydrogen Generation Unit	General
30601701	Industrial Processes	Petroleum Industry	Catalytic Hydrotreating Unit	General
30600508	Industrial Processes	Petroleum Industry	Wastewater Treatment	Oil/Water Separator
40600240	Petroleum and Solvent Evaporation	Transportation and Marketing of Petroleum Products	Marine Vessels	Gasoline: Barge Loading - Average Tank Condition
30119701	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: General
30119741	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: Flue Gas Vent
30119705	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: General
30119709	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: Fugitive Emissions
30119799	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Other Not Classified
31000205	Industrial Processes	Oil and Gas Production	Natural Gas Production	Flares
31000212	Industrial Processes	Oil and Gas Production	Natural Gas Production	Condensate Storage Tank
31000227	Industrial Processes	Oil and Gas Production	Natural Gas Production	Glycol Dehydrator Reboiler Still Stack

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ATTACHMENT 7.10

DUST CONTROL PLAN

ATTACHMENT 7.11

DUST CONTROL PLAN

(UPDATED FEBRUARY 2019)

Camino Real Landfill

I. BACKGROUND

Since 1988, the Camino Real Landfill (CRLF) has implemented a number of dust control measures to mitigate potential fugitive dust emissions during typical landfill operations. In addition, CRLF continues to evaluate the effectiveness of alternative dust control measures (surfactants, wind fences, soil amendments, etc.) as new industry technologies and approaches are developed and tested. Many of the dust control measures described below were implemented consistent with the landfill's Plan of Operations, which were an integral component of the approved Solid Waste Application for Permit Renewal (July 2008).

II. SUMMARY OF DUST CONTROL MEASURES

The dust control methods outlined in this Plan are indicative of the control measures currently employed at the site, as well as those planned for the duration of the next 5-year Title V Permit term. Using a variety proven techniques, CRLF has mitigated the emission of fugitive dust by implementing a combination of control measures:

1) <u>Watering</u> – Potential fugitive dust emissions are controlled via water application to the following areas of the landfill:
   - Disposal Route
   - Access Roads
   - Landfill Office Parking Lot
   - Maintenance Compound
   - Active Disposal Area Fill Face Under High Wind Conditions
   - Daily Cover Soil Borrow Areas

   Roads receiving the most traffic (e.g., the disposal route, parking lots) receive more frequent water applications. Landfill access roads and daily cover soil borrow areas are also watered.
2) <u>Chemical Surfactants</u> – On a periodic basis, dust palliatives or surfactants are used as a supplement to the water in order to promote the formation of a surficial crust resistant to erosion.
3) <u>Racetrack Waste</u> – Race track waste material supplied by the Sunland Park Race Track has proven to be more resistant to wind erosion than the native silty sands/sandy silts. The race track waste is a combination of straw and decomposing horse manure, and contains larger

particle sizes, moisture, and organic content than the native on-site material. Consequently, this material can be used to supplement the intermediate cover overlying waste deposits.

4) Rock Armoring – Rock was previously deployed over approximately 6 acres of undisturbed portions of the Closed Area. The rock, whose average size is 5 – 6 inches, resists both wind and water erosion. While the rock remains in place, much of it has been covered by wind-blown soil as a result of the activities associated with the installation of the site's gas collection and control system (GCCS) in 1999 and 2000. Racetrack waste was applied to the area once covered by rock armoring.

5) Vegetative Test Plots – Commencing in 1997, the site initiated a study to evaluate the effectiveness of stabilizing closed areas by planting a variety of plant species indigenous to the area. Since issuance of the first Title V Permit in April 2001, some of the plant growth was temporarily impacted by the excavation and drilling activities associated with the installation of the GCCS. Reseeding of select portions of the Closed Area commenced in August 2002. Although the vegetation did not become self-sustaining, this continues to be an option that may be used as necessary.

6) Limits on Vehicle Speed – Signs posted along the disposal route and access roads limit vehicle speeds to 15 miles per hour.

7) Site Access Restrictions – Access to the site continues to be controlled by a single point of ingress/egress. Vehicles entering the site can only gain authorized access by first checking in at the Gate House, and entering past the security gate. The remainder of the site is protected by fencing, topography, and "No Trespassing" signs.

8) Natural Topography and Engineered Development – The landfill's topographic setting within a low point surrounded by mesa walls on three sides continues to create favorable conditions for limiting wind erosion. Current landfilling activities are conducted to the south of the Closed Area, which acts as a wind barrier to potential dust generation by these activities. Temporary wind fencing has been deployed at selected downwind locations to trap particulates before they leave the site.

9) Paving – In 2004, Camino Real paved the 1-mile-long public access road from McNutt Road to the landfill entrance. Additional paving was applied to the Landfill Office parking lot, Gate House area, and the intersection of the facility's unpaved access roads and disposal route. Approximately 400 feet of paved road was constructed from the Gate House (i.e., site entrance) to the Landfill Office, and approximately 2,800 ft^2 of the Landfill Office parking lot was also paved. In addition, approximately 140 feet of the disposal route south of the site entrance and approximately 350 feet of access road east of the Gate House were paved.

The following discussion provides additional detail on dust control measures being implemented at the site. The discussion is generally formatted after the Maricopa County, Arizona Rule 310 Plan, which creates some repetition.

III. ACCESS RESTRICTIONS

A. Restricted Access

No Trespassing signs in Spanish and English have been in-place since 1988 leading up to the landfill entrance. CRLF is secured on the perimeters with both chain link fencing and 5-strand barbed wire where natural barriers do not preclude accessibility. The US Border Patrol maintains active surveillance of the perimeter 24 hours per day, 365 days per year. Site ingress/egress is controlled by both vertical and horizontal automatic swing-arm gates operated by an attendant at the Gate House during operating hours. After hours, site ingress/egress may be controlled by a gate attendant and/or a security keypad. **Figure 5.1**, **Section 5** shows the location of existing fencing, gates, and other access control measure. In the spring of 2008, a fence was completed by the Federal Government along the U.S./Mexico border. The fence is constructed of 21-foot steel sections which extend 15 feet above grade and 6 feet below grade. A mesh fence on steel posts is used in flat areas and sheet pile sections are used to traverse steep grades.

B. Physical Barriers That Limit Unauthorized Access

The landfill currently uses the following physical barriers to limit unauthorized access:

- Five-strand wire fencing prevents access from the Gate House to the former U.S. Border Patrol staging area (i.e., Stable) along the north property line.
- From the former Border Patrol staging area to the northern property boundary, elevated railroad tracks and natural barriers (e.g., steep hillsides, sand dunes) prevent vehicular access to the site and limit pedestrian traffic.
- Access to the remaining perimeter of the northern boundary is controlled by the elevated railroad tracks and a constructed elevated earthern berm approximately 2,800 feet in length.
- Five-strand barbed wire fencing prevents access to the western boundary of the landfill.
- Along the southern property boundary (the Mexico border), a fence is constructed of 21-foot steel sections which extend 15 feet above grade and 6 feet below grade.
- Access is prevented along the eastern property boundary by 5-strand wire fencing and steep canyon walls.
- Access through the single authorized entrance to the landfill is controlled by automated gates operated by landfill staff during operational hours.

IV. CONTROL OF EMISSIONS

A. Unpaved Parking Lots

Potential fugitive dust emissions from unpaved portions of parking lots are controlled by a combination of applying gravel as a base course, and the routine application of water by water wagons. When necessary, dust palliatives or chemical surfactants (e.g., Road Boss® and magnesium or calcium chloride) are used as a supplement to the water in order to promote the formation of a surficial crust resistant to erosion.

B. Unpaved Disposal Route/Access Roads

1.0 Vehicle Speed Limitations

Signs are posted along the disposal route and access roads that limit all vehicle speeds to 15 miles per hour.

2.0 Water Application

Potential fugitive dust emissions from landfill roads and disposal operations are controlled by application of water by the following equipment:

- A water wagon (8,000-gallon capacity) serves as the site's primary water truck and is used on a daily basis when the landfill is operational. The primary water truck applies water to landfill roads (e.g., disposal route and access roads), parking lot areas (e.g., Landfill Office and Maintenance Compound), and disposal operations areas (e.g., waste disposal and daily cover soil borrow areas). These areas are shown on **Figure 5.1**, **Section 5**.
- A water wagon (8,000-gallon capacity) serves as a backup in the event the primary water truck is not operational. The backup water truck may also serve to apply water to waste deposits at the active fill face of disposal areas during high wind events when the primary water truck is occupied with increased water application at other site locations. High wind events during landfill operations increase the frequency and application rate of water, or cessation of operations until the wind subsides.
- In the event the site's water supply well becomes inoperable, water previously stored in the two on-site water tanks would be used until empty (combined volume of 312,000 gallons). As an additional emergency measure, the site could purchase additional water from the City of Sunland Park water tank, which is located approximately 500 feet northeast of the Maintenance Compound.

3.0 Chemical Surfactants

On a periodic basis, dust palliatives or surfactants are currently used as a supplement to the water in order to promote the formation of a surficial crust resistant to erosion.

C. Disturbed Surface Areas

1.0 Daily Cover Soil Borrow Areas

Control of potential fugitive dust emissions from operations associated with the excavation of daily cover soil is accomplished with an 8,000-gallon water wagon. Water is routinely applied to control fugitive dust emissions and to facilitate more efficient removal of excavated soil. Previous experience has shown that when the native silty sands/sandy silts are amended with moisture, excavation is more efficient, and less passes of the scraper are necessary.

2.0 Phasing of Work

Routine landfill operations include the daily excavation, hauling, and stockpiling of soil from areas where the next landfill cell will be located. Soil not needed for daily cover is stockpiled at a location proximate to the cell being constructed and the cell being filled. After the day's waste receipts are accepted, stockpiling of soil ceases and only the amount of soil needed for that day's daily cover is applied. This procedure serves to eliminate double-handling of daily cover soil.

D. Control of Emissions During Dust Generating Operations

1.0 Application of Suitable Dust Suppressant

Currently, water is the primary dust suppressant used at the landfill. Water for dust suppression is obtained from an on-site water tank (400,000-gallon capacity) that is supplied by a 150-gallon-per-minute, on-site production well. Water is also available (upon arrangement with the City of Sunland Park, NM) from a 1.2 million gallon City water tank that is located adjacent to the landfill at the northeast corner of the site. Currently, a chemical surfactant is applied periodically to unpaved portions of facility parking lots and the disposal route. Consistent with manufacturer's specifications and recommendations for application rates and maintenance frequencies, the landfill intends to implement the routine application of these or comparable dust palliatives to areas of activity that generate the most dust. The Camino Real Landfill will evaluate the applicability of the various surfactants that are commercially available to actual site conditions, and select the most feasible application for the suppression of dust at the site.

2.0 Water Application

During dust generating operations, water is applied to minimize potential fugitive dust emissions. Water is regularly applied to the disposal route and access roads; daily cover soil borrow areas; and, under high wind conditions, to the active fill face of waste disposal areas.

3.0 Wind Barriers

Currently, 3-foot high wind fences have been deployed at strategic downwind locations to trap particulates before they exit the site. The wind fences are periodically re-positioned as a function of the locations of the daily active fill face and current cell under construction. In addition, a man-made vegetative barrier comprised of 2,800 feet of 6-foot high Oleander bushes are positioned atop the screening berm located parallel to the northern property boundary. The fences and Oleanders are positioned downwind of the prevailing wind direction (northeast).

4.0 Topographic Screening

The sequence of cell construction and waste disposal has been deliberately designed to take advantage of favorable natural topographic conditions. Natural topographic conditions allowed for filling in a low area that was surrounded by mesa walls on three sides (east, west and south). Waste accepted through July 1993 was placed in a 50± acre area near the north property line, and these deposits now represent the Closed Area. The Unit 2 landfill cells (Cell 1 – Cell 10B) are located south of and behind the Closed Area. Future cells will be located south of and behind current fill areas, and also to the east of current fill areas (Unit 4). The positioning of current and future cells increases the distance particulates must travel prior to exiting the site. The Closed Area and Cells 1 through 10B represent a barrier between landfill operations and the north perimeter. The surrounding natural sidewalls and the man-made barrier allow most activities to take place below-grade. Existing and proposed landfill operations are set back from the north property line by over 1,000 feet.

E. Temporary Stabilization During Non-Operating Hours

1.0 Vegetative Ground Cover

Vegetative test plots constructed in the Closed Area in 1997 were heavily impacted by the construction and installation of the GCCS. Reseeding of select portions of the Closed Area was performed again in August 2002. Due to the arid climate in the El Paso, Texas area, recovery of the vegetation was slow and will continue to be monitored. As new fill areas reach final grade, additional vegetative species may be tested.

2.0 Vehicular Access

Current and proposed traffic from all solid waste delivery vehicles and daily operations vehicles typically do not occur on Sundays and holidays. Border Patrol vehicular traffic is not controlled under this Plan. Restriction of vehicular access to the site is outlined in Section III above.

F. Permanent Stabilization

1.0 Phased Landfill Stabilization

Due to the sequencing of landfill construction and operations, most disposal cells are filled until a prescribed intermediate grade is achieved. At this point, the intermediate-grade slopes are covered with 12 inches of soil, and may be supplemented by race track waste supplied by the City of Sunland Park Race Track. Previous experience at the landfill has shown that the race track waste, comprised primarily of straw and decaying horse manure, possesses a larger particle size and higher moisture content than the native materials, making the race track waste more erosion resistant. Landfill equipment is used to spread the race track waste across the intermediate slopes, which currently occupies approximately 175 acres± (i.e., Cells 1 through 10B).

2.0 Ultimate Landfill Stabilization

As part of ultimate site closure, a final cover system will be constructed that includes the planting of vegetation known to be successful in southern Doña Ana County. The NMED-approved Closure/Post-Closure Plan outlines the steps leading to site restoration, including the establishment of vegetation.

G. Restoration of Open Areas and Vacant Lots

1.0 Area Restoration

The configuration of the landfill has been designed to allow development of the permitted landfill footprint while minimizing disturbance of adjacent areas. Therefore, at the time of ultimate site closure, the areas that are "open" or vacant will be minimal compared to the landfilled area subject to vegetation, as prescribed in the NMED-approved Closure/Post-Closure Plan. In addition, vacant areas will occupy perimeter locations much lower in elevation than the landfill final grades. As part of routine operations, open areas (e.g., parking lots) are watered or treated with chemical surfactants to control fugitive dust emissions.

2.0 Application of Suitable Dust Suppressant

Currently, potential fugitive dust emissions from unpaved parking lots are minimized by a combination of applying water, using gravel as a base course, and on a periodic basis, supplementing the water with chemical surfactant.

H. Bulk Material Handling Operations and Open Storage Piles (During Loading and Unloading Operations)

1.0 Water Application

Two primary materials are handled at the landfill: waste and soil. If high winds occur at the active disposal fill face, water is applied to the waste and daily cover soils, as necessary, to minimize potential fugitive dust emissions. Water is also applied (as necessary) to the areas where daily cover soil is obtained. High wind events during application of daily cover soil over waste deposits and disposal operations at the active fill face prompt increased water application rates and frequency. In the event of excessively high winds, non-essential dust generating landfill operations (e.g., cell preparation and routine road maintenance) are discontinued.

2.0 Application of Alternative Excavation Techniques

New earthmoving techniques are being evaluated and tested in an effort to minimize dust generation and maximize equipment and technology efficiencies. For example, on an as-needed basis, a bulldozer is used to loosen onsite soils in daily cover soil borrow areas that occasionally are either too difficult to remove with a scraper or need to be loosened from steep embankments that cannot be accessed by the scraper. In addition, in limited areas within daily cover soil borrow areas that are inaccessible by scrapers, front end loaders are used for excavation, and the loaders place the soil into articulated dump trucks for transportation to the active fill face for use as daily cover. Unlike soil removal by scrapers, use of the bulldozer and end loaders serves to localize and confine the disturbed soil to a smaller volume, enhancing control efficiencies and lowering potential fugitive emissions.

3.0 Wind Barriers

Currently, 3-foot high wind fences have been deployed at strategic locations at the landfill. The fences are moved periodically and re-positioned to maximize their capture efficiency with respect to changing fill face and cell construction locations. In addition, a vegetative barrier comprised of 2,800 feet of 6-foot high Oleander bushes are positioned atop the screening berm located parallel to the northern property boundary. The fences and Oleanders are positioned downwind of the prevailing wind direction (northeast).

The topographic setting of the landfill also provides natural advantages with respect to reducing potential dust emissions. For example, the site is located in a natural depression with steep sidewalls located on three of its four sides (to the west, east and south). The initial waste deposits were placed near the north property line, and this disposal area was filled to final grade and closed in 1993 (the Closed Area). The current landfill cells (Cell 1 – Cell 10B) are located south of and behind the Closed Area. Future cells will be located east of, and south of and behind current fill areas. The positioning of current and future cells increases the distance particulates must travel prior to exiting the site. The Closed Area and Cells 1 through 10B represent a barrier between landfill operations and the north perimeter. The surrounding natural sidewalls and the man-made barrier allow most activities to take place below-grade. Existing and proposed landfill operations are set back from the north property line by over 1,000 feet.

I. Waste Hauling and Transportation

1.0 Loading of Haul Trucks

Most waste delivery vehicles entering the site are enclosed, and it is the landfill's standard operating practice to require non-enclosed waste delivery vehicles to be covered prior to entry. For open-top vehicles, tarps are required to cover the waste contents.

2.0 Minimization of Vehicle Trackout

The site location receives approximately 9 inches of rain annually, and the on-site roads are constructed of a combination of caliche, on-site silty sands/sandy silts, and suitable construction and demolition debris. Because of the site's dry setting and lack of cohesive road materials, concerns associated with vehicle trackout are minimal.

3.0 Limiting Vehicle Speed

Signs installed along landfill roads (disposal route and access roads limit) vehicle speeds to 15 miles per hour.

4.0 Public Convenience Station

Since October 2001, Camino Real Landfill has operated a Public Convenience Station for residents of Sunland Park, New Mexico. The Convenience Station consists of two, side-by-side, 30-yd^3 roll-off boxes accessed by an elevated, paved ramp. The purpose of the Convenience Station is to provide a convenient location for residential self-haul customers to dispose of waste, and to reduce the amount of fugitive dust emissions generated by these vehicles on the disposal route.

V. WIND EVENT CONTROL MEASURES

A. Dust Generating Operations

1.0 High Wind Events

During high wind events, the rate of water application is increased, and certain non-essential landfill operations are either restricted or stopped for the day. For example, cell preparation or routine road maintenance would likely be restricted or stopped during high winds. On rare occasions, the landfill has closed due to high winds. As necessary, the application rate and frequency of watering are increased to minimize potential dust emissions.

2.0 Wind Barriers

Wind barriers are discussed in Section IV.D.3.

B. Temporary Disturbed Surface Areas

1.0 New Cell Construction

Areas subject to excavation for preparation of a new cell are routinely scheduled for when high winds are less likely. Excavation of a new cell area is performed on a daily basis and conducted as expeditiously as possible in order to deploy the composite liner system. Once the liner material is installed, potential dust emissions from the new cell approach zero.

2.0 Temporary and Permanent Access Roadways

Temporary access roadways and parking lots are maintained with gravel base course material, crushed aggregate, and/or select C & D debris. Recycled asphalt and on-site caliche are also used for road construction and maintenance. The locations of temporary roadways are placed below surrounding grade to the extent practical in order to minimize the effects of wind erosion.

3.0 Operational Requirements Using the Area Fill Landfill Method

The area fill method is the most common landfill method employed today. This method allows excavation of new cells to the desired depth, followed by construction of liners and leachate collection systems. Once the liner and leachate collection systems are installed, waste placement commences. Construction of new cells using the area fill method necessarily requires a temporary disturbance. During excavation of new cells, potential dust emissions are controlled by watering the area subject to excavation, watering access roads, and confining soil stockpiles to the smallest area practicable. The elevations of the landfill cell floors are all below the surrounding terrain, minimizing dust dispersion.

ATTACHMENT 7.11

SITE-SPECIFIC HYDROGEN SULFIDE ANALYSIS

5/8/17

Analytical Report

Sample log # : **S0427a**

Sample Description :	*Bio Gas*	Customer Project:	*Camino Real LF*
Number of Samples :	*2*	Received Date :	*4/27/17*

Note: This report is submitted to the requester through E-mail only. Please let us know if your need this document security signed, or a hard copy report by mail or fax.

Results:

All results are attached in following pages.

The unit conversion is based on standard conditions at 60^{o}F and 14.73 psia, where applied

Submitted by: Sherman S. Chao, Ph.D.
Tel: (630) 230-9378, Fax: (630) 230-9376

Disclaimer:

Analytical Solution, Inc., 7320 S. Madison, Unit 500, Willowbrook, Illinois 60527

ANALYTICAL SOLUTION, INC. **(AnSol)**

5/8/17 **Analytical Report** **Sample log # :** **S0427a**

GAS COMPONENT ANALYSIS

Sample ID:	**Conc. Unit**	**S0427a01**	**S0427a02**
	Description:	LFG, SKC Tedlar bag, 4/26/17, 1100	LFG, ESS Tedlar bag, 4/26/17, 1105
Methane	%	28.68	30.14
Carbon dioxide	%	26.56	28.29
Nitrogen	%	41.2	39.06
Oxygen	%	3.55	2.52
GHV, dry (14.73 psi) *	Btu/scf	291	306
NHV, dry (14.73 psi) *	Btu/scf	262	275
Relative density *		1.002	1.004
Hydrogen sulfide	ppmv	1.29	0.22
TNMOC, as methane **	ppmv	ND	ND

***** Calculation based on major components listed.

Note: All major component concentrations were reported as a moisture, H2S and C_2 plus free basis and were normalized to 100%. Oxygen and Argon cannot be separated; therefore, the oxygen result may include a small amount of Argon. Some results may be reported with additional significance for reference.

** Total Non-Methane Organic Carbon, modified EPA 25

Analytical Solution, Inc., 7320 S. Madison, Unit 500, Willowbrook, Illinois 60527

ATTACHMENT 7.12

Tier 1-3 Engine Emissions Factor Reference

Tier 1-3 Emission Standards (dieselnet.com)
https://dieselnet.com/standards/us/nonroad.php#tier3

The 1998 nonroad engine regulations were structured as a 3-tiered progression. Each tier involved a phase-in (by horsepower rating) over several years. Tier 1 standards were phased-in from 1996 to 2000. The more stringent Tier 2 standards took effect from 2001 to 2006, and yet more stringent Tier 3 standards phased-in from 2006 to 2008 (Tier 3 standards applied only for engines from 37-560 kW).

Tier 1-3 emissions standards are listed in Table 1. Nonroad regulations use the metric system of units, with regulatory limits expressed in grams of pollutant per kWh.

Table 1
EPA Tier 1-3 nonroad diesel engine emission standards, g/kWh (g/bhp·hr)

Engine Power	Tier	Year	CO	HC	NMHC+NOx	NOx	PM
kW < 8 (hp < 11)	Tier 1	2000	8.0 (6.0)	-	10.5 (7.8)	-	1.0 (0.75)
	Tier 2	2005	8.0 (6.0)	-	7.5 (5.6)	-	0.8 (0.6)
8 ≤ kW < 19 (11 ≤ hp < 25)	Tier 1	2000	6.6 (4.9)	-	9.5 (7.1)	-	0.8 (0.6)
	Tier 2	2005	6.6 (4.9)	-	7.5 (5.6)	-	0.8 (0.6)
19≤ kW < 37 (25 ≤ hp < 50)	Tier 1	1999	5.5 (4.1)	-	9.5 (7.1)	-	0.8 (0.6)
	Tier 2	2004	5.5 (4.1)	-	7.5 (5.6)	-	0.6 (0.45)
37 ≤ kW < 75 (50 ≤ hp < 100)	Tier 1	1998	-	-	-	9.2 (6.9)	-
	Tier 2	2004	5.0 (3.7)	-	7.5 (5.6)	-	0.4 (0.3)
	Tier 3	2008	5.0 (3.7)	-	4.7 (3.5)	-	-†
75 ≤ kW < 130 (100 ≤ hp < 175)	Tier 1	1997	-	-	-	9.2 (6.9)	-
	Tier 2	2003	5.0 (3.7)	-	6.6 (4.9)	-	0.3 (0.22)
	Tier 3	2007	5.0 (3.7)	-	4.0 (3.0)	-	-†
130 ≤ kW < 225 (175 ≤ hp < 300)	Tier 1	1996	11.4 (8.5)	1.3 (1.0)	-	9.2 (6.9)	0.54 (0.4)
	Tier 2	2003	3.5 (2.6)	-	6.6 (4.9)	-	0.2 (0.15)
	Tier 3	2006	3.5 (2.6)	-	4.0 (3.0)	-	-†
225 ≤ kW < 450 (300 ≤ hp < 600)	Tier 1	1996	11.4 (8.5)	1.3 (1.0)	-	9.2 (6.9)	0.54 (0.4)
	Tier 2	2001	3.5 (2.6)	-	6.4 (4.8)	-	0.2 (0.15)
	Tier 3	2006	3.5 (2.6)	-	4.0 (3.0)	-	-†
450 ≤ kW < 560 (600 ≤ hp < 750)	Tier 1	1996	11.4 (8.5)	1.3 (1.0)	-	9.2 (6.9)	0.54 (0.4)
	Tier 2	2002	3.5 (2.6)	-	6.4 (4.8)	-	0.2 (0.15)
	Tier 3	2006	3.5 (2.6)	-	4.0 (3.0)	-	-†
kW ≥ 560 (hp ≥ 750)	Tier 1	2000	11.4 (8.5)	1.3 (1.0)	-	9.2 (6.9)	0.54 (0.4)
	Tier 2	2006	3.5 (2.6)	-	6.4 (4.8)	-	0.2 (0.15)

† Not adopted, engines must meet Tier 2 PM standard.

Section 8

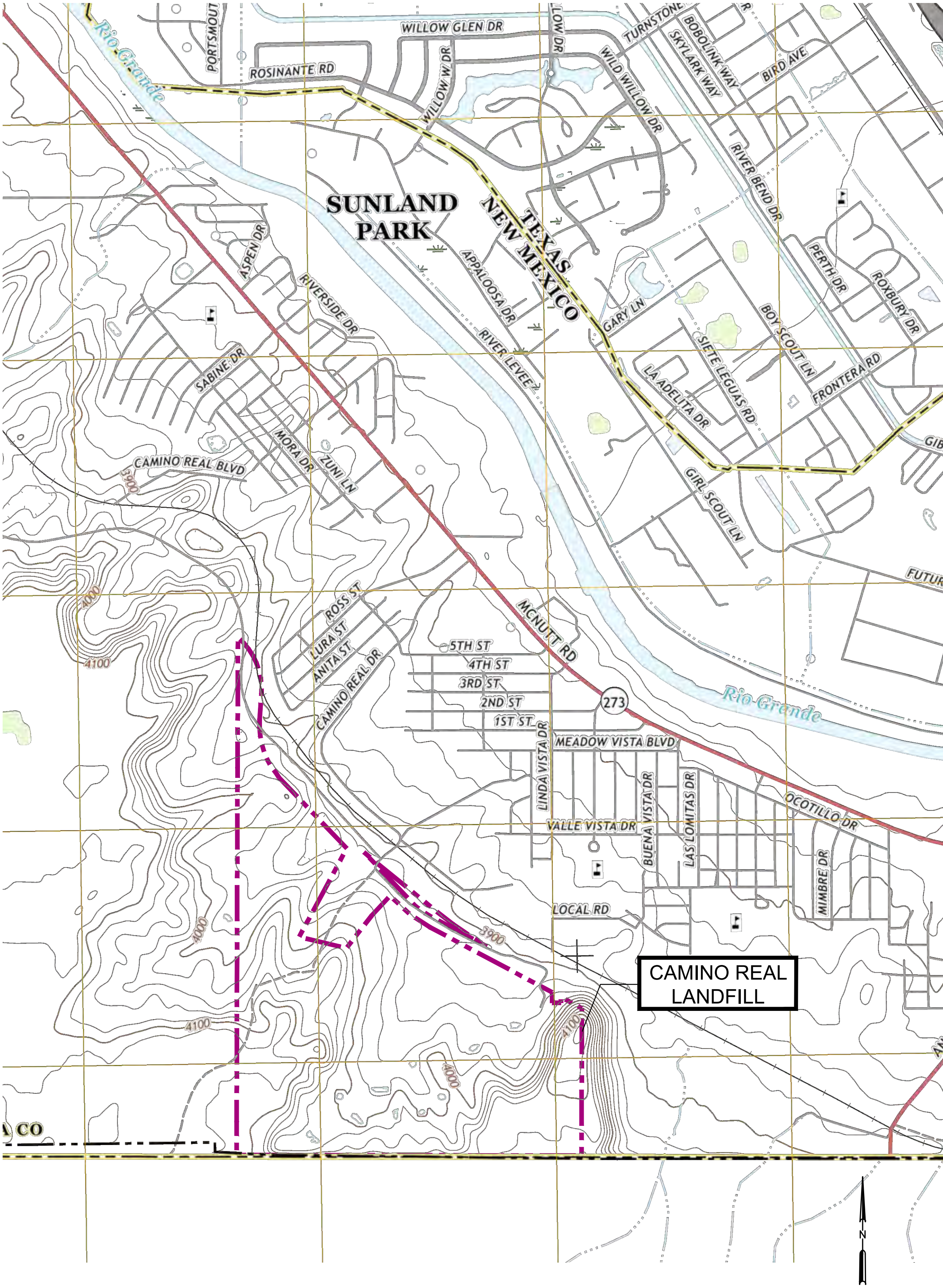
Map(s)

A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

The UTM or Longitudinal coordinate system on both axes	An indicator showing which direction is north
A minimum radius around the plant of 0.8km (0.5 miles)	Access and haul roads
Topographic features of the area	Facility property boundaries
The name of the map	The area which will be restricted to public access
A graphical scale	

Four drawings as follows are included which encompass the content listed above for clarity. A current drawing showing the gas collection and control system is also included. These drawings are as follows:

Drawing 8.1 Site Location Map;
Drawing 8.2 Overall Landfill Site Plan;
Drawing 8.3 Facility Layout; and
Drawing 8.4 GCCS Site Plan.



NOTE

1. BASED ON SMELTERTOWN, TX–NM–CHH, REVISED 2016 QUADRANGLE, USGS 7.5' SERIES (1:24,000 SCALE).

FOR PERMIT PURPOSES ONLY

REV	DATE	DESCRIPTION	BY

DRAWING TITLE
SITE LOCATION MAP

PROJECT TITLE
TITLE V RENEWAL

CLIENT
CAMINO REAL ENVIRONMENTAL CENTER, INC.
SUNLAND PARK, NEW MEXICO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
1901 CENTRAL DRIVE SUITE 550
BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188

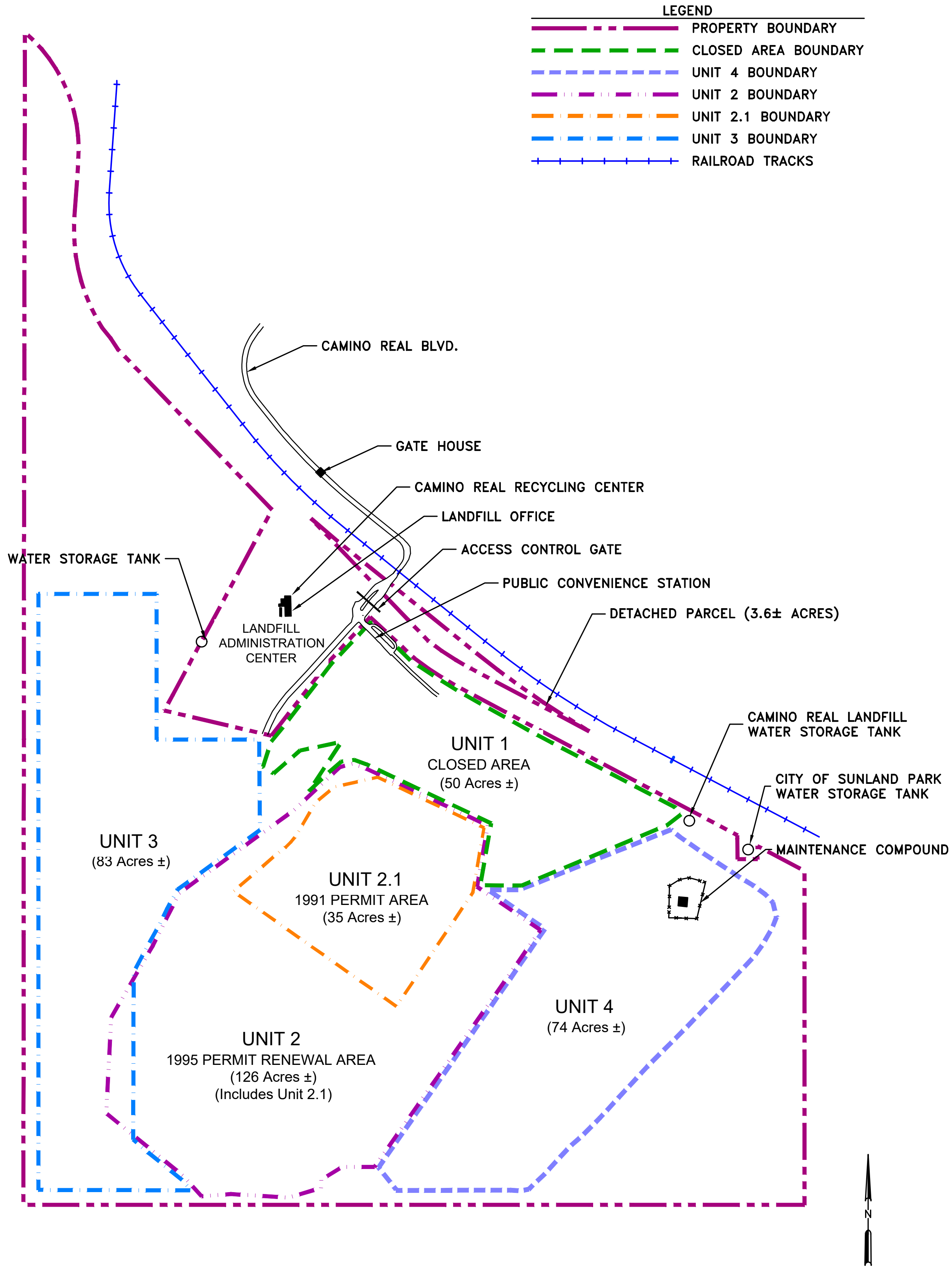
PROJ. NO. 16220119.00 | DSN. BY: JK | DWN. BY: ORA | CHK. BY: JK | Q/A RVW BY: DJM | APP. BY: DJM

CADD FILE: SITE LOCATION MAP (RENEWAL)

DATE: 06/2021

SCALE: AS SHOWN

DRAWING NO. **8.1**



NOTE

1. THE INFORMATION FOR THIS DRAWING WAS ACQUIRED FROM A FIGURE ENTITLED "SPECIAL WASTE MANAGEMENT AREAS," PREPARED BY GORDON ENVIRONMENTAL, INC., DATED SEPTEMBER 02, 2010.

FOR PERMIT PURPOSES ONLY

REV | DATE | DESCRIPTION | BY

DRAWING TITLE
OVERALL LANDFILL SITE PLAN

PROJECT TITLE
TITLE V RENEWAL

CLIENT
CAMINO REAL ENVIRONMENTAL CENTER, INC. SUNLAND PARK, NEW MEXICO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
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PROJ. NO. 16217091.00
DSN. BY: JK
DWN. BY: ORA
CHK. BY: JK
Q/A RVW BY: DJM
APP. BY: DJM

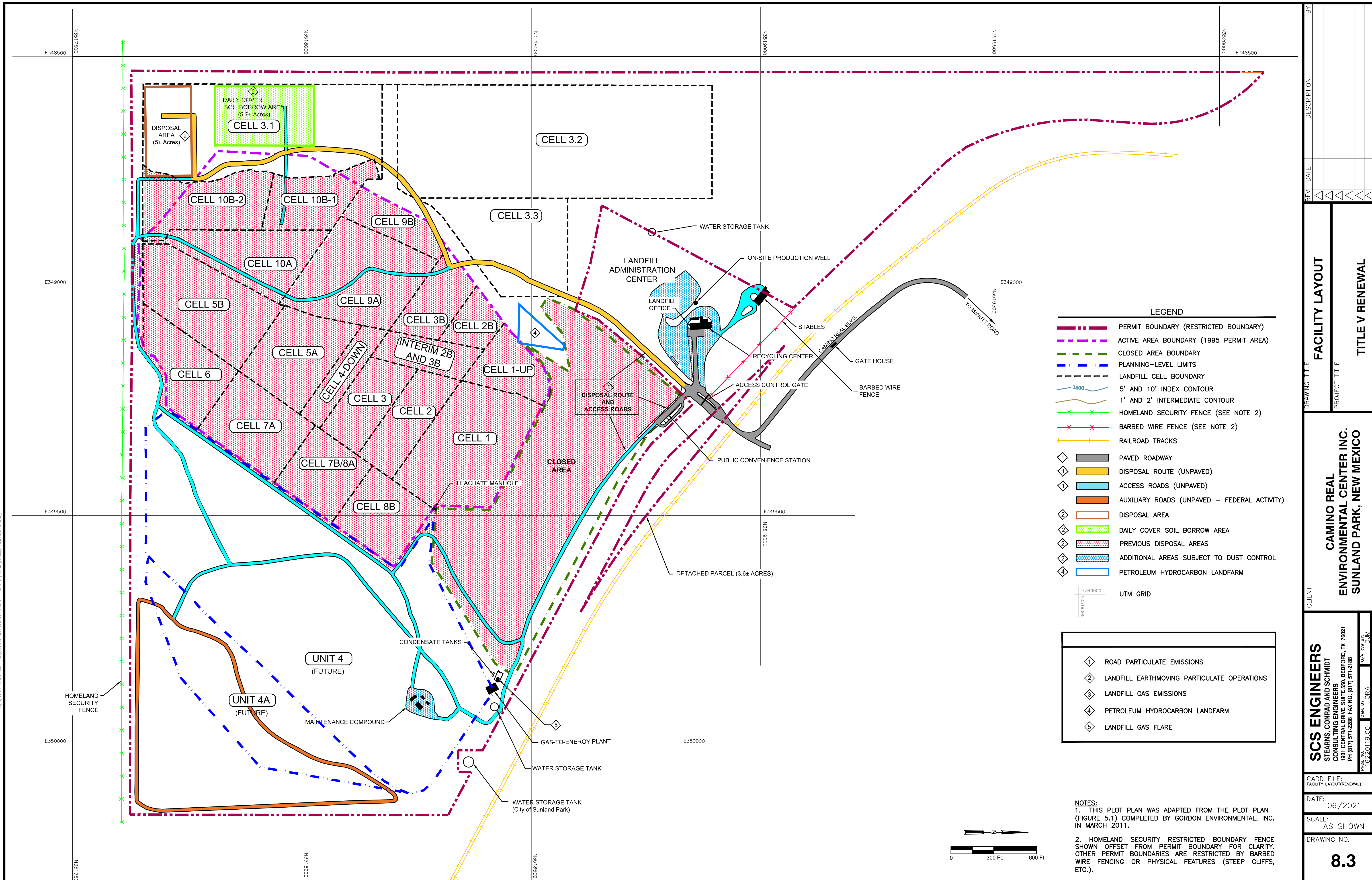
CADD FILE: SITE PLAN (RENEWAL)

DATE: 06/2021

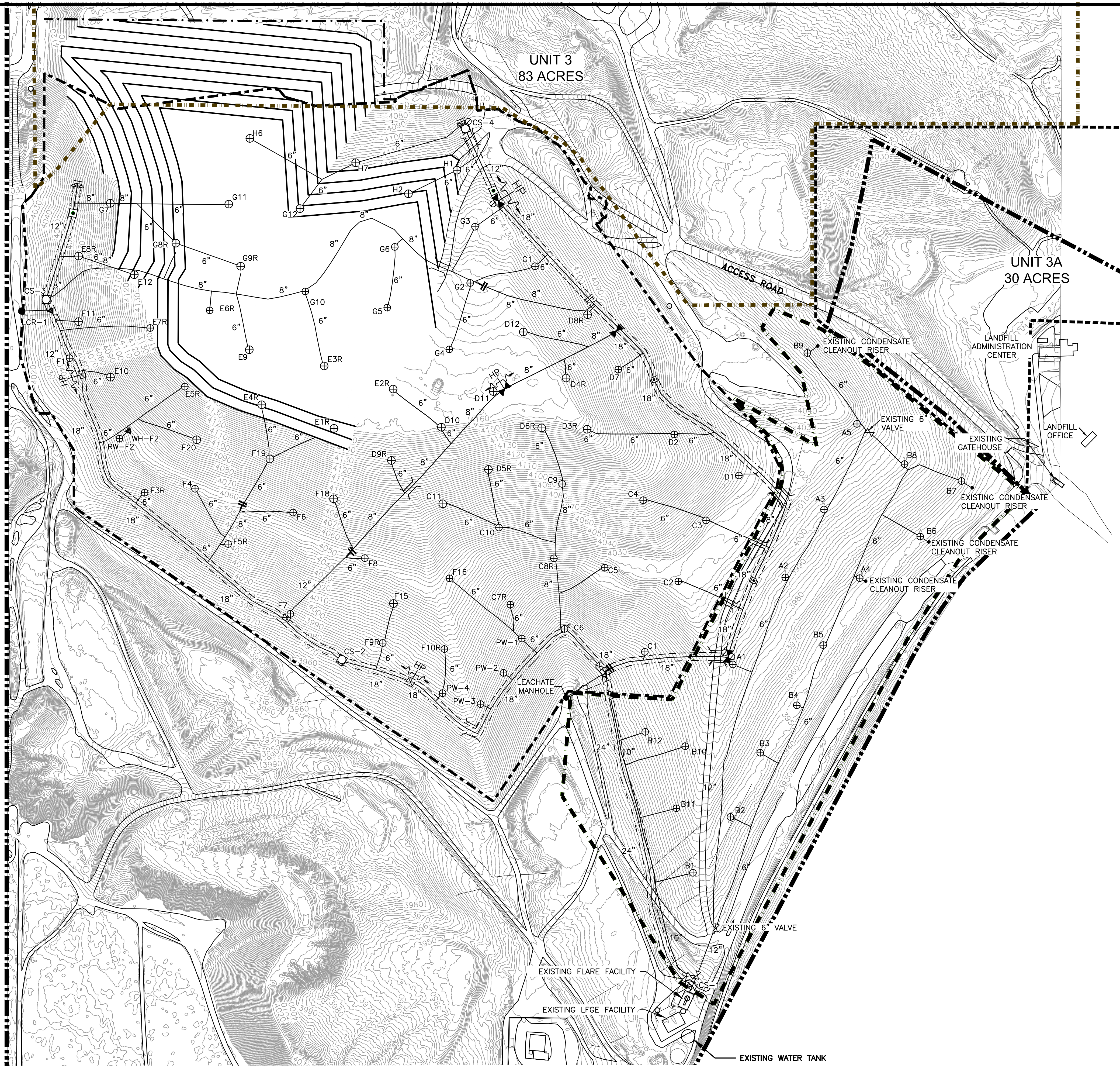
SCALE: AS SHOWN

DRAWING NO.
8.2

G:\Camino Real\16220119.00 – Title V permit\SITE PLAN (RENEWAL)
3/8/2021 11:57 AM



CELL 3.1
DAILY COVER SOIL BORROW AREA (6.7± Acres)
DISPOSAL AREA (5± Acres)
CELL 3.2
CELL 3.3
CELL 10B-2
CELL 10B-1
CELL 9B
CELL 10A
CELL 5B
CELL 9A
CELL 3B
CELL 2B
CELL 5A
INTERIM 2B AND 3B
CELL 4-DOWN
CELL 1-UP
CELL 6
CELL 3
CELL 2
CELL 7A
CELL 1
CELL 7B/8A
CELL 8B
CLOSED AREA
DISPOSAL ROUTE AND ACCESS ROADS
LEACHATE MANHOLE
LANDFILL ADMINISTRATION CENTER
LANDFILL OFFICE
WATER STORAGE TANK
ON-SITE PRODUCTION WELL
STABLES
RECYCLING CENTER
GATE HOUSE
ACCESS CONTROL GATE
BARBED WIRE FENCE
PUBLIC CONVENIENCE STATION
DETACHED PARCEL (3.6± ACRES)
CAMINO REAL BLVD.
TO McNUTT ROAD
UNIT 4 (FUTURE)
UNIT 4A (FUTURE)
CONDENSATE TANKS
MAINTENANCE COMPOUND
GAS-TO-ENERGY PLANT
WATER STORAGE TANK
WATER STORAGE TANK (City of Sunland Park)
HOMELAND SECURITY FENCE
E348500
E349000
E349500
E350000
N3517500
N3518000
N3518500
N3519000
N3519500
N3520000
LEGEND
PERMIT BOUNDARY (RESTRICTED BOUNDARY)
ACTIVE AREA BOUNDARY (1995 PERMIT AREA)
CLOSED AREA BOUNDARY
PLANNING-LEVEL LIMITS
LANDFILL CELL BOUNDARY
5' AND 10' INDEX CONTOUR
1' AND 2' INTERMEDIATE CONTOUR
HOMELAND SECURITY FENCE (SEE NOTE 2)
BARBED WIRE FENCE (SEE NOTE 2)
RAILROAD TRACKS
PAVED ROADWAY
DISPOSAL ROUTE (UNPAVED)
ACCESS ROADS (UNPAVED)
AUXILIARY ROADS (UNPAVED - FEDERAL ACTIVITY)
DISPOSAL AREA
DAILY COVER SOIL BORROW AREA
PREVIOUS DISPOSAL AREAS
ADDITIONAL AREAS SUBJECT TO DUST CONTROL
PETROLEUM HYDROCARBON LANDFARM
UTM GRID
1 ROAD PARTICULATE EMISSIONS
2 LANDFILL EARTHMOVING PARTICULATE OPERATIONS
3 LANDFILL GAS EMISSIONS
4 PETROLEUM HYDROCARBON LANDFARM
5 LANDFILL GAS FLARE
0 300 Ft. 600 Ft.
NOTES:
1. THIS PLOT PLAN WAS ADAPTED FROM THE PLOT PLAN (FIGURE 5.1) COMPLETED BY GORDON ENVIRONMENTAL, INC. IN MARCH 2011.
2. HOMELAND SECURITY RESTRICTED BOUNDARY FENCE SHOWN OFFSET FROM PERMIT BOUNDARY FOR CLARITY. OTHER PERMIT BOUNDARIES ARE RESTRICTED BY BARBED WIRE FENCING OR PHYSICAL FEATURES (STEEP CLIFFS, ETC.).
REV DATE DESCRIPTION BY
DRAWING TITLE
FACILITY LAYOUT
PROJECT TITLE
TITLE V RENEWAL
CLIENT
CAMINO REAL ENVIRONMENTAL CENTER INC. SUNLAND PARK, NEW MEXICO
SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
1901 CENTRAL DRIVE, SUITE 550, BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188
PROJ. NO. 16220119.00
DSN. BY: JK
DWN. BY: ORA
CHK. BY: JK
Q/A RVW BY: DJM
APP. BY: DJM
CADD FILE: FACILITY LAYOUT(RENEWAL)
DATE: 06/2021
SCALE: AS SHOWN
DRAWING NO.
8.3



0 200 400
SCALE IN FEET

- EXISTING CONTOURS (SEE NOTE 1)
- SOLID WASTE FACILITY BOUNDARY
- LIMIT OF WASTE FOR UNIT 1 (CLOSED)
- LIMIT OF WASTE FOR UNIT 2
- EXISTING HEADER/LATERAL PIPING
- EXISTING AIR SUPPLY LINE
- EXISTING 3"/4" CONDENSATE FORCEMAIN
- G4/RW-G3 EXISTING VERTICAL/REMOTE LFG EXTRACTION WELL
- WH-G3 EXISTING REMOTE WELLHEAD
- EXISTING LEACHATE CONNECTION RISER/MANHOLE
- EXISTING HEADER ISOLATION VALVE
- EXISTING BLIND FLANGE
- EXISTING HEADER ISOLATION VALVE
- EXISTING FORCEMAIN ISOLATION VALVE
- EXISTING AIR SUPPLY LINE ISOLATION VALVE
- EXISTING HEADER ACCESS RISER
- EXISTING BLIND FLANGE
- EXISTING HDPE CAP
- HP EXISTING HIGH POINT
- EXISTING ROAD CROSSING

1. EXISTING TOPOGRAPHY IS FROM AN AERIAL SURVEY FLOWN ON FEBRUARY 15, 2020.
2. THE EXISTING GCCS LAYOUT IS CONSISTENT WITH GCCS RECORD DRAWING AND PROPOSED WORK PREPARED BY SCS ENGINEERS, DATED MAY 31, 2019 AND FEBRUARY 01, 2021, RESPECTIVELY.

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: SITE LAYOUT

PROJECT TITLE: TITLE V RENEWAL

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER INC. SUNLAND PARK, NEW MEXICO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
1901 CENTRAL DRIVE, SUITE 550, BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188

PROJ. NO. 16220119.00 | DSN. BY: JK | DWN. BY: ORA | CHK. BY: JK | Q/A RVW BY: DJM | APP. BY: DJM

CADD FILE: 01 - EXITING GCCS (2020)

DATE: 06/2021

SCALE: AS SHOWN

DRAWING NO. 8.4

Section 9

Proof of Public Notice

(for NSR applications submitting under 20.2.72 or 20.2.74 NMAC)
(This proof is required by: 20.2.72.203.A.14 NMAC "Documentary Proof of applicant's public notice")

☑ **I have read the AQB "Guidelines for Public Notification for Air Quality Permit Applications"**
This document provides detailed instructions about public notice requirements for various permitting actions. It also provides public notice examples and certification forms. Material mistakes in the public notice will require a re-notice before issuance of the permit.

Unless otherwise allowed elsewhere in this document, the following items document proof of the applicant's Public Notification. Please include this page in your proof of public notice submittal with checkmarks indicating which documents are being submitted with the application.

New Permit and **Significant Permit Revision** public notices must include all items in this list.

Technical Revision public notices require only items 1, 5, 9, and 10.

Per the Guidelines for Public Notification document mentioned above, include:

1. ☐ A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
2. ☐ A list of the places where the public notice has been posted in at least four publicly accessible and conspicuous places, including the proposed or existing facility entrance. (e.g: post office, library, grocery, etc.)
3. ☐ A copy of the property tax record (20.2.72.203.B NMAC).
4. ☐ A sample of the letters sent to the owners of record.
5. ☐ A sample of the letters sent to counties, municipalities, and Indian tribes.
6. ☐ A sample of the public notice posted and a verification of the local postings.
7. ☐ A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
8. ☐ A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
9. ☐ A copy of the classified or legal ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
10. ☐ A copy of the display ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
11. ☐ A map with a graphic scale showing the facility boundary and the surrounding area in which owners of record were notified by mail. This is necessary for verification that the correct facility boundary was used in determining distance for notifying land owners of record.

Public notification is not required since this is a Title V Renewal Application.

Section 10

Written Description of the Routine Operations of the Facility

---

<u>A written description of the routine operations of the facility</u>. Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

There are no inherent bottlenecks to operation. The amount of material brought into the landfill is a function of the generation of waste in the area and is unlikely to outstrip the landfill's capacity to efficiently landfill it in an environmentally safe manner.

Emissions calculations are provided for the following sources; this section will provide operational data on these sources:

- Road Particulate Emissions inclusive of both paved and unpaved routes (Unit Number 1);
- Landfill Earthmoving Particulate Emissions inclusive of bulldozing operations, grading operations, scraper operations, and wind erosion (Unit Number 2);
- Landfill Gas Emissions (Unit Number 3);
- Petroleum Hydrocarbon Landfill (Unit Number 4);
- Landfill Gas Flare inclusive of flare combustion by-products (Unit Number 5);
- Portable Engines (Unit Numbers 6-8); and
- Insignificant Sources.

Roads Particulate Emissions – Emission Unit 1

The disposal route and landfill access roads consist of paved and unpaved surfaces, and temporary graded roadways. Vehicles traveling on the unpaved portions of the disposal route and access roads (Figure 5.1) have the potential to generate fugitive dust emissions. Cumulatively, potential fugitive dust emissions from vehicular traffic have been designated as Emission Unit 1. Unpaved road surfaces are currently watered on a daily basis, or treated with chemical surfactants for dust control. The Dust Control Plan, Attachment 7.10, provides additional information on the dust control measures. Emission rate estimates are provided for the following categories:

- Refuse Delivery Vehicles – Delivery of solid waste along the disposal route (site entrance to disposal area);
- Public Convenience Station Vehicles – For approximately 2 hours each day, a portion of incoming light/medium vehicles (residential haulers) are diverted to the Public Convenience Station; and
- Miscellaneous Vehicles – Employee vehicles (trucks, personal vehicles) which travel on the disposal route and access roads.

Detailed emissions calculations for Emission Unit 1 activities are provided in Tables 6.2a and 6.2b. References used in emissions calculations can be found in Attachment 7.1. Road lengths were conservatively estimated to ensure that any changes in the routes would not result in any emissions increase above permitted limits during the landfill's development. Road lengths were determined by:

- Refuse Delivery Vehicles – 164 feet paved and 4,938 feet unpaved, one-way each. The lengths were determined to be from the permit boundary to the edge of paved roadway leading to the active landfill face and the unpaved from the edge of paved to the most distant possible disposal cell during the landfill's development.
- Public Convenience Station Vehicles – 460.5 feet paved only, one-way. The length was determined from the permit boundary to the far end of the public convenience station. All vehicles routed to the public convenience station would not drive on any unpaved roadways.
- Miscellaneous Vehicles – Employee vehicles (trucks, personal vehicles) which travel on the disposal route and access roads.

To determine vehicle typical quantities for the calculations, actual values from recent emissions inventories were checked against the permit application vehicle totals. Since the overall vehicle totals in the permit were higher in total than any recent year and since the road lengths assumed here are the longest during the landfill's development, they were utilized for conservativeness.

Dust control measures are regularly employed during routine landfill operations in order to reduce fugitive dust emissions produced by landfill activities. Consistent with existing New Mexico Environment Department (NMED) Air Quality Bureau (AQB) policy, an overall water control efficiency of 60 percent was applied to unpaved access roads which receive water as a dust control measure. The disposal route is treated quarterly with surfactant and daily with water, consistent with surfactant manufacturer's application specifications and frequencies, for an overall control efficiency of 90 percent (as approved by the Bureau). Detailed calculations for fugitive dust control efficiencies for the disposal route and access roads are provided in Tables 6.2a and 6.2b, and discussions of surfactant and water application are detailed in the Dust Control Plan, Attachment 7.10.

Landfill Earthmoving Particulate Emissions – Emission Unit 2

Fugitive dust emissions from disposal area operations and daily landfill cell construction result primarily from the daily operations of heavy equipment such as scrapers, road graders, bulldozers, and compactors. Scrapers are used to excavate soil in order to prepare new landfill disposal cells and to deliver soil to the disposal area for daily cover. Road graders maintain the disposal route and access roads and perform limited finish-grading operations for new cells (which are subject to periodic watering). Compactors consolidate waste at the disposal area. Bulldozers assist the compactors at the disposal area by positioning waste so it can be easily consolidated.

Potential fugitive dust emissions from the heavy equipment associated with disposal area and cell construction operations were calculated based on CRLF equipment annual usage for each piece of equipment at the landfill and a conservative factors-of-safety. Detailed calculations of fugitive dust emissions for heavy equipment operations can be found in Tables 6.3a and 6.3b. References for the calculations can be found in Attachments 7.1, 7.2, and 7.3. Also note that heavy equipment specifications can be found in Attachment 7.8.

Wind erosion was also included as part of this emission unit. Based on guidance provided in AP-42, Section 13.2.5, Industrial Wind Erosion (November, 2006), only those areas of the landfill actively disturbed by facility operations were included in the acreage for which potential fugitive dust emissions attributable to wind erosion were calculated. It is assumed that no more than 36 acres will be actively disturbed at any one time. Detailed calculations for fugitive dust emissions due to wind erosion can be found in Table 6.3c. References for the calculations can be found in Attachments 7.1 and 7.3.

Fugitive dust control measures are employed during the operating day in order to reduce potential fugitive dust emissions during normal operations. A control efficiency of 60 percent was applied to scraper travel and grader travel on the landfill access roads, and a control efficiency of 90 percent was applied to scraper travel on the disposal route. The bulldozer and compactor operate nearly 100 percent of the time within the disposal area, which is watered to a limited degree (e.g., during high wind events). Therefore, no control efficiency was applied to bulldozer and compactor operations. Using the AP-42 guidance, wind erosion emissions estimates from approximately 36± acres of actively disturbed areas were estimated. A control efficiency of 60 percent for fugitive dust emissions due to wind erosion was applied to landfill access roads, the Maintenance Compound, and the Landfill Office parking area. The disposal route control efficiency is 90 percent for wind erosion due to quarterly application dust palliatives. For the purposes of wind erosion estimates, auxiliary roads, disposal area operations, and the daily cover soil borrow area were conservatively assumed to have a control efficiency of zero.

Landfill Gas Emissions – Emission Unit 3

A municipal solid waste landfill consists of an area of land which has been permitted under solid waste regulations for the construction and acceptance of municipal solid waste materials. Disposal operations are permitted as below and above-grade area fill. A defined area of the landfill is excavated, lined, and prepared to receive waste prior to the completion of the previous waste management unit.

Waste is hauled to the landfill in trucks during the landfill's operating hours. The trucks dispose of waste at the landfill's active fill area. The waste is spread and compacted in lifts (or layers) by landfill equipment. At the end of the daily activities, soil cover or other approved alternative daily cover (ADC) is spread over the waste to minimize odors and reduce the occurrence of vectors (e.g. insects and birds).

Complex microbial and biochemical reactions occur within the landfill's interior after the waste has been deposited for a period of time. The first stage of refuse decomposition is rapid and continues until the entrained oxygen within the refuse is depleted.

The mature stage of refuse decomposition is anaerobic. The two primary constituents of landfill gas during this phase are methane (CH_4) and carbon dioxide (CO_2). CO_2 content is typically in the 50 percent range, with CH_4 comprising the other 50 percent. The production of landfill gas is a continuous process; it begins a few months after initial waste placement and continues until the microbial reactions are limited by substrate or moisture availability.

Landfill gas generation is affected by the rate at which the solid waste is disposed and from what is collected and destroyed. Landfill gas generation varies over the lifetime of the landfill but generally increases from year to year until the peak volume is reached shortly after landfill closure. Other factors influencing production include climate (i.e. precipitation), overall moisture conditions within the landfill, and types of solid waste accepted (degradable vs. inert).

The landfill gas picks up other constituents in relatively small concentrations as it travels through the refuse. These include hydrogen sulfide, which can range from zero to several hundred parts per million (ppm), and volatile organic compounds (VOC), which can range from several hundred to several thousand ppm. Some of the VOCs are hazardous air pollutants (HAPs).

After November 16, 2018, the landfill became subject to full NSPS control requirements according to 40 CFR 60, Subpart WWW. The combustion of LFG in the on-site backup flare will result in the emissions of combustion byproducts, specifically SO_2, NO_x, and CO; therefore, the more LFG that is destroyed in the flare, the more combustion byproduct emissions will result. Moreover, a small portion of the NMOCs, VOCs, and HAPs routed to the flare will not be destroyed and will pass through the flare, the degree to which is based on the flare's destruction efficiency. It should be noted here that the flare is a backup control device for the landfill gas, which is mainly sent off-site to a separately owned and operated landfill gas-to-energy (LFGE) facility.

Attachment 7.6 includes the output from EPA's LandGEM models which estimate landfill gas production. Two models were used since only so many years can be accommodated in one model and the landfill's site life and past history exceeds one model. Sample calculations are included after the notes section of Table 6.4 (the table which estimates landfill gas fugitive emissions as well as open flare emissions). The VOC content of the landfill gas was tested to be 999 ppmv in 2016. For HAP content in landfill gas, since site-specific values were not available, Waste Industry Air Coalition (WIAC) values were used. WIAC data is more current and believed to be more accurate than AP-42 when site-specific values are not available. All HAPs combined were less than the 25 ton per year major source limit. References for the landfill gas emissions calculations are provided in Attachments 7.4 and 7.5.

Table 6.4 Column H, utilizes the uncontrolled 2018 gas generation rate to estimate uncontrolled landfill gas emissions prior to mandatory NSPS control in late 2018 and for conservativeness. Sample calculations are included after the notes section of Table 6.4. For HAP content in landfill gas, since site-specific values were not available, Waste Industry Air Coalition (WIAC) values were used. WIAC data is more current and believed to be more accurate than AP-42 when site-specific values are not available. All HAPs combined were less than the 25 ton per year major source limit. References for the landfill gas emissions calculations are provided in Attachments 7.4 and 7.5 and the EPA's LandGEM model is included as Attachment 7.6.

GHG Emissions are included in Table 6.5. These calculations utilize the maximum uncontrolled landfill emissions condition from 2018, prior to full control being required, combined with a maximum gas total sent to the flare of 3,000 cfm for conservativeness even though these conditions would not occur simultaneously. Using the global warming potential of 25 for methane, the total anthropogenic CO_2e is below 100,000 metric tons.

Petroleum Hydrocarbon Landfarm – Emission Unit 4

CRLF is permitted to accept petroleum contaminated soils (PCS) for remediation via landfarming; for beneficial use as daily cover soil; or for direct disposal although this is not currently an active on-site source. The petroleum hydrocarbon landfarm (Figure 5.1, Section 5) has been designated as Emission Unit 4. Consistent with the New Mexico Solid Waste Rules (August 2007), PCS are considered remediated for the purpose of beneficial use when soil sample analyses meet the following conditions:

1. the sum of benzene, toluene, ethylbenzene, and xylene isomer concentrations (i.e., BTEX) is less than 500 mg/Kg, with benzene individually less than 10 mg/Kg; and
2. the total petroleum hydrocarbon (TPH) concentration is less than 1,000 mg/Kg.

Prior to acceptance by CRLF, incoming shipments of PCS will be required to be analyzed for TPH using EPA Method 418.1 and BTEX via EPA Method 8260B (or approved equals). PCS shipments will be recorded on a non-hazardous waste manifest with the approved profile number identifying the remediation project. CRLF may accept PCS for remediation (i.e., PCS exhibiting parameter concentrations above the regulatory thresholds). CRLF will electronically track the highest individual BTEX parameter concentrations from each remediation project and volume/mass of each inbound PCS shipment using the above methodologies. This approach will provide a conservative indicator of HAP emissions; and CRLF will track the accumulated daily volume of PCS accepted, by approved profile number.

If this Emissions Unit is active during the landfill's development, CRLF will track total HAP emissions from PCS such that, on an annual basis, total site emissions do not exceed 10 tons/year for any individual HAP or 25 tons/year of aggregate HAPs (including contributions from Emission Units 3 and 5). For the purposes of estimating emissions from the landfarm, it will be conservatively assumed that 100 percent of the VOCs are emitted as HAPs.

For the emissions shown in the Section 2 tables of this application for this source, emissions will be shown as being just below those totals which would cause the emissions levels noted above to be triggered since these would be possible maximums authorized by this application.

Landfill Gas Flare – Emission Unit 5

As of November 16, 2018 the landfill is subject to the control requirements of 40 CFR 60, Subpart WWW. The combustion of LFG in the flare will result in the emissions of combustion byproducts, specifically SO_2, NO_x, and CO; therefore, the more LFG that is destroyed in the flare, the more combustion byproduct emissions will result. Moreover, a small portion of the NMOCs, VOCs, and HAPs routed to the flare will not be destroyed and will be allowed to pass through the flare, the degree to which is based on the flare's destruction efficiency.

Emissions from the flare assuming the gas system is being operated during the landfill's development are based on a maximum flare capacity of 3,000 cfm for conservativeness since landfill gas generation may vary from that estimated here. Detailed calculations for the combustion by-products of flaring the landfill gas are provided in Table 6.4. The emissions summary table (Table 6.1) shows landfill emissions assuming no GCCS in 2018 for conservativeness as well as flare emissions assuming the maximum flow to the flare. Although these worst-case operations will not occur simultaneously, this is a conservative estimate for potential emissions with or without the gas system operating. References for the calculations are provided in Attachments 7.4 and 7.9.

Of course, the flare is also currently a backup destruction device to the off-site LFGE facility. This also makes the flare's emissions being assumed at its full capacity a conservative assumption.

Portable Engines – Emission Units 6-8

Several portable engines are being authorized to support landfilling operations (light towers, a portable compressor engine, etc.). These engines are being permitted for year-round operation for conservativeness. They will be utilized around the landfill's working face and, as such, will be relocated around the landfill as the working face moves. References for the calculations are provided in Attachments 7.7 and 7.12; and the emissions estimates are included in Table 6.5 with further notes on emissions factor assumptions.

Insignificant Sources

Insignificant sources include 10,000-gallon and 1,000-gallon diesel fuel storage tanks, a 500-gallon or smaller waste oil storage tank, a parts degreaser, motor oil and antifreeze storage, and natural gas comfort heating. No emissions estimates are included for these sources since their being insignificant is not based on their emissions.

Section 11

Source Determination

Source submitting under 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC

Sources applying for a construction permit, PSD permit, or operating permit shall evaluate surrounding and/or associated sources (including those sources directly connected to this source for business reasons) and complete this section. Responses to the following questions shall be consistent with the Air Quality Bureau's permitting guidance, Single Source Determination Guidance, which may be found on the Applications Page in the Permitting Section of the Air Quality Bureau website.

Typically, buildings, structures, installations, or facilities that have the same SIC code, that are under common ownership or control, and that are contiguous or adjacent constitute a single stationary source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes. Submission of your analysis of these factors in support of the responses below is optional, unless requested by NMED.

A. Identify the emission sources evaluated in this section (list and describe)**:**

Camino Real Landfill (CRLF) and the Four Peaks Energy, Inc. LFGE Facility are both situated on contiguous property owned by CRLF. Since these two operations appear to be co-located, it is necessary to analyze the relationship between the two facilities and determine whether they constitute a single stationary source and should be treated as one facility for this permitting action. The three factors to consider when determining whether the two operations should be considered as a single source are listed in **Section B**, below. An additional consideration for the evaluation of this relationship pertains to the role one facility plays in the other facility's daily operations, and what pertinent agreements or dependencies, if any, exist between the two facilities.

B. Apply the 3 criteria for determining a single source:

SIC Code: Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☑ Yes ☐ No

Common Ownership or Control: Surrounding or associated sources are under common ownership or control as this source.

☐ Yes ☑ No

Contiguous or Adjacent: Surrounding or associated sources are contiguous or adjacent with this source.

☑ Yes ☐ No

C. Make a determination:

☑ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "**YES**" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "**NO**" to conclude that the source, as described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

Item B.1

CRLF and the LFGE Plant both share the same 2-digit SIC-code (Major Group 49, for electric, gas, and sanitary services), but do not share the same 4-digit SIC-code. CRLF is included under Industry Group 4953 for Refuse Systems, and the LFGE Plant is listed under Industry Group 4911 for Electric Services.

Item B.2

In order to answer "no" to item B.2, the facilities in question must not have common ownership or control. The LFGE Plant and CRLF are completely separate legal entities that do not share common control, and are unrelated in their ownership. The LFGE Plant is owned by Four Peaks Energy LLC, a limited liability company (4PE); and the Camino Real Landfill is owned by Camino Real Environmental Center, Inc., a wholly-owned subsidiary of Waste Connections, Inc. The LFGE Plant utilizes the methane gas produced by the decomposition of waste disposed of in the landfill as fuel for up to two Caterpillar® generators installed at the Plant. Neither operation serves as a support facility to the other, they are not engaged in the same industrial activity, nor can they be classified as being engaged in the same enterprise. An enterprise exists if the establishments in question have greater than 50 percent common direct or indirect ownership. No common control or ownership exists between the two facilities in question, so neither can be considered a support facility.

The LFGE Plant is a permitted facility which was determined in 2005 by AQB to be a separately owned and operated facility. The power generated by the LFGE Plant is sold to El Paso Electric.

Item B.3

The LFGE Plant is located on a parcel of land (approximately 0.25-acres) leased to 4PE by CRLF. This parcel is located within the CRLF property boundary. As stated in Item No. 2 of the contract between 4PE and CRLF, the property on which the LFGE Plant is located is licensed to the LFGE Plant by CRLF. Item B.3 is answered "yes" because the sources in question are co-located on contiguous or adjacent parcels of land.

Since only two of the three criteria above have been met, CRLF and the LFGE Plant must be considered two separate facilities.

Section 12

Section 12.A
PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

This is a Title V permit modification for a municipal solid waste landfill. No PSD applicability determination is required.

Section 13

Determination of State & Federal Air Quality Regulations

This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

Required Information for Specific Equipment:
For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply**. **For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

Required Information for Regulations that Apply to the Entire Facility:
See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

Regulatory Citations for Regulations That Do Not, but Could Apply:
If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example,** if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

Regulatory Citations for Emission Standards:
For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard. Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

Federally Enforceable Conditions:
All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVENT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc: http://cfpub.epa.gov/adi/

STATE REGULATIONS:

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.1 NMAC	General Provisions	Yes	Facility	General Provisions apply to Notice of Intent, Construction, and Title V permit applications.
20.2.3 NMAC	Ambient Air Quality Standards NMAAQS	Yes	Facility	The facility is subject to NMAAQS. Conformance with these requirements was confirmed with the NSR application and is maintained here since the NSR Permitted emissions are being retained.
20.2.7 NMAC	Excess Emissions	Yes	Facility	Records kept of any excess emission periods and notifications will be provided to NMED. Verbal (< 24 hours) and written (< 10 days) notice of excess emissions.
20.2.8 NMAC	Emissions Leaving New Mexico	Yes	Facility	No regulation or reciprocal action in effect with Texas or Mexico. Since emissions limits for New Mexico are met by the landfill, other programs should be satisfied also.
20.2.23 NMAC	Fugitive Dust Control	No	Facility	Facility is exempt since it is permitted.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	Facility	The facility's gas burning equipment (comfort heating with a heat capacity of 71,000 Btu/hr or 621.96 mmBtu/yr) is rated at less than 1,000,000 million British Thermal Units per year per unit. As such this rule is not applicable.
20.2.34 NMAC	Oil Burning Equipment: NO_2	No	Facility	This facility does not include oil burning equipment having a heat input of greater than 1,000,000 million British Thermal Units per year per unit.
20.2.60 NMAC	Open Burning	Yes	Facility	Although applicable to this and other landfills in New Mexico, Open burning does not occur at and is prohibited at the facility.
20.2.61 NMAC	Smoke & Visible Emissions	Yes	5	This regulation applies to the open flare (Unit 5) and limits opacity to 20%.
20.2.62 NMAC	Municipal Waste Combustion	No		No affected facilities at the landfill.
20.2.63 NMAC	Biomedical Waste Combustion	No		No affected facilities at the landfill.
20.2.64 NMAC	Municipal Solid Waste Landfills	Yes	3	20.2.64.110(A) requires that Title V permit be obtained for "new" or "existing" facilities over 2.5 million megagrams or 2.5 million cubic meters. The landfill is over this design capacity trigger. These are the same as requirements of 40 CFR 60, Subpart XXX. The landfill is "existing" under this rule and fully subject to its requirements, although as will be discussed for 40 CFR 63, Subpart AAAA – that rule will drive most of the related requirements after September 26, 2021.
20.2.70 NMAC	Operating Permits	Yes	Facility	Subpart WWW originally required that a Title V permit be maintained due to the landfill's overall capacity. This requirement has also been brought forward into the subsequent NSPS-related rules (20.2.64 NMAC; 40 CFR 60, Subpart XXX; and 40 CFR 63, Subpart AAAA).
20.2.71 NMAC	Operating Permit Fees	Yes	Facility	This facility is subject to 20.2.70 NMAC and is in turn subject to 20.2.71 NMAC.
20.2.72 NMAC	Construction Permits	Yes	Facility	This facility is subject to 20.2.72 NMAC and has an approved NSR Permit: No. 7592
20.2.73 NMAC	NOI & Emissions Inventory Requirements	Yes	Facility	Landfill subject to emissions-related requirements to complete an annual emissions inventory (20.2.73.300 NMAC) based on emissions rates. Would also possibly be subject to notice of intent requirements under 20.2.73.200 if a modification met the thresholds included in 20.2.73.200(A)(2) NMAC.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No		The facility is not an existing PSD major source.
20.2.75 NMAC	Construction Permit Fees	Yes	Facility	Since the landfill has an NSR permit, it is subject to annual fee requirements per 20.2.75.11.E.

STATE REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.77 NMAC	New Source Performance	Yes	3, 5	See discussion of NSPS below (40 CFR 60). The landfill and flare are subject to control requirements in 40 CFR 60.
20.2.78 NMAC	Emission Standards for HAPS	No		This facility emits hazardous air pollutants but which are not subject to the requirements of 40 CFR Part 61, as amended through December 31, 2010. Asbestos disposal is the most common type of 40 CFR 61 requirement that some landfills are subject to. However, this landfill does not accept any form of asbestos.
20.2.79 NMAC	Permits – Nonattainment Areas	No		The landfill (all sources) is not a major source nor is a major modification being proposed at this time.
20.2.80 NMAC	Stack Heights	No		No affected facilities since this section involves specifics related to new or modified permitting that involves stack heights related to 20.2.72 NMAC (Construction Permits); 20.2.74 NMAC (Prevention of Significant Deterioration (PSD)); or 20.2.79 NMAC (Permits - Nonattainment Areas).
20.2.82 NMAC	MACT Standards for source categories of HAPS	Yes	3, 5	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63. See the discussion below on 40. CFR 63, Subpart AAAA.

FEDERAL REGULATIONS:

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS	Yes	Facility	This applies since the facility is subject to 20.2.70 and 20.2.72 NMAC.
NSPS 40 CFR 60, Subpart A	General Provisions	Yes	3, 5	Applicable since, as noted in 40 CFR §60.1(a), provisions of this part apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility. At this time, the landfill is not subject to control requirements under 40 CFR 60, Subpart WWW that became effective on November 16, 2018. Unit 5 will must also meet 40 CFR §60.18 requirements. The landfill is currently subject to the full Subpart WWW control requirements, however in accordance with the new State EG rule (20.2.64 NMAC) which became effective in 2019, the landfill is now subject to Subpart XXX by 20.2.64 NMAC reference. Although the Subpart XXX full control requirements were to become effective July 9, 2022; the new 40 CFR 63, Subpart AAAA rule finalized on March 20, 2020 will bring in requirements that will replace Subpart WWW fully, and augment Subpart XXX effective September 27, 2021.
NSPS 40 CFR 60 Subpart Cc	NSPS – Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills	No		The Facility is subject to 40 CFR 60, Subpart WWW since it meets the definition of a "new" landfill under that rule. It is not an "existing" facility as defined in 40 CFR 60, Subpart Cc. It should be noted that all Subpart WWW requirements will, however, be replaced by 40 CFR 63, Subpart AAAA requirements effective September 27, 2021.
NSPS 40 CFR 60 Subpart Cf	NSPS – Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills	Yes	3,5	The Facility meets the definition of an existing site under 40 CFR 60, Subpart Cf. The State of New Mexico prepared their Emission Guideline rule implementing these provisions in 2019 (20.2.64 NMAC). As such, please refer to 20.2.64 NMAC for these requirements.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR60.40a, Subpart Da	Subpart Da, Performance Standards for **Electric Utility Steam Generating Units**	No		No steam generating units are present at the landfill.
NSPS 40 CFR60.40b Subpart Db	**Electric Utility Steam Generating Units**	No		No steam generating units are present at the landfill.
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	No		No steam generating units are present at the landfill.
NSPS 40 CFR 60, Subpart Ka	Standards of Performance for **Storage Vessels for Petroleum Liquids** for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and **Prior** to July 23, 1984	No		No applicable storage vessels are present on-site.
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984	No		The landfill has no storage vessels with a capacity greater than or equal to 75 cubic meters (m^3) (19,813 US gallons) that are used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.
NSPS 40 CFR 60.330 Subpart GG	**Stationary Gas Turbines**	No		The landfill has no stationary gas turbines.
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from **Onshore Gas Plants**	No		This rule is not applicable to this facility.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for **Onshore Natural Gas Processing**: SO_2 Emissions	No		This rule is not applicable to this facility.
NSPS 40 CFR 60	NSPS – Standards of Performance for	Yes	3,5	The landfill now subject to NSPS control requirements at this time that became effective on November 16, 2018. Although the Subpart XXX full control

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
Subpart WWW	Municipal Waste Solid Landfills			requirements were to become effective July 9, 2022 and replace the Subpart WWW control requirements; the new 40 CFR 63, Subpart AAAA rule finalized on March 20, 2020 will bring in requirements that will replace Subpart WWW fully, and augment Subpart XXX effective September 27, 2021.
NSPS 40 CFR 60 Subpart XXX	NSPS – Standards of Performance for Municipal Waste Solid Landfills	No		The landfill does not meet the definition of being a "new" landfill under 40 CFR 60, subpart XXX. The landfill is, however, subject to 40 CFR 60, Subpart XXX by reference through the State's EG rule for landfills (20.2.64 NMAC); however, the full Subpart XXX control requirements were not due to replace Subpart WWW requirements until July 9, 2022. In the meantime, the new 40 CFR 63, Subpart AAAA rule finalized on March 20, 2020 will bring in requirements that will replace Subpart WWW fully, and augment Subpart XXX effective September 27, 2021.
NSPS 40 CFR 60 Subpart AAAA	Standards of Performance for Small Municipal Waste Combustion Units for Which Commenced After August 30, 1999 or for Which Modifications or Reconstruction is Commenced After June 6, 2001	No		The landfill includes no applicable incineration units on-site (no incineration of any kind takes place on-site).
NSPS 40 CFR 60 Subpart CCCC	Standards of Performance for Commercial and Industrial Solid Waste Incineration Units for Which Construction is Commenced After November 30, 1999 or for Which Modification or Reconstruction is Commenced After June 1, 2001	No		The landfill includes no applicable incineration units on-site (no incineration of any kind takes place on-site).
NSPS 40 CFR 60 Subpart EEEE	Standards of Performance for Other Solid Waste Incineration Units for Which Construction is Commenced After December 9, 2004, or for Which Modification or Reconstruction is Commenced on or After June 16, 2006	No		The landfill includes no applicable incineration units on-site (no incineration of any kind takes place on-site).
NSPS 40 CFR 60 Subpart IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines	No		The landfill has no applicable stationary compression ignition internal combustion engines. All engines are portable.
NSPS 40 CFR 60	Standards of Performance for	No		The landfill has no applicable stationary spark ignition engines.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
Subpart JJJJ	Stationary Spark Ignition Internal Combustion Engines			
NSPS 40 CFR Part 60 Subpart OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015	No		The rule applies to “affected” facilities that are constructed, modified, or reconstructed after Aug 23, 2011 (40 CFR 60.5365): gas wells, including fractured and hydraulically refractured wells, centrifugal compressors, reciprocating compressors, pneumatic controllers, certain equipment at natural gas processing plants, sweetening units at natural gas processing plants, and storage vessels. No such facilities exist at the Camino Real Landfill.
NSPS 40 CFR Part 60 Subpart OOOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	No		No such facilities exist at the Camino Real Landfill
NSPS 40 CFR 60 Subpart TTTT	Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units	No		There are no such units at the landfill.
NSPS 40 CFR 60 Subpart UUUU	Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units	No		There are no such units at the landfill.
NESHAP 40 CFR 61 Subpart A	General Provisions	No		Applies if any other Subpart in 40 CFR 61 applies.
NESHAP 40 CFR 61 Subpart E	National Emission Standards for **Mercury**	No		The landfill does not contain a stationary source that process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge.
NESHAP 40 CFR 61 Subpart V	National Emission Standards for **Equipment Leaks** (Fugitive Emission Sources)	**No**		The provisions of this subpart apply to each of the following sources that are intended to operate in volatile hazardous air pollutant (VHAP) service: pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, and control devices or systems required by this subpart. VHAP service means a piece of equipment either contains or contacts a fluid (liquid or gas) that is at least 10 percent by weight of VHAP. VHAP means a substance regulated under this subpart for which a standard for equipment leaks of the substance has been

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
				promulgated. Benzene is a VHAP (See 40 CFR 61 Subpart J). The landfill has no such applicable sources.
EG 40 CFR 62, Subpart OOO	Federal Plan Requirements for Municipal Solid Waste Landfills	No		This rule was promulgated on May 21, 2021. This does not affect the landfill since the landfill is subject to an approved State Plan that implemented 40 CFR 60, subpart Cf already.
MACT 40 CFR 63, Subpart A	General Provisions	Yes	3, 5	Applies if any other subpart under 40 CFR 63 applies. Since there is a NESHAP rule for MSW landfills (40 CFR 63, Subpart AAAA), this rule applies to the landfill. Since the landfill's NMOC emissions were over 50 Mg/yr, the flare and landfill became fully subject to this rule on November 16, 2018. This status did not change with the March 20, 2020 revisions to Subpart AAAA, which become effective September 27, 2021 although the table showing general conditions that apply in the March 20, 2020 version of Subpart AAAA did show that different parts of Subpart A did and did not apply effective September 27, 2021.
MACT 40 CFR 63.760 Subpart HH	**Oil and Natural Gas Production Facilities**	No		This facility is a landfill and does not produce natural gas.
MACT 40 CFR 63 Subpart HHH		No		This subpart applies to owners and operators of natural gas transmission and storage facilities that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company), and that are major sources of hazardous air pollutants (HAP) emissions as defined in §63.1271. **See link below** 40 CFR 63 Subpart HHH
40 CFR 63, Subpart AAAA	NESHAP for MSW Landfills	Yes	3,5	Per 40 CFR §63.1935(a)(3), this rule applies since the landfill has accepted waste since November 8, 1987, is an area source, exceeds the NSPS capacity limits shown in Subpart AAAA, and was shown to emit in excess of 50 Mg/yr of NMOCs during NSPS compliance. The landfill will follow its SSM Plan as of November 16, 2018 through September 26, 2021. The landfill is also not classified as a bioreactor as defined in this subpart. This rule was revised on March 20, 2020; however, the triggers for compliance (area source, over the NSPS capacity limits, and emits over 50 Mg/yr of uncontrolled NMOC emissions) were retained such that the landfill is still subject to the new rule. The new rule suspends the SSM Plan requirement sand moves to a work practice standard. The new rule also has control provisions which will replace 40 CFR 60, Subpart WWW requirements and also blend control requirements with the provisions of 40 CFR 60, Subpart XXX effective September 27, 2021.
40 CFR 63, Subpart MMMM	National Emission Standard for Hazardous Air Pollutants for Surface Coating of Miscellaneous Metal Parts and Products	No		The landfill does not conduct surface coating operations that would trigger requirements in this subpart.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**)			Facilities are subject to this subpart if they own or operate a stationary RICE, except if the stationary RICE is being tested at a stationary RICE test cell/stand. The landfill includes no stationary engines.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters	No		The facility does not include any sources applicable to this rule.
MACT 40 CFR 63 Subpart UUUUU	National Emission Standards for Hazardous Air Pollutants Coal & Oil Fire Electric Utility Steam Generating Unit	No		The facility does not include any sources applicable to this rule.
40 CFR 63 Subpart CCCCCC	NESHAP for Gasoline Dispensing Facilities	No		The facility does not include a stationary gasoline tank.
40 CFR 63, Subpart HHHHHH	National Emission Standard for Hazardous Air Pollutants: Miscellaneous Coating Manufacturing	No		Surface coating operations that would trigger requirements in this subpart are not conducted on-site.
40 CFR 64	**Compliance Assurance Monitoring**	No		No affected facilities.
40 CFR 68	**Chemical Accident Prevention**	Yes		Facility-wide, risk management plan in–place.
Title IV – Acid Rain 40 CFR 72	**Acid Rain**	No		Not an affected source under 40 CFR §72. This facility does not generate commercial electric power or electric power for sale.
Title IV – Acid Rain 40 CFR 73	**Sulfur Dioxide** Allowance Emissions	No		Not an affected source under 40 CFR §73. This facility does not generate commercial electric power or electric power for sale.
Title IV-Acid Rain 40 CFR 75	**Continuous Emissions Monitoring**	No		Not an affected source under 40 CFR §75. This facility does not generate commercial electric power or electric power for sale.
Title IV – Acid Rain 40 CFR 76	**Acid Rain** Nitrogen Oxides **Emission Reduction Program**	No		This facility does not generate commercial electric power or electric power for sale.
Title VI – 40 CFR 82	Protection of **Stratospheric Ozone**	Yes	Facility	The facility does not produce, transfer, destroy, import or export substances controlled under this regulation. It may service on-site equipment air conditioners and from time to time may accept pre-drained white goods.
40 CFR 98 Subpart HH	Greenhouse Gas Reporting Requirements	Yes	3,5	Annual GHG emissions are reported under this rule since the landfill generates GHGs over the reporting threshold.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
CAA Section 112(r)	Chemical Accident Prevention Provisions	No		The facility does not store or use any of the chemicals listed in Section 112(r) in or above the threshold quantities specified in this section.

Section 14

Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

☑ **Title V Sources** (20.2.70 NMAC)**:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies** defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown** defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **Title V** (20.2.70 NMAC)**, NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.

A dust control plan is in place to mitigate particulate emissions. The measures taken to mitigate excessive fugitive particulate emissions during startup, shutdown, and emergencies also consists of a backup water wagon that is available on-site and access to water stored in three water storage tanks. As an additional emergency measure, the site could purchase additional water from the City of Sunland Park. The City maintains a 1.2 million gallon water tank, which is located approximately 500 feet northeast of the maintenance compound.

The landfill has been subject to control requirements of 40 CFR 60, Subpart WWW since November 16, 2018. This was replaced by the State of New Mexico Emission Guideline Rule (20.2.64 NMAC), which became effective on May 31, 2017 and implemented the provisions of 40 CFR 60, Subpart XXX. The landfill operates the GCCS by sending gas to the off-site LFGE Facility for treatment prior to being combusted to produce electricity, or to the flare as a backup if the other facility cannot accept the gas.

As of November 16, 2018, the landfill became subject to the SSM Plan requirements of 40 CFR 63, Subpart AAAA – and prepared/implemented this SSM Plan. This plan was designed to minimize emissions during routine or predictable startups, shutdowns, malfunctions (emergencies), and scheduled maintenance; consistent with the applicable provisions noted above. Beginning on September 27, 2021, the revised Subpart AAAA (finalized March 2020) shifts the SSM Plan to a work practice standard which the landfill will meet (and which is discussed in the January 2021 GCCS Design Plan – included here as Attachment 21.6). As such, the final of the three boxes above is checked to reflect this standard. This January 2021 GCCS Design Plan and the work practice standard requirements serve as the operational plan to mitigate landfill gas emissions after September 26, 2021.

Section 15

Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

Alternative Operating Scenarios: Provide all information required by the department to define alternative operating scenarios. This includes process, material and product changes; facility emissions information; air pollution control equipment requirements; any applicable requirements; monitoring, recordkeeping, and reporting requirements; and compliance certification requirements. Please ensure applicable Tables in this application are clearly marked to show alternative operating scenario.

Construction Scenarios: When a permit is modified authorizing new construction to an existing facility, NMED includes a condition to clearly address which permit condition(s) (from the previous permit and the new permit) govern during the interval between the date of issuance of the modification permit and the completion of construction of the modification(s). There are many possible variables that need to be addressed such as: Is simultaneous operation of the old and new units permitted and, if so for example, for how long and under what restraints? In general, these types of requirements will be addressed in Section A100 of the permit, but additional requirements may be added elsewhere. Look in A100 of our NSR and/or TV permit template for sample language dealing with these requirements. Find these permit templates at: https://www.env.nm.gov/aqb/permit/aqb_pol.html. Compliance with standards must be maintained during construction, which should not usually be a problem unless simultaneous operation of old and new equipment is requested.

In this section, under the bolded title "Construction Scenarios", specify any information necessary to write these conditions, such as: conservative-realistic estimated time for completion of construction of the various units, whether simultaneous operation of old and new units is being requested (and, if so, modeled), whether the old units will be removed or decommissioned, any PSD ramifications, any temporary limits requested during phased construction, whether any increase in emissions is being requested as SSM emissions or will instead be handled as a separate Construction Scenario (with corresponding emission limits and conditions, etc.

No discreet alternate operating scenario/construction scenario is being proposed with this application. However, since this landfill, like all landfills, has varying gas composition; year-over-year waste intake; and varying landfill gas collection quantities overall, to the flare, and off-site to the treatment system/LFGE Facility; it is reasonable to expect variation within the proposed emissions limits. To cover these possible fluctuations, the potential emissions included in this application have been conservatively set to encompass the expected variability of these different facets of the landfill's operation. To match the prior NSR permit, limited landfill gas collection is built into the emissions estimates (resulting in higher landfill emissions) for the landfill source for conservativeness since the landfill is subject to NSPS/NESHAP control requirements.

Section 16

Air Dispersion Modeling

1) Minor Source Construction (20.2.72 NMAC) and Prevention of Significant Deterioration (PSD) (20.2.74 NMAC) ambient impact analysis (modeling): Provide an ambient impact analysis as required at 20.2.72.203.A(4) and/or 20.2.74.303 NMAC and as outlined in the Air Quality Bureau's Dispersion Modeling Guidelines found on the Planning Section's modeling website. If air dispersion modeling has been waived for one or more pollutants, attach the AQB Modeling Section modeling waiver approval documentation.
2) SSM Modeling: Applicants must conduct dispersion modeling for the total short term emissions during routine or predictable startup, shutdown, or maintenance (SSM) using realistic worst case scenarios following guidance from the Air Quality Bureau's dispersion modeling section. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions modeling requirements.
3) Title V (20.2.70 NMAC) ambient impact analysis: Title V applications must specify the construction permit and/or Title V Permit number(s) for which air quality dispersion modeling was last approved. Facilities that have only a Title V permit, such as landfills and air curtain incinerators, are subject to the same modeling required for preconstruction permits required by 20.2.72 and 20.2.74 NMAC.

What is the purpose of this application?	Enter an X for each purpose that applies
New PSD major source or PSD major modification (20.2.74 NMAC). See #1 above.	
New Minor Source or significant permit revision under 20.2.72 NMAC (20.2.72.219.D NMAC). See #1 above. **Note:** Neither modeling nor a modeling waiver is required for VOC emissions.	
Reporting existing pollutants that were not previously reported.	
Reporting existing pollutants where the ambient impact is being addressed for the first time.	
Title V application (new, renewal, significant, or minor modification. 20.2.70 NMAC). See #3 above.	X
Relocation (20.2.72.202.B.4 or 72.202.D.3.c NMAC)	
Minor Source Technical Permit Revision 20.2.72.219.B.1.d.vi NMAC for like-kind unit replacements.	
Other: i.e. SSM modeling. See #2 above.	
This application does not require modeling since this is a No Permit Required (NPR) application.	
This application does not require modeling since this is a Notice of Intent (NOI) application (20.2.73 NMAC).	
This application does not require modeling according to 20.2.70.7.E(11), 20.2.72.203.A(4), 20.2.74.303, 20.2.79.109.D NMAC and in accordance with the Air Quality Bureau's Modeling Guidelines.	X

Check each box that applies:

☐ See attached, approved modeling **waiver for all** pollutants from the facility.
☐ See attached, approved modeling **waiver for some** pollutants from the facility.
☐ Attached in Universal Application Form 4 (UA4) is a **modeling report for all** pollutants from the facility.
☐ Attached in UA4 is a **modeling report for some** pollutants from the facility.
☑ No modeling is required.

Air dispersion modeling was performed in 2018 and approved by NMED in association with NSR Permit 7592. That modeling showed that the landfill meets applicable ambient air quality standards, and was incorporated into the Title V permit (P186LR3M1) via a major amendment approved on September 14, 2020. A modeling waiver for the proposed portable engines (Sources 6-8) was submitted prior to the Significant NSR revision being submitted concurrently with this renewal, which scaled the prior modeling results showing that, with the proposed engine emissions, air quality standards are maintained.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permit conditions, you must submit a compliance test history. The table below provides an example.

Compliance Test History Table

Unit No.	Test Description	Test Date
3	Tier 3 sampling under NSPS Rule (40 CFR 60, Subpart WWW), EPA Method 2E.	9/31/1999
3	Tier 2 sampling under NSPS Rule (40 CFR 60, Subpart WWW), EPA Methods 3C and 25C (40 CFR 60).	5/11/2016
5	Flare Source Testing conducted per 40 CFR 60.18 as required by 40 CFR §60.757(g).	2/13/2019

Compliance testing performed at the landfill is included in the table above and described below.

The compliance testing at the landfill (Unit 3) is included from voluntary 40 CFR 60, Subpart WWW procedures (the NSPS rule for municipal solid waste landfills). This voluntary testing allowed site-specific landfill gas parameters to be used to calculate non-methane organic compound (NMOC) emissions. Once the landfill exceeded 50 Mg/yr of uncontrolled NMOC emissions, this testing was no longer performed.

Once the landfill became subject to landfill gas control by the NSPS rules (40 CFR 60, Subpart WWW and now 40 CFR 60, subpart Cf); flare source testing was performed as required by the rule (the flare passed all requirements from this testing). Although 40 CFR 63, Subpart AAAA rules will bring in new requirements which will overlay into the 40 CFR 60, subpart XXX requirements that the New Mexico State Plan for Landfill's incorporated by reference, the original source testing will still be valid and will be certified forward for continued use under these rules.

The NSR permit also has provisions for monitoring and recordkeeping related to dust control and the landfill's dust control plan; however, these include no testing requirements. Lastly, the landfill's NSR permit includes provisions for calculations and recordkeeping if Petroleum Contaminated Soil Land Farming is conducted on-site; however, to date this has not occurred since the NSR permit was finalized.

Section 19

Requirements for Title V Program

Who Must Use this Attachment:

* Any major source as defined in 20.2.70 NMAC.
* Any source, including an area source, subject to a standard or other requirement promulgated under Section 111 - Standards of Performance for New Stationary Sources, or Section 112 Hazardous Air Pollutants, of the 1990 federal Clean Air Act ("federal Act"). Non-major sources subject to Sections 111 or 112 of the federal Act are exempt from the obligation to obtain an 20.2.70 NMAC operating permit until such time that the EPA Administrator completes rulemakings that require such sources to obtain operating permits. In addition, sources that would be required to obtain an operating permit solely because they are subject to regulations or requirements under Section 112(r) of the federal Act are exempt from the requirement to obtain an Operating Permit.
* Any Acid Rain source as defined under title IV of the federal Act. The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.

19.1 - 40 CFR 64, Compliance Assurance Monitoring (CAM) (20.2.70.300.D.10.e NMAC)

Any source subject to 40CFR, Part 64 (Compliance Assurance Monitoring) must submit all the information required by section 64.7 with the operating permit application. The applicant must prepare a separate section of the application package for this purpose; if the information is already listed elsewhere in the application package, make reference to that location. Facilities not subject to Part 64 are invited to submit periodic monitoring protocols with the application to help the AQB to comply with 20.2.70 NMAC. Sources subject to 40 CFR Part 64, must submit a statement indicating your source's compliance status with any enhanced monitoring and compliance certification requirements of the federal Act.

The Camino Real Landfill does not operate an emissions source that is subject to 40 CFR Part 64 (Compliance Assurance Monitoring). Therefore, compliance assurance monitoring is not performed.

19.2 - Compliance Status (20.2.70.300.D.10.a & 10.b NMAC)

Describe the facility's compliance status with each applicable requirement at the time this permit application is submitted. This statement should include descriptions of or references to all methods used for determining compliance. This statement should include descriptions of monitoring, recordkeeping and reporting requirements and test methods used to determine compliance with all applicable requirements. Refer to Section 2, Tables 2-N and 2-O of the Application Form as necessary. (20.2.70.300.D.11 NMAC) For facilities with existing Title V permits, refer to most recent Compliance Certification for existing requirements. Address new requirements such as CAM, here, including steps being taken to achieve compliance.

The Camino Real Landfill is committed to complying with all applicable regulatory requirements. To that end, relevant regulatory citations have been compiled, and the landfill's compliance status has been summarized for all known applicable regulations (Section 13) at the time of this Application.

Semi-Annual Monitoring Reports (SAMRs) and Annual Compliance Certifications (ACCs) have been submitted historically in accordance with Title V reporting requirements. No deviations were noted in the last ACC (dated January 27, 2021) or the most recent SAMR (dated January 27, 2021). Please refer to these historical SAMR and ACCs, for backup documentation relating to the various methods (for example, opacity monitoring and recordkeeping) used to show compliance with applicable requirements.

19.3 - Continued Compliance (20.2.70.300.D.10.c NMAC)

Provide a statement that your facility will continue to be in compliance with requirements for which it is in compliance at the time of permit application. This statement must also include a commitment to comply with other applicable requirements as they come into effect during the permit term. This compliance must occur in a timely manner or be consistent with such schedule expressly required by the applicable requirement.

Consistent with historical monitoring and reporting practices, Camino Real Landfill hereby commits to remain in compliance with applicable local, state, and federal regulations at the time of this application for permit renewal. Compliance will be maintained for those regulatory elements where compliance is required, and will, in a timely manner or at such schedule expressly required by the applicable requirement, meet additional applicable requirements that become effective during the permit term.

19.4 - Schedule for Submission of Compliance (20.2.70.300.D.10.d NMAC)

You must provide a proposed schedule for submission to the department of compliance certifications during the permit term. This certification must be submitted annually unless the applicable requirement or the department specifies a more frequent period. A sample form for these certifications will be attached to the permit.

No change to the current schedule for submission of compliance certifications is proposed. The ACC period is from January 1st to December 31st each year. SAMRs are submitted for calendar semi-annual periods (January 1 – June 30 and July 1 – December 31).

19.5 - Stratospheric Ozone and Climate Protection

In addition to completing the four (4) questions below, you must submit a statement indicating your source's compliance status with requirements of Title VI, Section 608 (National Recycling and Emissions Reduction Program) and Section 609 (Servicing of Motor Vehicle Air Conditioners).

1. Does your facility have any air conditioners or refrigeration equipment that uses CFCs, HCFCs or other ozone-depleting substances? ☑ **Yes** ☐ **No**

2. Does any air conditioner(s) or any piece(s) of refrigeration equipment contain a refrigeration charge greater than 50 lbs? ☐ **Yes** ☑ **No**

   (If the answer is yes, describe the type of equipment and how many units are at the facility.)

3. Do your facility personnel maintain, service, repair, or dispose of any motor vehicle air conditioners (MVACs) or appliances ("appliance" and "MVAC" as defined at 82. 152)? ☐ **Yes** ☑ **No**

4. Cite and describe which Title VI requirements are applicable to your facility (i.e. 40 CFR Part 82, Subpart A through G.)

The Camino Real Landfill staff does not maintain, service, repair, or dispose of motor vehicle air conditioners. Occasionally, and only if the need arises, a certified commercial vendor is contracted to “service” motor vehicle air conditioners. Appliances accepted for disposal must be accompanied by a Certification that the refrigerant has been removed.

19.6 - Compliance Plan and Schedule

Applications for sources, which are not in compliance with all applicable requirements at the time the permit application is submitted to the department, must include a proposed compliance plan as part of the permit application package. This plan shall include the information requested below:

A. Description of Compliance Status: (20.2.70.300.D.11.a NMAC)
A narrative description of your facility's compliance status with respect to all applicable requirements (as defined in 20.2.70 NMAC) at the time this permit application is submitted to the department.

B. Compliance plan: (20.2.70.300.D.11.B NMAC)
A narrative description of the means by which your facility will achieve compliance with applicable requirements with which it is not in compliance at the time you submit your permit application package.

C. Compliance schedule: (20.2.70.300D.11.c NMAC)
A schedule of remedial measures that you plan to take, including an enforceable sequence of actions with milestones, which will lead to compliance with all applicable requirements for your source. This schedule of compliance must be at least as stringent as that contained in any consent decree or administrative order to which your source is subject. The obligations of any consent decree or administrative order are not in any way diminished by the schedule of compliance.

D. Schedule of Certified Progress Reports: (20.2.70.300.D.11.d NMAC)
A proposed schedule for submission to the department of certified progress reports must also be included in the compliance schedule. The proposed schedule must call for these reports to be submitted at least every six (6) months.

E. Acid Rain Sources: (20.2.70.300.D.11.e NMAC)
If your source is an acid rain source as defined by EPA, the following applies to you. For the portion of your acid rain source subject to the acid rain provisions of title IV of the federal Act, the compliance plan must also include any additional requirements under the acid rain provisions of title IV of the federal Act. Some requirements of title IV regarding the schedule and methods the source will use to achieve compliance with the acid rain emissions limitations may supersede the requirements of title V and 20.2.70 NMAC. You will need to consult with the Air Quality Bureau permitting staff concerning how to properly meet this requirement.

NOTE: The Acid Rain program has additional forms. See http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

Camino Real Environmental Center, Inc. believes it is in compliance with applicable regulatory requirements at the time this application for permit renewal is submitted to the Bureau. Additional compliance requirements, if any, which may be imposed by virtue of new regulations, and will be addressed in accordance with applicable regulatory schedules.

19.7 - 112(r) Risk Management Plan (RMP)

Any major sources subject to section 112(r) of the Clean Air Act must list all substances that cause the source to be subject to section 112(r) in the application. The permittee must state when the RMP was submitted to and approved by EPA.

The landfill is not a major source nor does it have any substances on the 112(r) list above the reportable quantities.

19.8 - Distance to Other States, Bernalillo, Indian Tribes and Pueblos

Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B NMAC)?

(If the answer is yes, state which apply and provide the distances.)

Yes, the City of El Paso, Texas and the Texas state boundary are located approximately 1.3 miles northeast of the landfill. The Texas Commission on Environmental Quality (TCEQ) is the main air pollution control program for the State of Texas; however, TCEQ also lists the City of El Paso Environmental Services as a local air pollution control program.

Chihuahua, Mexico is located approximately 60 feet (18.3 m) south of the landfill property.

The Tigua (Ysleta del Sur) Pueblo is the only known Indian Tribe/Pueblo within 50 miles of the Landfill. The Pueblo is located in El Paso County, approximately 20 miles (32 km) southeast of the Camino Real Landfill.

The nearest Class I areas, Guadalupe Mountains National Park, and Gila National Wilderness, are in excess of 50 miles (80 kilometers) from the landfill.

19.9 - Responsible Official

Pursuant to 20.2.70.7.AE NMAC, the responsible official is the Camino Real Landfill Manager, Dr. Juan Carlos Tomas.

Section 20

Other Relevant Information

Other relevant information. Use this attachment to clarify any part in the application that you think needs explaining. Reference the section, table, column, and/or field. Include any additional text, tables, calculations or clarifying information.

Additionally, the applicant may propose specific permit language for AQB consideration. In the case of a revision to an existing permit, the applicant should provide the old language and the new language in track changes format to highlight the proposed changes. If proposing language for a new facility or language for a new unit, submit the proposed operating condition(s), along with the associated monitoring, recordkeeping, and reporting conditions. In either case, please limit the proposed language to the affected portion of the permit.

No other relevant information is necessary for this Application for Renewal.

Section 21

Addendum for Landfill Applications

Landfill Applications are not required to complete Sections 1-C Input Capacity and Production Rate, 1-E Operating Schedule, 17 Compliance Test History, and 18 Streamline Applications. Section 12 – PSD Applicability is required only for Landfills with Gas Collection and Control Systems and/or landfills with other non-fugitive stationary sources of air emissions such as engines, turbines, boilers, heaters. All other Sections of the Universal Application Form are required.

EPA Background Information for MSW Landfill Air Quality Regulations:
https://www3.epa.gov/airtoxics/landfill/landflpg.html

NM Solid Waste Bureau Website: https://www.env.nm.gov/swb/

<table>
<tr><th colspan="5">21-A: Municipal Solid Waste Landfill Information</th></tr>
<tr><td>1</td><td colspan="4">How long will the landfill be operated? Approximately 2060</td></tr>
<tr><td>2</td><td colspan="4">Maximum operational hours per year: 3,443 hours/year</td></tr>
<tr><td>3</td><td colspan="2">Landfill Operating hours (open to the public) M-F: 5:30am–5:00pm</td><td>Sat. 5:30am–2:00pm</td><td>Sun. Closed</td></tr>
<tr><td>4</td><td colspan="4">To determine to what NSPS and emissions guidelines the landfill is subject, what is the date that the landfill was constructed, modified, or reconstructed as defined at 40 CFR 60, Subparts A, WWW, XXX, Cc, and Cf.</td></tr>
<tr><td>5</td><td>Landfill Design Capacity. Enter all 3</td><td>Tons: 13,300,000</td><td>Megagrams (Mg): 12,063,100</td><td>Cubic meters: 20,337,159</td></tr>
<tr><td colspan="5">[1]Volume in m³ based on reported capacity of 26,600,000 yd³ in Attachment 4 of the Initial Design Capacity and Tier 1 NMOC Report included in Attachment 21.1. Tons and Mg conversions were made using the factors also shown in Attachment 4 of the Initial Design Capacity and Tier 1 NMOC Report included in Attachment 21.1. This was re-reported in the Design Capacity Report required by the State Emission Guideline Rule (Attachment 25.5 dated January 9, 2020).</td></tr>
<tr><td>6</td><td>Landfill NMOC Emission Rate (NSPS XXX)</td><td colspan="2">☐ Less than 34 Mg/year using Tiers 1 to 3</td><td>☒ Equal to or Greater than 34 Mg/year using Tiers 1 to 3</td></tr>
<tr><td></td><td>Landfill NMOC Emission Rate (NSPS XXX) Not tested at this time</td><td colspan="2">☐ Less than 500 ppm using Tier 4</td><td>☐ Equal to or Greater than 500 ppm using Tier 4</td></tr>
<tr><td></td><td>Landfill NMOC Emission Rate (NSPS WWW)</td><td colspan="2">☐ Less than 50 Mg/yr</td><td>☒ Equal to or Greater than 50 Mg/yr</td></tr>
<tr><td>7</td><td colspan="4">Annual Waste Acceptance Rate: 432,033 tons/year (Reported CY2020 Total) – for LandGEM emissions modeling we vary and increase the incoming waste total for conservativeness.</td></tr>
<tr><td>8</td><td colspan="2">Is Petroleum Contaminated Soil Accepted? The site is approved to accept it.</td><td colspan="2">If so, what is the annual acceptance rate? Acceptance rate limited by BTEX concentration and calculated emissions (Section 6).</td></tr>
<tr><td>9</td><td colspan="3">NM Solid Waste Bureau (SWB) Permit No.: SWM-030738</td><td>SWB Permit Date: July 24, 2008</td></tr>
<tr><td>10</td><td colspan="4">Describe the NM Solid Waste Bureau Permit, Status, and Type of waste deposited at the landfill.

The Camino Real Landfill is operating pursuant to NMED Solid Waste Facility Permit SWM-030738. The permit was issued July 24, 2008, and will expire twenty years later (July 24, 2028). The landfill is currently authorized to dispose of municipal solid waste (MSW) and the following three special wastes: petroleum contaminated soils, sludge, and industrial solid waste.</td></tr>
<tr><td>11</td><td colspan="4">Describe briefly any process(es) or any other operations conducted at the landfill.
The Camino Real Landfill is authorized to dispose of municipal solid wastes and specific special wastes as detailed in item 10 above. Waste types approved for acceptance at the Camino Real Landfill were detailed in the solid waste</td></tr>
</table>

	Application for Permit Renewal. The landfill's maintenance compound is equipped with a diesel tank, whose fuel is used exclusively for on-site equipment. Currently, the landfill operates a GCCS that collects landfill gas which is routed to an open flare for destruction or the on-site LFGE Facility owned and operated by Four Peaks Energy, Inc. The GCCS was required as of November 11, 2018 per 40 CFR 60, Subpart WWW. CRLF also operates a public convenience station as a convenience to self-hauler customers. CRLF also operates a registered, source-separated recycling center located adjacent to the administrative offices.

21-B: NMOC Emissions Determined Pursuant to 40 CFR 60, Subparts WWW or XXX

	Enter the regulatory citation of all Tier 1, 2, 3, and/or 4 procedures used to determine NMOC emission rates and the date(s) that each Tier procedure was conducted. In Section 7 of the application, include the input data and results.
1	Tier 1 equations (e.g. LandGEM): >**50 Mg/yr (see Attachment 21.1 June 1996 for Subpart WWW reporting) – Site did not return to Tier 1 after this submittal.**
2	Tier 2 Sampling: **>50 Mg/yr (2016 Tier 2 NMOC Report included in Attachment 21.3). Tier 2 testing was not performed again as part of XXX compliance.**
3	Tier 3 Rate Constant: **A Tier 3 was performed in 1999 that set the k value for the landfill at 0.007 year $^{-1}$ (1999 Tier 3 is included in Attachment 21.2) and is good for the life of site.**
4	Tier 4 Surface Emissions Monitoring: **This has not been performed.**
5	Attach all Tier Procedure calculations, procedures, and results used to determine the Gas Collection and Control System (GCCS) requirements. **Per Attachment 21.3 the landfill exceeded 50 Mg/yr and became subject to Subpart WWW control requirements. Then, per Attachment 21.5, the landfill was shown to be over 34 Mg/yr and subject to Subpart XXX control requirements 30 months from that reporting date. Subsequently to all of this, 40 CFR 63, Subpart AAAA as finalized in March 2020 shifted the rules such that, effective September 27, 2021, the requirements of Subpart XXX/Subpart AAAA will replace subpart WWW requirements. This is discussed in the most recently submitted GCCS Design Plan (Attachment 21.6 submitted January 2021).**

Facilities that have a landfill GCCS must complete Section 21-C.

21-C: Landfill Gas Collection and Control System (GCCS) Design Plan

1	Was the GCCS design certified by a Professional Engineer? **Yes**
2	Attach a copy of the GCCS Design Plan and enter the submittal date of the Plan pursuant to the deadlines in either NSPS WWW or NSPS XXX. **The NMOC applicability threshold requiring a GCCS plan is 50Mg/yr for NSPS WWW and 34 Mg/yr or 500 ppm for NSPS XXX. The Subpart WWW GCCS Design Plan (which is effective through September 26, 2021), is included at Attachment 21.4). This GCCS Plan was submitted May 10, 2017 and was due by no later than May 16, 2017 per the cover letter (was set at one year form the prior Tier 2 testing).** **The Subpart XXX GCCS Design Plan is included as Attachment 21.6 and will become effective on September 27, 2021 with 40 CFR 63, Subpart AAAA requirements bring in Subpart XXX provisions early and wholly replace Subpart WWW control requirements. This most recent GCCS Design Plan was submitted to AQB January 8, 2021 and was due by January 9, 2021 (12 months after the landfill's NMOC emissions were shown to be over 34 Mg/yr – See Attachment 21.5).**
3	Is/Was the GCCS planned to be operational within 30 months of reporting NMOC emission rates equal to or greater than 50 Mg/yr, 34 Mg/yr, or 500 ppm pursuant to the deadlines specified in NSPS WWW or NSPS XXX? Yes the GCCS originally was fully 40 CFR 60, Subpart WWW compliance by the **November 16, 2018 deadline. It will shift to 40 CFR 60, Subpart XXX/40 CFR 63, Subpart AAAA operation on September 27, 2021.**
4	Does the GCCS comply with the design and operational requirements found at 60.752, 60.753, and 69.759 (NSPS WWW) or at 60.762, 60.763, and 60.769 (NSPS XXX)? **Yes, each GCCS Design Plan was prepared to conform to all applicable requirements (including any requirements of 40 CFR 63, Subpart AAAA in the most recent GCCS Design Plan – see Attachment 21.6).**

5	Enter the control device(s) to which the landfill gas will be/is routed such as an open flare, enclosed combustion device, boiler, process heater, or other. **For both 40 CFR 60, Subpart WWW starting on November 16, 2018 through the newer NSPS/NESHAP requirements, landfill gas is routed to either the landfill's open flare, or the third-party LFGE facility for treatment prior to combustion in a landfill gas-to-electricity CAT generator. These are the current control devices.**
6	Do the control device(s) meet the operational requirements at 60.752 and 60.756 (NSPS WWW) or 60.762, 60.763, 60.766 (NSPS XXX)? **Yes, the flare was shown to have met 40 CFR 60.18 requirements, which were valid for both Subpart WWW and will be certified forward for Subpart XXX/Subpart AAAA. For gas going into the LFGE Facility, a treatment system monitoring plan will be put into place and implemented effective September 27, 2021.**

ATTACHMENT 21.1

40 CFR 60, SUBPART WWW

INITIAL DESIGN CAPACITY REPORT AND TIER 1 NMOC EMISSION RATE CALCULATIONS (JUNE 1996)

June 27, 1996
Project No. 95042.00

LANDFILL GAS NSPS DESIGN CAPACITY AND EMISSION REPORTS

Camino Real Landfill
Sunland Park, New Mexico

Prepared for:

Dr. Joe King
President
Camino Real Landfill
1000 Camino Real Blvd.
Sunland Park, New Mexico 88063

Submitted to:

Mr. Jim Nellessen
Air Quality Bureau
New Mexico Environment Department
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502

Weaver Boos Consultants, Inc.

ENVIRONMENTAL AND GEOTECHNICAL SERVICES
Chicago, Illinois *Elkhart, Indiana*

Weaver Boos Consultants, Inc.

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June 27, 1996
Project No. 95042.00

Mr. Jim Nellessen
Air Quality Bureau
New Mexico Environment Department
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502

LANDFILL GAS NSPS DESIGN CAPACITY AND EMISSION REPORTS
Camino Real Landfill
Sunland Park, New Mexico

Dear Mr. Nellessen:

Weaver Boos Consultants, Inc. (WBC), on behalf of our client Camino Real Environmental Center, Inc. (owner of the Camino Real Landfill), is submitting the attached Design Capacity and Emission Reports. These reports have been prepared in accordance with the Municipal Solid Waste Landfill (MSWLF) New Source Performance Standards (NSPS) enumerated by 40 CFR Part 60 and promulgated by USEPA on March 12, 1996. The reports are being submitted in accordance with an amended due date of June 30, 1996, as outlined in a June 5, 1996 correspondence (Draft) from NMED's Air Quality Bureau to owners and/or operators of municipal solid waste landfills.

Because the landfill's design capacity exceeds the 2.5 million megagram (Mg) and the 2.5 million cubic meter (m^3) exemption level, as presented in the Design Capacity Report, the Camino Real Landfill must submit an estimate of the non-methane organic compound (NMOC) emissions. The estimated NMOC emission rate is 461 Mg/yr. This estimate was calculated based on the Tier 1 procedures outlined in the regulations. Copies of the calculations and supporting documentation are attached.

If you have any questions regarding the enclosed information, please contact Dr. Joe King at (505) 589-5440 or the undersigned at 312-670-0041 at your convenience.

Very truly yours,
Weaver Boos Consultants, Inc.

Jerome L. Kamieniecki, P.E.
Project Manager

I. Keith Gordon, P.E.
Principal

Attachments

cc: Ron Acton, Camino Real Landfill
Dr. Joe King, Camino Real Landfill

LIST OF ATTACHMENTS

LANDFILL GAS NSPS DESIGN CAPACITY AND EMISSION REPORTS
Camino Real Landfill
Sunland Park, New Mexico

ATTACHMENT	DESCRIPTION
1	Initial Design Capacity Report Form
2	NMOC Emission Rate Calculation Form
3	Copy of NMED Solid Waste Facility Permit SW-91-04
4	Design Capacity Summary
5	Site Plan

ATTACHMENT 1

Initial Design Capacity Report Form

INITIAL DESIGN CAPACITY REPORT FORM

Camino Real Landfill
Sunland Park, New Mexico

Completion of this form fulfills the requirements of the Initial Design Capacity Report for the municipal solid waste landfills new source performance standards and emission guidelines promulgated on March 12, 1996, 40 CFR 60, Subparts WWW and Cc. For new landfills, this report also fulfills the notification requirements for the date construction is commenced as required under 40 CFR 60.7(a)(1).

I. IDENTIFYING INFORMATION

1. Name of person completing form: *I. Keith Gordon, P.E.*
   Weaver Boos Consultants, Inc.
   520 North Michigan Ave.
   Chicago, IL 60611
   Telephone number: (312) 670-0041
   Fax number: (312) 670-0044

2. Person's position: *Principal Consultant*

3. Name of landfill: *Camino Real Landfill*

4. Address of landfill: *1000 Camino Real Blvd., Sunland Park, New Mexico 88063*

5. Name of landfill owner: *Camino Real Environmental Center, Inc.*

6. Address of landfill owner: *1000 Camino Real Blvd., Sunland Park, New Mexico 88063*

7. Name of landfill operator: *Camino Real Environmental Center, Inc.*

8. Address of landfill operator: *1000 Camino Real Blvd., Sunland Park, New Mexico 88063*

9. Is landfill new or existing?

   _X_ New (began construction, reconstruction, or modification on or after May 30, 1991)

_____ Existing (began construction, reconstruction, or modification before May 30, 1991; has accepted waste after November 8, 1987; or has additional capacity available for future waste deposition)

II. DATES

10. Date construction or operating permit was issued: *Solid Waste Facility Permit No. SW-91-04 was issued by NMED on December 20, 1991. A copy of this permit is provided as **Attachment** 3.*

11. Date landfill began construction, modification, or reconstruction: *Landfill construction was initiated in April 1987*

12. Date landfill first began accepting waste: *April, 1987. (Prior to operation of the facility as a permitted landfill in April 1987, the site was used as a municipal dump.)*

13. Date this form is submitted: *June 27, 1996*

III. DESIGN CAPACITY INFORMATION

14. Maximum design capacity of landfill in Mg or m^3: *5.495 million cubic yards.*

    Basis for design capacity information: *For the purposes of calculating the site's design capacity, the landfill area was subdivided into two parcels: the current 35 acre permit area, and the prior landfill area (adjacent to the permit area - see **Attachment 5**). Using EARTHWK, an earthwork quantity program developed by CIVILSOFT, the total airspace in the permit area was calculated to be approximately 2.914 million cubic yards. Of this volume, 113,000 cubic yards are occupied by a two foot protective layer on the bottom liner. An additional 113,000 cubic yards will be occupied by the final cap. Lastly, it is expected that 10% of the available airspace (minus the protective cover and final cover layers) will be occupied by daily cover. When daily cover, final cover and the protective cover volumes are subtracted from the total airspace of the 35 acre permit area, approximately 2,419,000 cubic yards are available for waste disposal.*

The volume of waste adjacent to the permit area (the prior landfill area and closed landfill area on ***Attachment 5****) was estimated by designating a liner elevation of 3900 ft. (MSL) and constructing three trapezoids of waste corresponding to the following elevation intervals:*

3900' - 3950'
3950' - 3995'
3995' - 4045'

The volume of waste and cover material from the three trapezoid calculations was approximately 3,583,000 cubic yards. After subtracting the volume of final cover (169,000 cubic yards) and daily cover (341,000 cubic yards), approximately 3,073,000 cubic yards of waste are estimated in the prior landfill area.

Combining the design capacity of the 35 acre permit area with the in-place waste volume of the prior landfill area, a total design capacity of 5,492,000 cubic yards is estimated. Supporting calculations are provided as part of ***Attachment 4****. A summary table presenting the site's design capacity data is also included as part of* ***Attachment 4****.*

15. Site Map: *A map of the Camino Real Landfill is provided as* ***Attachment 5****. The map indicates the size and location of the landfill and delineates those areas where refuse has or may be placed according to the NMED permit.*

IV. SIGNATURE

16. Signature of person completing form:

I Keith Gordon, P.E.
Principal
Weaver Boos Consultants, Inc.

17. Date of signature:

June 27, 1996

ATTACHMENT 2

NMOC Emission Rate Calculation Form

NMOC EMISSION RATE CALCULATION

Camino Real Landfill
Sunland Park, New Mexico

EQUATION 2 - ANNUAL ACCEPTANCE RATE IS KNOWN

Default Values Required in Tier I Calculation		
Refuse methane generation potential:	170	m^3/Mg
Methane generation rate constant:	0.05	1/yr
Concentration of NMOC:	4000	ppm as hexane

Summary of Annual Acceptance Rates

Year		Mass of waste (Mg) in i^{th} section[1,2]	Age of the i^{th} Section t_i (Years)	M_{NMOC} (Mg/Year) for i^{th} Section
1977		850	19	0.080473072
1978		850	18	0.084599015
1979		850	17	0.088936499
1980		850	16	0.093496371
1981		850	15	0.098290032
1982		850	14	0.10332947
1983		850	13	0.108627285
1984		850	12	0.114196725
1985		850	11	0.120051717
1986		850	10	0.1262069
1987		151000	9	23.5697971
1988		213000	8	34.95209597
1989		226000	7	38.98672763
1990		239000	6	43.3431998
1991		277000	5	52.81016958
1992		274000	4	54.91652901
1993		283000	3	59.62847147
1994		277000	2	61.35666338
1995		271000	1	63.105321
1996		114000	0.21	27.61570741
		M_{NMOC} for the landfill (Mg/yr)	=	**461.3029**

Notes:

1) An average annual disposal rate of 850 tons/year was assumed from 1977 until April 1987.

2) Refer to Attachment 4 for the conversion of Waste Volume (cubic yards) to Mass of Waste (Mg).

ATTACHMENT 3

Copy of NMED Landfill Permit No. SW-91-04

The New Mexico Environment Department

hereby issues this

SOLID WASTE FACILITY PERMIT

Facility Type: CLASS "A" LANDFILL & RECYCLING

Facility ID No: SW-91-04

Facility Name & Address:

NU-MEX LANDFILL
P.O. BOX 580
SUNLAND PARK, NM 88053

Operator's Name & Address:

JOAB, INC.
P.O. BOX 580
SUNLAND PARK, NM 88053

Permit Expiration Date: NOVEMBER 21, 1996

This permit is issued pursuant to Section 74-9-20 of the Solid Waste Act and is subject to the conditions of the Orders of the Secretary, dated NOV. 21 and DEC. 20 1991.

Given this 6th day of November, 1992.

Judith M. Espinosa
Secretary of Environment

ATTACHMENT 4

Design Capacity Summary

DESIGN CAPACITY SUMMARY

Camino Real Landfill
Sunland Park, New Mexico

Description	Quantity	Units
Total Landfill Air Space	**6,497,000**	**yd^3**
Less Daily Cover Volume	-610,000	yd^3
Less Final Cover Volume	-282,000	yd^3
Less Protective Layer Volume	-113,000	
Total Waste Volume	**5,492,000**	**yd^3**
Convert yd^3 to m^3 (1 m^3 = 1.3069 yd^3)		
Total Waste Volume	**4,205,000**	**m^3**
Convert waste volume to mass (Compacted refuse density = ~0.5 tons/yd^3)		
Total Waste Mass	**2,748,000**	**tons**
Convert tons to Mg (1 ton = 0.907 Mg)		
Total Waste Mass	**2,492,000**	**Mg**

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CAMINO REAL LANDFILL

By BH Date 6/27/96 Subject WASTE VOLUMES-IN PLACE Sheet 1 of 1

Ckd By ______ Date ______ PRIOR TO 1991 File No. 95042

PURPOSE:

TO CALCULATE THE VOLUME OF WASTE DEPOSITED AT THE SITE BEFORE 1991.

METHOD:

BASED ON REVIEW OF OLD TOPO MAPS AND INTERVIEWS WITH PEOPLE FAMILIAR WITH WASTE FILLING OPERATIONS. DETERMINE THE BASE ELEVATION. THEN DETERMINE THE *AREA* OF THIS SURFACE.

COMPARE THIS SURFACE TO THE FINAL WASTE ELEVATIONS BEFORE THE INSTALLATION OF THE 1991 PERMIT AREA. USE THESE COMPARISONS TO CREATE ADDITIONAL SURFACES; ONE AT THE TOP OF WASTE, THE SECOND AT AN INTERIM ELEVATION.

USE TRAPEZOIDAL FORMULA TO CALCULATE VOLUME USING THESE 3 HORIZONTAL SLICES

SUBTRACT FINAL COVER VOLUMES.

RESULTS:

VOLUME BETWEEN 3900 MSL 3950 MSL $= \frac{1}{2}(A_{3900} + A_{3950})(3950-3900) = \frac{1}{2}(1{,}574{,}800\,ft^2 + 844{,}500\,ft^2)50'$

$= 2{,}240{,}000\,cy$

VOLUME BETWEEN 3950 & 3995 $= \frac{1}{2}(844{,}500 + 358{,}500)(45) = 1{,}003{,}000\,cy$

VOLUME BETWEEN 3995 & 4045 $= \frac{1}{2}(358{,}500 + 7940)(50) = 340{,}000\,cy$

3,583,000 cy

SUBTRACTING FINAL COVER VOLUMES

$(2.0'\ \text{FINAL COVER} \times 52.5\,AC)\ \frac{43560\,ft^2}{AC} \cdot \frac{1\,cy}{27\,ft^3} = 169{,}000\,cy$

TOTAL IN-PLACE VOLUME = 3,414,000 CY (INCLUDES REFUSE & DAILY COVER)

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By BH Date 6/27/96 Subject CAMINO REAL LANDFILL Sheet 1 of 10

Ckd By ______ Date ______ USEABLE CAPACITY - PERMIT AREA (1991) File No. 95042

PURPOSE:

TO CALCULATE THE CAPACITY OF THE 1991 PERMIT AREA

METHOD:

EARTHWK, an earthwork quantity program developed by CIVILSOFT will be used to perform the volume calculations.

The base grades used are the design liner grades of the 35.0 Acre Permit Area.

The final grades are based on 4.5:1 slopes

RESULTS:

The attached calculations show that the Useable Airspace in the 1991 Landfill Permit Area is 2.7×10^6 CUBIC YARDS

THIS INCLUDES REFUSE AND DAILY COVER

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 0.0

Existing Profile Data

Point	Offset	Elevation
1	195.00	3983.00
2	200.00	3983.00

Future Profile Data

Point	Offset	Elevation
1	195.00	3983.00
2	200.00	3983.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	0.0
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	0.0
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	0.0

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

3 of 10

Station : 105.0

Existing Profile Data

Point	Offset	Elevation
1	140.00	3960.00
2	340.00	3963.00
3	440.00	3968.00
4	945.00	3995.00

Future Profile Data

Point	Offset	Elevation
1	140.00	3960.00
2	340.00	3980.00
3	440.00	4000.00
4	945.00	3995.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	12230.0
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	23780.6
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	23780.6

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

4 of 10

Station : 252.0

Existing Profile Data

Point	Offset	Elevation
1	40.00	3920.00
2	116.00	3922.00
3	180.00	3925.00
4	580.00	3935.00
5	880.00	3973.00
6	1060.00	3993.00

Future Profile Data

Point	Offset	Elevation
1	40.00	3920.00
2	116.00	3926.00
3	180.00	3940.00
4	580.00	4030.00
5	880.00	4025.00
6	1060.00	3993.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	49490.0
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	168015.6
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	191796.1

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 478.0

Existing Profile Data

Point	Offset	Elevation
1	0.00	3898.00
2	637.50	3920.00
3	780.00	3945.00
4	820.00	3953.00
5	1010.00	3990.00
6	1155.00	4015.00
7	1220.00	4030.00

Future Profile Data

Point	Offset	Elevation
1	0.00	3898.00
2	637.50	4040.00
3	780.00	4073.00
4	820.00	4073.00
5	1010.00	4045.00
6	1155.00	4035.00
7	1220.00	4030.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	83592.5
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	556974.9
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	748771.1

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 680.0

Existing Profile Data			Future Profile Data		
Point	Offset	Elevation	Point	Offset	Elevation
1	0.00	3900.00	1	0.00	3900.00
2	570.00	3924.00	2	570.00	4025.00
3	880.00	3981.00	3	880.00	4100.00
4	920.00	3986.00	4	920.00	4100.00
5	1030.00	4009.00	5	1030.00	4090.00
6	1230.00	4048.00	6	1230.00	4048.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	86370.0
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	635785.6
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	%1384556.8

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 804.0

Existing Profile Data

Point	Offset	Elevation
1	0.00	3903.00
2	533.00	3925.00
3	910.00	3995.00
4	950.00	4003.00
5	1220.00	4053.00

Future Profile Data

Point	Offset	Elevation
1	0.00	3903.00
2	533.00	4020.00
3	910.00	4110.00
4	950.00	4110.00
5	1220.00	4053.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	83787.5
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	390732.0
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	%1775288.8

***** Earthwork Calculations By Average End Area Method *****

8 OF 10

Project : caminovol1991

Station : 1000.0

Existing Profile Data

Point	Offset	Elevation
1	0.00	3908.00
2	465.00	3929.00
3	490.00	3932.00
4	1040.00	4034.00
5	1070.00	4040.00
6	1140.00	4055.00
7	1170.00	4050.00
8	1680.00	4063.00

Future Profile Data

Point	Offset	Elevation
1	0.00	3908.00
2	465.00	4011.00
3	490.00	4015.00
4	1040.00	4110.00
5	1070.00	4110.00
6	1140.00	4094.00
7	1170.00	4087.00
8	1680.00	4063.00

Cut Area In Square Feet	=	0.0
Fill Area In Square Feet	=	81432.5
Cut Volume In This Reach In Cubic Yards	=	0.0
Fill Volume In This Reach In Cubic Yards	=	599687.4
Total Cut Volume In Cubic Yards	=	0.0
Total Fill Volume In Cubic Yards	=	%2374976.3

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 1140.0

Existing Profile Data

Point	Offset	Elevation
1	0.00	3913.00
2	260.00	3923.00
3	480.00	3940.00
4	1120.00	4059.00
5	1160.00	4063.00
6	1310.00	4068.00

Future Profile Data

Point	Offset	Elevation
1	0.00	3913.00
2	260.00	3970.00
3	408.00	3980.00
4	1120.00	4100.00
5	1160.00	4100.00
6	1310.00	4068.00

Cut Area In Square Feet = 0.0
Fill Area In Square Feet = 50615.0

Cut Volume In This Reach In Cubic Yards = 0.0
Fill Volume In This Reach In Cubic Yards = 342345.3

Total Cut Volume In Cubic Yards = 0.0
Total Fill Volume In Cubic Yards = %2717321.5

***** Earthwork Calculations By Average End Area Method *****

Project : caminovol1991

Station : 1350.0

Existing Profile Data			Future Profile Data		
Point	Offset	Elevation	Point	Offset	Elevation
1	0.00	3918.00	1	0.00	3918.00
2	367.50	3935.00	2	367.50	3935.00
3	810.00	4020.00	3	810.00	4020.00
4	1050.00	4050.00	4	1050.00	4050.00
5	1350.00	4073.00	5	1350.00	4073.00

Cut Area In Square Feet = 0.0
Fill Area In Square Feet = 0.0

Cut Volume In This Reach In Cubic Yards = 0.0
Fill Volume In This Reach In Cubic Yards = 196836.0

Total Cut Volume In Cubic Yards = 0.0
Total Fill Volume In Cubic Yards = %2914157.5

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1. WASTE MASS CALCULATIONS : 1990 TO 1996

BASED ON WASTE VOLUME ACCEPTANCE RECORDS PROVIDED BY THE CAMINO REAL LANDFILL, WASTE VOLUMES FOR 1990 THROUGH 1995, WITH THE EXCEPTION OF 1994, WERE CONVERTED TO MASS BY MULTIPLYING THE VOLUMES BY A COMPACTION RATIO OF 5 GATE YARDS : 3 IN-PLACE YARDS. (eg. 1.67)

THEN, IN-PLACE YARDS WERE CONVERTED TO MASS BY MULTIPLYING VOLUMES BY AN ASSUMED IN-PLACE DENSITY OF 0.5 TONS / YD^3. THIS MASS (IN TONS) WAS THEN CONVERTED INTO MEGAGRAMS (Mg).

EXAMPLE CALCULATION USING 1995 WASTE RECEIPTS:

$$\left(1,195,334\ YD^3\right)\left(\frac{1\ \text{IN-PLACE YARD}^3}{2\text{-GATE } YD^3}\right)\left(\frac{0.5\ \text{TONS}}{YD^3}\right)\left(\frac{0.907\ Mg}{\text{TON}}\right) = 271,000$$

FOR 1994, WASTE VOLUME RECEIPTS WERE NOT READILY AVAILABLE. THEREFORE, AN AVERAGE OF 1993 AND 1995 WASTE RECEIPTS WAS USED.

2. WASTE MASS CALCULATIONS - APRIL 1987 TO 1990

WASTE ACCEPTANCE RECORDS WERE NOT READILY AVAILABLE FOR THIS TIME PERIOD. THEREFORE, BASED ON A REVIEW OF WASTE RECEIPTS FROM 1990 - 1993, IT WAS DETERMINED THAT THE WASTE DISPOSAL RATES INCREASED APPROXIMATELY 6% PER YEAR. THEREFORE, THE YEARLY GATE RECEIPTS FOR 1987 (9 OF 12 MONTHS), 1988, AND 1989 WERE CALCULATED BY ASSUMING THAT WASTE DISPOSAL DECREASED 6% PER YEAR.

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By ______ Date 6/27/96 Subject CAMINO REAL LANDFILL Sheet 2 of 2

Ckd By ______ Date ______ File No. 95042.00

3. WASTE MASS DEPOSITED BEFORE APRIL 1987

BASED ON INFORMATION WITH PEOPLE FAMILIAR WITH THE SITE, THE LANDFILL WAS USED AS A MUNICIPAL DUMP FOR APPROXIMATELY 10 YEARS PRIOR TO ITS PERMITTING IN APRIL 1987 THEREFORE, FOR THE PURPOSES OF NMOC CALCULATION, IT IS ASSUMED THAT WASTE DISPOSAL STARTED IN 1977.

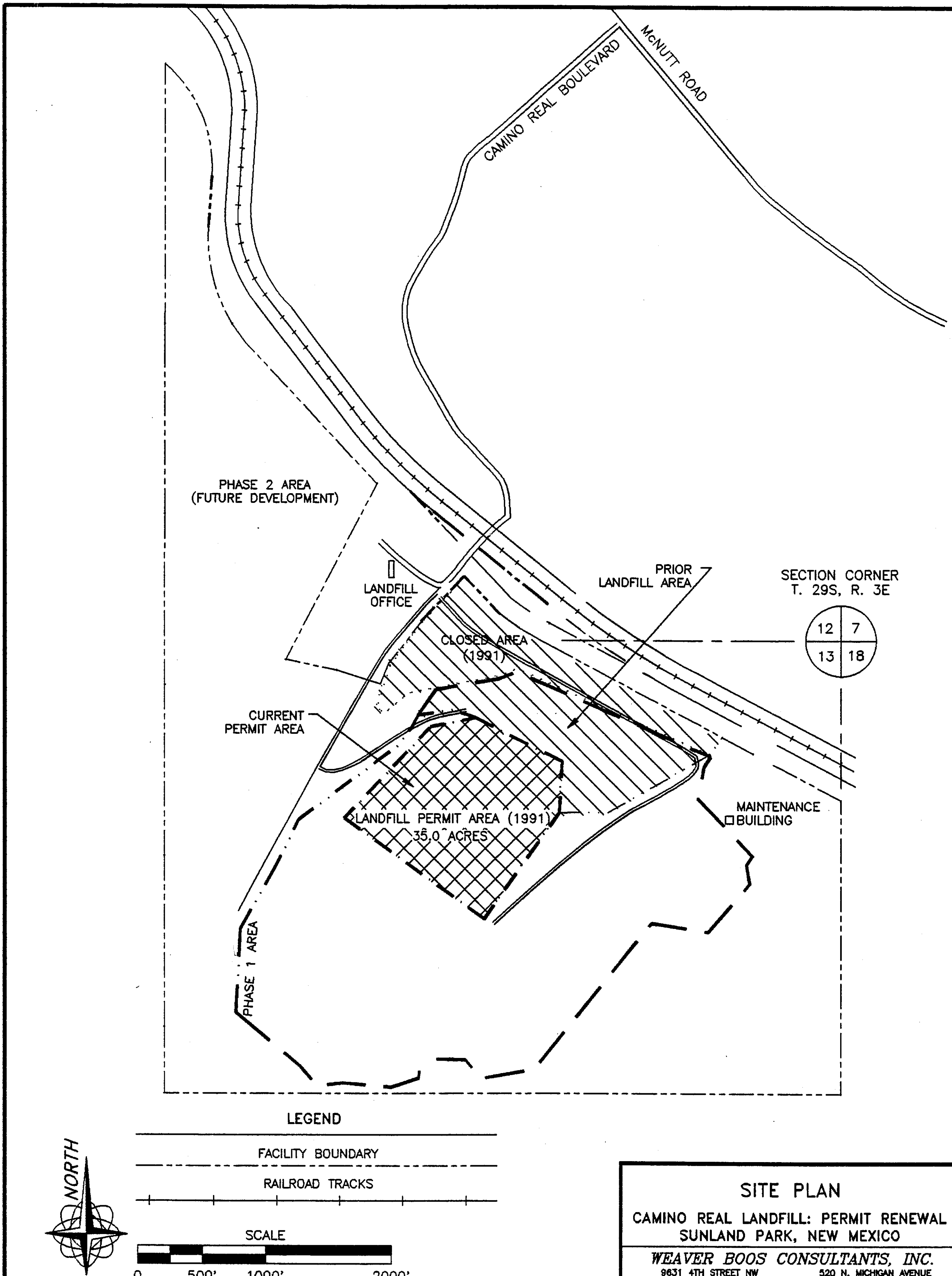
IT IS ALSO ASSUMED THAT THE CITY OF SUNLAND PARK, POPULATION OF APPROXIMATELY 5000, USED THE SITE INTERMITTENTLY DURING THIS TIME PERIOD. THEREFORE, BASED ON AN ESTIMATED WASTE GENERATION RATE OF ONE POUND PER PERSON PER DAY, THE YEARLY WASTE GENERATION RATE IS:

$$(5000\ \text{PEOPLE})(365\ \text{DAYS})\left(\frac{1\ \text{POUND}}{\text{PERSON}\cdot\text{DAY}}\right)\left(\frac{1\ \text{TON}}{2000\ \text{LBS.}}\right)\left(\frac{0.907\ \text{Mg}}{\text{TON}}\right) \cong 850\ \frac{\text{Mg}}{\text{YR.}}$$

THIS WASTE GENERATION RATE WAS USED ON A YEARLY BASIS FOR 1977 UNTIL 1986, AND THE FIRST 3 MONTHS OF 1987.

ATTACHMENT 5

Site Plan



BOUNDARY SURVEY BY SKYLINE ENG. ON 10/31/95 JOB #975-052 & 053.

SITE PLAN

CAMINO REAL LANDFILL: PERMIT RENEWAL
SUNLAND PARK, NEW MEXICO

WEAVER BOOS CONSULTANTS, INC.

9631 4TH STREET NW
ALBUQUERQUE, NM 87114
(505) 890-0573

520 N. MICHIGAN AVENUE
CHICAGO, IL 60611
(312) 670-0041

DRAWN BY: JRS	REVISED: 6/27/96	FILE: 95-42.00
REVIEWED BY: IKG	CAD: ATTACH5.DWG	ATTACHMENT 5

ATTACHMENT 21.2

40 CFR 60, SUBPART WWW TIER 3 TESTING (AUGUST 1999)

Weaver Boos & Gordon, Inc.

Illinois • Geo-Environmental Engineers and Scientists • Indiana

213 South Camino del Pueblo • Bernalillo, New Mexico 87004 • (505) 867-6990 • Fax (505) 867-6991

August 31, 1999

Mr. Lawrence Alires
Environmental Engineer
New Mexico Environment Department
Air Quality Bureau
2048 Galisteo
Santa Fe, NM 87505

Re: Camino Real Landfill: Landfill Gas Testing Results [0016-01-10/12]

Dear Mr. Alires:

We have initiated landfill gas testing at the Camino Real Landfill and have attached results from static testing and short term testing of extraction well A2. Field testing procedures were conducted consistent with the Pretest Protocol, which was previously provided to the Air Quality Bureau on July 19, 1999. It is our understanding that the Pretest Protocol has been approved by Mr. Vince Vigil.

Please contact me if you have any questions regarding the enclosed information.

Very truly yours,

Mark Turnbough

Mark Turnbough, Ph.D.

cc: Ron Acton, CRECI
John O'Connell, NMED/SWB

Enclosure

WEAVER BOOS & GORDON, INC.

TO: Lawrence Alires, NMED/AQB
John O'Connell, NMED/SWB

CC: Mark Turnbough, MT & Associates
Ron Acton, CRECI
Dr. Joe King, CRECI

FROM: Jerry Kamieniecki

DATE: August 31, 1999

SUBJECT: Camino Real Landfill Gas Testing Program: Project Status Update [0016-01-10/12]

In June 1999, the Camino Real Landfill initiated the installation of five landfill gas extraction wells and thirty-six pressure probes. The purpose of the installations is to collect site-specific landfill gas composition and flow characteristic data. The wells and probes were installed based upon the requirements of EPA Method 2E, as described in the Pretest Protocol previously submitted to the Air Quality Bureau. This project status update corresponds to the first report submittal to NMED as referenced in the Pretest Protocol.

In July 1999, the field data collection component of Method 2E was initiated. One round of static testing and short term testing of the target extraction well (Well A2) has been completed. Field procedures were completed consistent with the Pretest Protocol (July 19, 1999) which includes the well layout (also shown on **Figure 7**, attached) along with the site topo data for the test area. Following is a brief summary of data developed to date.

I. Static Testing

Static testing was completed from July 20 to July 22. Measurements from pressure probes were recorded at 3 PM, 11 PM, and 7 AM. **Tables 1, 2** and **3** summarize the static test results from pressure probes corresponding to wells A2, A3, and A4, respectively. **Figure 7** shows the positioning of the 36 pressure probes with respect to the five extraction wells. Based on the static test measurements, positive pressure was recorded consistently only at the 3 PM measurement time.

II. Short Term Testing of Well A2

Well A2 was selected as the target well because its internal position would provide the least interference from perimeter conditions; and because the leak check procedure performed with the GEM-500 indicated proper performance of the transmission piping between A1 and the blower/flare. Short term testing of Well A2 commenced on July 26 at approximately 3 PM. 3 PM was selected as the start of the test based upon pressure probe readings recorded during the static test (which indicated that all pressures were greater than zero). Gas system measurements on **Table 4** were recorded after 24 hours of pumping at the indicated vacuum/flowrate.

Initially, the vacuum at the blower was set at 2" H_2O column, and was adjusted at 24 hour intervals as specified by Method 2E. On July 27 (the beginning of the 2nd day of testing), the blower vacuum was increased to 4" H_2O column.

On July 28, a negative pressure in shallow probe A2-3 was recorded. Therefore, the blower vacuum was reduced to 3" H_2O column per Method 2E. After 24 hours of pumping at 3" H_2O column of vacuum, it was determined that this was the maximum vacuum that could be applied to Well A2 without causing apparent air infiltration into the shallow probes (corresponding to the 3 PM measurement time).

Table 5 summarizes pressure probe measurements recorded at eight-hour increments corresponding to the end of the short term test (blower set at 3" H_2O column of vacuum). Pressure measurements were also recorded from nearby probes A3-4, A3-5, A3-7 and A3-10. These additional probes were monitored in order to assist in evaluating the apparent radius of influence during the final 24 hours of testing.

III. Leak Check

Samples of landfill gas were analyzed by both field instrumentation (GEM-500) and by laboratory analysis (Air Toxics, Ltd.; Method 3C) to ensure the transmission piping did not leak. Samples of LFG were analyzed prior to the beginning of the short term test (one sample at well A1 and one sample after the blower); and twice during the short term test. **Table 6** summarizes field and laboratory gas composition data corresponding to leak check testing. Method ASTM D-1945 was used as an interim lab method until Air Toxics' lab equipment was able to perform Method 3C.

IV. Apparent Radius of Influence

Absolute pressures recorded from pressure probes at the end of the short term test were compared to the average absolute pressures recorded during the static test. **Table 7** summarizes the calculated pressure differential between the static test (higher pressure) and short term test (lower pressure). **Table 7** also shows the pressure differential adjusted for differences in barometric pressure. Based on the pressures recorded during final 24 hours of the short term test, it appears that the pumping influence extended to between 100 and 150 feet from well A2.

V. Instrumentation

Pressure measurements from pressure probes were recorded with a Dwyer, Model 475-00-FM manometer. Each pressure probe is equipped with a ¼" quick-disconnect fitting that allows for the GEM-500 sample line to be easily attached to the quick disconnect. The range of the manometer is + 4.00" to – 4.00" H_2O. This instrument is capable of measuring pressure to the nearest 0.01".

Landfill gas composition and flow rates at the Accu-Flow well head were recorded with a Landtec GEM-500. The GEM-500 was also used to record gas composition at a sampling port near the blower.

The blower/flare unit leased from LFG Specialties is a model #PCF41614 with control rack, flame arrestor, knock-out pot, automatic shut off valve and peripheral equipment. Vacuum at the blower is obtained from a magnehelic gauge. Gas flow rate (after the blower) is provided as a digital reading at the control panel.

LIST OF ATTACHMENTS

TABLE 1
CAMINO REAL LANDFILL
Well A2 Static Testing Summary

Time	3:00 PM			AVERAGE	11:00 PM			AVERAGE	7:00 AM			AVERAGE
Date	7/20	7/21	7/22		7/20	7/21	7/22		7/21	7/22	7/23	
Weather Data												
Temperature (°F)	81	83	81		74	72	74		70	70	70	
Barometric Pressure (" Hg)	30.06	30.14	30.20		30.16	30.19	30.21		30.20	30.23	30.23	
	Gauge Pressure (in. water)											
Well Data												
A2-1	0.10	0.09	0.05	0.08	-0.01	-0.01	0.02	0.00	-0.02	-0.02	-0.01	-0.02
A2-2	0.05	0.04	0.01	0.03	-0.01	0.00	0.02	0.00	-0.01	0.00	-0.01	-0.01
A2-3	0.14	0.07	0.08	0.10	-0.01	-0.01	0.01	0.00	-0.03	-0.02	-0.01	-0.02
A2-4	0.24	0.14	0.16	0.18	-0.02	-0.02	0.02	-0.01	-0.05	-0.05	-0.01	-0.04
A2-5	0.22	0.10	0.11	0.14	0.00	-0.02	0.00	-0.01	-0.06	-0.05	-0.02	-0.04
A2-6	0.27	0.11	0.13	0.17	0.00	-0.01	0.00	0.00	-0.06	-0.05	-0.02	-0.04
A2-7	0.28	0.18	0.13	0.20	-0.01	-0.01	0.02	0.00	-0.05	-0.05	-0.01	-0.04
A2-8	0.10	0.06	0.06	0.07	0.00	-0.01	0.01	0.00	-0.03	-0.02	-0.02	-0.02
A2-9	0.36	0.20	0.18	0.25	0.00	-0.01	0.00	0.00	-0.07	-0.08	-0.02	-0.06
A2-10	0.29	0.12	0.14	0.18	-0.01	-0.01	0.02	0.00	-0.05	-0.05	-0.01	-0.04
A2-11	0.35	0.03	0.15	0.18	-0.02	-0.03	0.00	-0.02	-0.07	-0.10	-0.03	-0.07
A2-12	0.36	0.25	0.18	0.26	0.00	-0.01	0.00	0.00	-0.07	-0.05	-0.01	-0.04
	Absolute Pressure (in. water)											
A2-1	409.07	410.14	410.92	410.04	410.32	410.72	411.03	410.69	410.85	411.26	411.27	411.13
A2-2	409.02	410.09	410.88	410.00	410.32	410.73	411.03	410.69	410.86	411.28	411.27	411.14
A2-3	409.11	410.12	410.95	410.06	410.32	410.72	411.02	410.69	410.84	411.26	411.27	411.12
A2-4	409.21	410.19	411.03	410.14	410.31	410.71	411.03	410.68	410.82	411.23	411.27	411.11
A2-5	409.19	410.15	410.98	410.11	410.33	410.71	411.01	410.68	410.81	411.23	411.26	411.10
A2-6	409.24	410.16	411.00	410.13	410.33	410.72	411.01	410.69	410.81	411.23	411.26	411.10
A2-7	409.25	410.23	411.00	410.16	410.32	410.72	411.03	410.69	410.82	411.23	411.27	411.11
A2-8	409.07	410.11	410.93	410.04	410.33	410.72	411.02	410.69	410.84	411.26	411.26	411.12
A2-9	409.33	410.25	411.05	410.21	410.33	410.72	411.01	410.69	410.80	411.20	411.26	411.09
A2-10	409.26	410.17	411.01	410.15	410.32	410.72	411.03	410.69	410.82	411.23	411.27	411.11
A2-11	409.32	410.08	411.02	410.14	410.31	410.70	411.01	410.67	410.80	411.18	411.25	411.08
A2-12	409.33	410.30	411.05	410.23	410.33	410.72	411.01	410.69	410.80	411.23	411.27	411.10

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TABLE 2
CAMINO REAL LANDFILL
Well A3 Static Testing Summary

Time	3:00 PM			AVERAGE	11:00 PM			AVERAGE	7:00 AM			AVERAGE
Date	7/20	7/21	7/22		7/20	7/21	7/22		7/21	7/22	7/23	
Weather Data												
Temperature (°F)	81	83	81		74	72	74		70	70	70	
Barometric Pressure (" Hg)	30.06	30.14	30.20		30.16	30.19	30.21		30.20	30.23	30.23	
	Gauge Pressure (in. water)											
Well Data												
A3-1	0.13	0.08	0.05	0.09	0.00	-0.01	0.00	0.00	-0.03	-0.02	-0.01	-0.02
A3-2	0.14	0.12	0.11	0.12	-0.01	-0.01	0.00	-0.01	-0.04	-0.02	0.00	-0.02
A3-3	0.20	0.09	0.12	0.14	0.00	-0.01	0.00	0.00	-0.05	-0.03	0.00	-0.03
A3-4	0.25	0.12	0.12	0.16	-0.01	-0.01	0.00	-0.01	-0.05	-0.05	0.00	-0.03
A3-5	0.16	0.11	0.11	0.13	-0.01	-0.01	0.00	-0.01	-0.05	-0.03	0.01	-0.02
A3-6	0.23	0.14	0.16	0.18	0.00	-0.01	0.00	0.00	-0.05	-0.03	0.00	-0.03
A3-7	0.26	0.14	0.14	0.18	-0.01	-0.01	0.00	-0.01	-0.06	-0.06	-0.02	-0.05
A3-8	0.15	0.09	0.10	0.11	-0.02	-0.01	0.00	-0.01	-0.04	-0.03	0.00	-0.02
A3-9	0.35	0.18	0.21	0.25	0.00	-0.01	0.00	0.00	-0.06	-0.05	0.01	-0.03
A3-10	0.17	0.11	0.09	0.12	-0.01	-0.01	0.00	-0.01	-0.05	-0.04	0.00	-0.03
A3-11	0.23	0.17	0.15	0.18	-0.04	-0.02	0.00	-0.02	-0.07	-0.06	0.00	-0.04
A3-12	0.31	0.20	0.19	0.23	0.00	-0.01	0.00	0.00	-0.06	-0.05	0.00	-0.04
	Absolute Pressure (in. water)											
A3-1	409.10	410.13	410.92	410.05	410.33	410.72	411.01	410.69	410.84	411.26	411.27	411.12
A3-2	409.11	410.17	410.98	410.09	410.32	410.72	411.01	410.68	410.83	411.26	411.28	411.12
A3-3	409.17	410.14	410.99	410.10	410.33	410.72	411.01	410.69	410.82	411.25	411.28	411.12
A3-4	409.22	410.17	410.99	410.13	410.32	410.72	411.01	410.68	410.82	411.23	411.28	411.11
A3-5	409.13	410.16	410.98	410.09	410.32	410.72	411.01	410.68	410.82	411.25	411.29	411.12
A3-6	409.20	410.19	411.03	410.14	410.33	410.72	411.01	410.69	410.82	411.25	411.28	411.12
A3-7	409.23	410.19	411.01	410.14	410.32	410.72	411.01	410.68	410.81	411.22	411.26	411.10
A3-8	409.12	410.14	410.97	410.08	410.31	410.72	411.01	410.68	410.83	411.25	411.28	411.12
A3-9	409.32	410.23	411.08	410.21	410.33	410.72	411.01	410.69	410.81	411.23	411.29	411.11
A3-10	409.14	410.16	410.96	410.09	410.32	410.72	411.01	410.68	410.82	411.24	411.28	411.11
A3-11	409.20	410.22	411.02	410.15	410.29	410.71	411.01	410.67	410.80	411.22	411.28	411.10
A3-12	409.28	410.25	411.06	410.20	410.33	410.72	411.01	410.69	410.81	411.23	411.28	411.11

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TABLE 3
CAMINO REAL LANDFILL
Well A4 Static Testing Summary

Time	3:00 PM			AVERAGE	11:00 PM			AVERAGE	7:00 AM			AVERAGE
Date	7/20	7/21	7/22		7/20	7/21	7/22		7/21	7/22	7/23	
Weather Data												
Temperature (° F)	81	83	81		74	72	74		70	70	70	
Barometric Pressure (" Hg)	30.06	30.14	30.20		30.16	30.19	30.21		30.20	30.23	30.23	
	Gauge Pressure (in. water)											
Well Data												
A4-1	0.29	0.20	0.16	-0.04	-0.02	0.01	-0.09	-0.08	-0.02	0.05	-0.01	0.01
A4-2	0.17	0.13	0.10	-0.02	0.00	0.00	-0.04	-0.03	0.00	0.03	0.00	0.01
A4-3	0.08	0.05	0.01	0.00	0.00	0.01	-0.02	-0.01	-0.02	0.01	0.00	0.00
A4-4	0.33	0.25	0.17	-0.04	-0.02	0.02	-0.10	-0.09	-0.03	0.05	0.00	0.01
A4-5	0.26	0.20	0.16	-0.01	0.00	-0.02	-0.05	-0.03	0.01	0.06	0.01	0.03
A4-6	0.10	0.02	0.03	-0.02	-0.01	0.00	-0.05	-0.02	-0.02	0.00	0.00	-0.01
A4-7	0.45	0.27	0.23	-0.04	-0.03	0.02	-0.10	-0.11	-0.03	0.07	-0.02	0.01
A4-8	0.09	0.11	0.06	0.00	0.00	0.01	-0.01	0.00	0.01	0.03	0.00	0.01
A4-9	0.09	0.10	0.12	-0.02	-0.01	0.00	-0.05	-0.04	-0.02	0.02	0.01	0.00
A4-10	0.30	0.13	0.14	-0.02	-0.02	0.02	-0.08	-0.09	-0.04	0.04	0.00	0.00
A4-11	0.18	0.14	0.11	-0.02	-0.01	0.00	-0.05	-0.03	-0.01	0.03	0.00	0.01
A4-12	0.03	0.01	0.03	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00
	Absolute Pressure (in. water)											
A4-1	409.26	410.25	411.03	410.18	410.31	410.74	410.92	410.66	410.85	411.32	411.27	411.15
A4-2	409.14	410.18	410.97	410.10	410.33	410.73	410.97	410.68	410.87	411.31	411.28	411.15
A4-3	409.05	410.10	410.88	410.01	410.33	410.74	410.99	410.69	410.85	411.29	411.28	411.14
A4-4	409.30	410.30	411.04	410.21	410.31	410.75	410.91	410.66	410.84	411.33	411.28	411.15
A4-5	409.23	410.25	411.03	410.17	410.33	410.71	410.96	410.67	410.88	411.34	411.29	411.17
A4-6	409.07	410.07	410.90	410.01	410.32	410.73	410.96	410.67	410.85	411.28	411.28	411.14
A4-7	409.42	410.32	411.10	410.28	410.30	410.75	410.91	410.65	410.84	411.35	411.26	411.15
A4-8	409.06	410.16	410.93	410.05	410.33	410.74	411.00	410.69	410.88	411.31	411.28	411.16
A4-9	409.06	410.15	410.99	410.07	410.32	410.73	410.96	410.67	410.85	411.30	411.29	411.15
A4-10	409.27	410.18	411.01	410.15	410.31	410.75	410.93	410.66	410.83	411.32	411.28	411.14
A4-11	409.15	410.19	410.98	410.11	410.32	410.73	410.96	410.67	410.86	411.31	411.28	411.15
A4-12	409.00	410.06	410.90	409.99	410.33	410.73	411.00	410.69	410.87	411.29	411.28	411.15

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TABLE 4
CAMINO REAL LANDFILL
Well A2 Short Term Testing Log

Date	Time	A2 Well Measurements					Blower Measurements								Pressure Probe Measurements	
		CH_4	CO_2	O_2	N_2	Flow (SCFM)	CH_4	CO_2	O_2	N_2	Vacuum (in. water)	Flow (SCFM)	Flare Temp.	Gas Temp.	Probe ID	Pressure (in. water)
7/27/99	3:00 PM	60.0%	40.0%	0.0%	0.0%	18	58.5%	40.9%	0.6%	0.0%	2	33.6	1141	112	A2-1	0.06
															A2-2	0.02
															A2-3	0.05
7/28/99	3:00 PM	58.9%	40.9%	0.1%	0.0%	43	58.3%	41.4%	0.3%	0.0%	5 (set @ 4")	64	1098	118	A2-1	0.01
															A2-2	0.00
															A2-3	-0.01
7/29/99	3:00 PM	58.7%	41.1%	0.1%	0.0%	27	59.8%	40.2%	0.0%	0.0%	3	43	920	115	A2-1	0.04
															A2-2	0.01
															A2-3	0.03

Note: Data recorded at the end of each 24-hour period.

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TABLE 5
CAMINO REAL LANDFILL
Well A2 Short Term Test Pressure Probe Readings

Date	7/29/99	7/29/99	7/30/99	Average Gauge Pressure (in. Water)
Time	3:00 PM	11:00 PM	7:00 AM	
Weather Data				
Temperature (degrees F)	88	80	76	
Barometric Pressure (in. Hg)	30.03	30.05	30.06	
Wind (mph/Direction)	10 SW	10 SW	10 SW	
Pressure Probe Data	**Gauge Pressure (in. Water)**			
A2-1	0.04	-0.03	-0.04	-0.01
A2-2	0.01	-0.01	-0.02	-0.01
A2-3	0.03	-0.07	-0.09	-0.04
A2-4	0.04	-0.19	-0.21	-0.12
A2-5	0.08	-0.13	-0.15	-0.07
A2-6	0.14	-0.09	-0.13	-0.03
A2-7	0.17	-0.02	-0.07	0.03
A2-8	0.09	-0.04	-0.04	0.00
A2-9	0.30	-0.01	-0.04	0.08
A2-10	0.22	-0.01	-0.02	0.06
A2-11	0.30	0.00	0.00	0.10
A2-12	0.33	0.00	0.00	0.11
A3-10	0.17	0.00	0.00	0.06
A3-4	0.22	0.03	0.00	0.08
A3-5	0.20	0.04	0.00	0.08
A3-7	0.18	0.00	0.00	0.06
Absolute Pressure (in. Water)				Average Absolute Pressure (in. Water)
A2-1	408.75	408.95	409.08	408.93
A2-2	408.72	408.97	409.10	408.93
A2-3	408.74	408.91	409.03	408.89
A2-4	408.75	408.79	408.91	408.82
A2-5	408.79	408.85	408.97	408.87
A2-6	408.85	408.89	408.99	408.91
A2-7	408.88	408.96	409.05	408.96
A2-8	408.80	408.94	409.08	408.94
A2-9	409.01	408.97	409.08	409.02
A2-10	408.93	408.97	409.10	409.00
A2-11	409.01	408.98	409.12	409.04
A2-12	409.04	408.98	409.12	409.05
A3-10	408.88	408.98	409.12	408.99
A3-4	408.93	409.01	409.12	409.02
A3-5	408.91	409.02	409.12	409.02
A3-7	408.89	408.98	409.12	409.00

TABLE 6
CAMINO REAL LANDFILL
Leak Check and LandGEM Validation Results

Sample ID	Description	Sample Date	GEM-500 Data (7/26-7/28)					Natural Gas Analysis ASTM D-1945 (7/30-8/2)*								Modified Method 3C (8/12)*							
			CH4 (%)	CO2 (%)	O2 (%)	Balance (N2) (%)	Total (%)	Final Field Vacuum ("Hg)	Lab Receipt Vacuum ("Hg)	CH4 (%)	CO2 (%)	O2 (%)	N2 (%)	Total (%)	Final Field Vacuum ("Hg)	Lab Receipt Vacuum ("Hg)	CH4 (%)	CO2 (%)	O2 (%)	N2 (%)	Total (%)
LC-1	Leak Check at A1	7/26/99	63.1	36.7	0.2	0	**100.0**	1.5	5.5	44.0	38.0	1.7	7.2	**90.9**	1.5	5.5	48.0	41.0	1.4	5.6	**96.0**
LC-2	Leak Check at Blower/Flare	7/26/99	60.4	38.7	0.9	0	**100.0**	0.0	6.0	47.0	40.0	1.0	4.3	**92.3**	0.0	6.0	51.0	43.0	0.8	3.4	**98.2**
A2-ST1	Validation at A2	7/27/99	60.2	39.8	0	0	**100.0**	1.0	5.5	47.0	39.0	0.9	5.0	**91.9**	1.0	5.5	51.0	42.0	0.7	4.0	**97.7**
A2-ST2	Validation at A2	7/28/99	58.9	41.1	0	0	**100.0**	2.0	6.0	46.0	39.0	0.7	6.7	**92.4**	2.0	6.0	50.0	42.0	0.6	5.3	**97.9**

*Analysis performed by Air Toxics, LTD.

TABLE 7
CAMINO REAL LANDFILL

Well A2 Pressure Probe Differentials

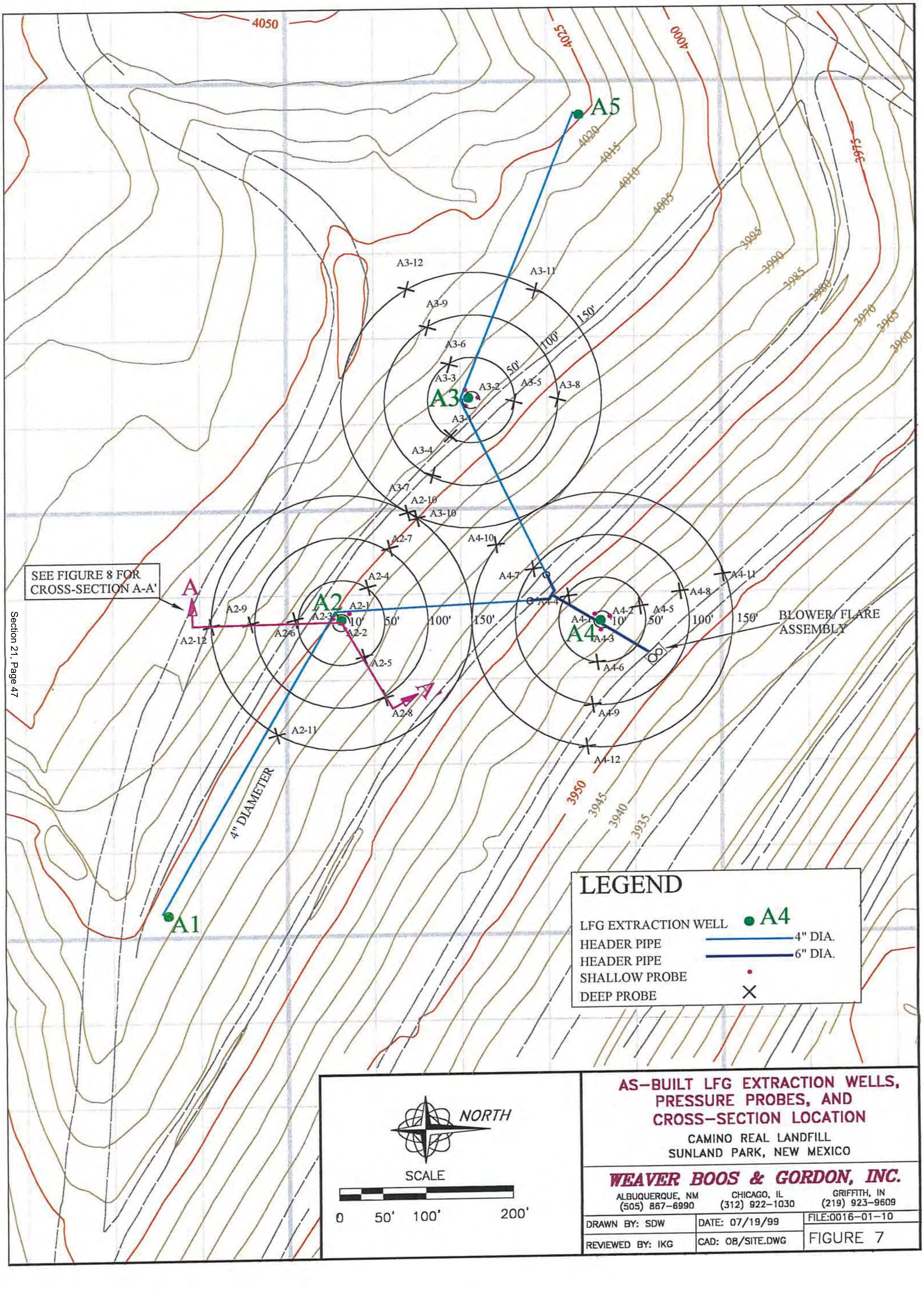
Pressure Probe I.D.	Distance from Well A2 (feet)	Pressure Differential (in. H_2O Column)*		
		3:00 PM	11:00 PM	7:00 AM
A2-4	50	1.54	2.04	2.35
A2-5	50	1.47	1.98	2.28
A2-6	50	1.43	1.95	2.26
A2-7	100	1.43	1.88	2.21
A2-8	100	1.39	1.90	2.19
A2-9	100	1.35	1.87	2.16
A2-10	150	1.37	1.87	2.16
A2-11	150	1.28	1.84	2.11
A2-12	150	1.34	1.86	2.11
A3-10	150	1.36	1.85	2.14
A3-7	200	1.40	1.85	2.13
A3-4	250	1.35	1.82	2.14
A3-5	325	1.33	1.81	2.15

Note: *Pressure differential was calculated by subtracting the absolute pressure probe data recorded at the end of the Short Term Test (**Table 5**) from the average absolute pressure probe data recorded during the Static Test.

Well A2 Pressure Probe Differentials - Adjusted for Barometric Pressure

Pressure Probe I.D.	Distance from Well A2 (feet)	Pressure Differential (in. H_2O Column)*		
		3:00 PM	11:00 PM	7:00 AM
A2-4	50	0.14	0.18	0.17
A2-5	50	0.07	0.12	0.10
A2-6	50	0.03	0.09	0.08
A2-7	100	0.03	0.02	0.03
A2-8	100	-0.01	0.04	0.01
A2-9	100	-0.05	0.01	-0.02
A2-10	150	-0.03	0.01	-0.02
A2-11	150	-0.12	-0.02	-0.07
A2-12	150	-0.06	0.00	-0.07
A3-10	150	-0.04	-0.01	-0.04
A3-7	200	0.00	-0.01	-0.05
A3-4	250	-0.05	-0.04	-0.04
A3-5	325	-0.07	-0.05	-0.03

Note: *Pressure differential was calculated by subtracting the absolute pressure probe data recorded at the end of the Short Term Test (**Table 5**) from the average absolute pressure probe data recorded during the Static Test, and adjusting for differences in barometric pressure.



4050
4025
4020
4015
4010
4005
4000
3995
3990
3985
3980
3975
3970
3965
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3945
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A5
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A2
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A3-1
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A2-11
A2-12
A4-1
A4-2
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A4-4
A4-5
A4-6
A4-7
A4-8
A4-9
A4-10
A4-11
A4-12
10'
50'
100'
150'
SEE FIGURE 8 FOR CROSS-SECTION A-A'
A
A'
4" DIAMETER
BLOWER/ FLARE ASSEMBLY
LEGEND
LFG EXTRACTION WELL
HEADER PIPE 4" DIA.
HEADER PIPE 6" DIA.
SHALLOW PROBE
DEEP PROBE
NORTH
SCALE
0 50' 100' 200'
AS-BUILT LFG EXTRACTION WELLS, PRESSURE PROBES, AND CROSS-SECTION LOCATION
CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO
WEAVER BOOS & GORDON, INC.
ALBUQUERQUE, NM (505) 867-6990
CHICAGO, IL (312) 922-1030
GRIFFITH, IN (219) 923-9609
DRAWN BY: SDW
DATE: 07/19/99
FILE:0016-01-10
REVIEWED BY: IKG
CAD: 08/SITE.DWG
FIGURE 7

ATTACHMENT 6.2

Methane Generation Rate Constant (k) Calculation

Methane Generation Rate Constant (k) Calculation
Camino Real Landfill

Static Test

1.) Determine the average initial absolute pressure (P_{ia}) of each deep probe.
This value of P_{ia} will be used to determine the maximum radius of influence (R_m) in the Short Term Test.

Short Term Test (STT)

1.) Determine the average final absolute pressure (P_{fa}) of each deep probe.

2.) For each probe, compare P_{fa} to P_{ia} along each radial arm.

3.) For each radial arm, determine the distance along that radial arm where P_{fa} is < or = to P_{ia}. This distance is the maximum radius of influence (R_m) for that particular arm.

4.) After determining R_m for each radial arm, obtain the average maximum radius of influence (R_{ma}) for that well.
Note: A graphical analysis was used in determining R_{ma}.

R_{maA2} (ft)	R_{maA3} (ft)	R_{maA4} (ft)
150	259	93
R_{maA2} (m)	R_{maA3} (m)	R_{maA4} (m)
46	79	28

5.) Determine the depth (WD) of that well.
Note: WD is 75% of the depth of the landfill (see D_{LF} in step 6 below) and includes one foot of stick-up above ground surface.

WD_{A2} (ft)	WD_{A3} (ft)	WD_{A4} (ft)
59	69	34
WD_{A2} (m)	WD_{A3} (m)	WD_{A4} (m)
18	21	10

6.) Calculate the depth (D_{st}) affected by that well as follows:

$$D_{st} = WD + R_{ma}$$

Note: If the calculated value of D_{st} is > the depth of the landfill (D_{LF}), set D_{st} equal to the depth of the landfill.

	D_{LFA2} (ft)	D_{LFA3} (ft)	D_{LFA4} (ft)
	79	92	45
	D_{LFA2} (m)	D_{LFA3} (m)	D_{LFA4} (m)
	24	28	14
	D_{stA2} (m)	D_{stA3} (m)	D_{stA4} (m)
Calculated value ------>	64	100	38
	D_{stA2} (m)	D_{stA3} (m)	D_{stA4} (m)
Final value ------>	24	28	14

7.) Calculate the void volume (V) for that well as follows:

$$V = (0.40)(\pi)(R_{ma}^2)(D_{st})$$

V_{A2} (m^3)	V_{A3} (m^3)	V_{A4} (m^3)
63,259	219,633	13,851

8.) Repeat steps 1 through 7 for each well.

9.) Calculate the total void volume (V_v) for all three wells by summing the void volumes (V) for all three wells.
Note: This value of V_v is used to determine two total void volumes ($2V_v$) to be used in the Long Term Test.

$V_v (m^3)$
296,743

$2V_v (m^3)$
593,487

9a.) The simplified procedure of calculating void volume according to Method 2E above does not take into account overlap between well ROIs. Therefore, the calculations were reworked using AutoCAD to calculate well ROI areas and overlap areas so that these overlaps are not double-counted.

$V_{A2} (ft^3)$	$V_{A3} (ft^3)$	$V_{A4} (ft^3)$	$V_v (ft^3)$	$2V_v (ft^3)$
1,611,758	7,755,269	389,628	9,756,655	19,513,310
$V_{A2} (m^3)$	$V_{A3} (m^3)$	$V_{A4} (m^3)$	$V_v (m^3)$	$2V_v (m^3)$
45,633	219,572	11,031	276,236	552,472

Long Term Test (LTT)

1.) Set blower vacuum to highest stabilized blower vacuum demonstrated by any individual well in the Short Term Test.

2.) Every 8 hours, for the duration of the LTT:
- a.) Sample the LFG at the wellhead.
- b.) Measure the gauge pressures (P_l) of all shallow and deep probes.
- c.) Record the barometric pressure (P_{bar}).
- d.) Calculate the absolute pressure (P_s) for all deep probes.
- e.) Record the blower vacuum.
- f.) Record the LFG flowrate at each well head and at the blower.
- g.) Use established criteria to check for air infiltration.

Note: If infiltration is detected, ***DO NOT REDUCE THE BLOWER VACUUM.*** *Instead, reduce the LFG flowrate at the affected wellhead until infiltration is no longer detected.*

3.) Continue with step 2 until two total void volumes ($2V_v$) have been extracted from all three wells.

4.) Record the final stabilized flowrate (Q_f) at the wellhead. If, during the Long Term Test, the flowrate does not stabilize, calculate Q_f by averaging the last 10 recorded flowrates. Convert flowrate (cfm) at blower to m^3/min. This value of Q_f will be used on the following page in the calculation of the methane generation rate constant (k).

$Q_{fA2} (ft^3/min)$	$Q_{fA3} (ft^3/min)$	$Q_{fA4} (ft^3/min)$
3.40	106.00	0.00
$Q_{fA2} (m^3/min)$	$Q_{fA3} (m^3/min)$	$Q_{fA4} (m^3/min)$
0.10	3.00	0.000

5.) Determine the average final stabilized absolute pressure (P_{sa}) for each deep probe.

6.) For each probe, compare P_{sa} to P_{la} along each radial arm.

7.) For each radial arm, determine the distance along that radial arm where P_{sa} is < or = to P_{ia}. This distance is the stabilized radius of influence (R_s) for that particular arm.

8.) After determining R_s for each radial arm, obtain the average stabilized radius of influence (R_{sa}) for that well.
Note: A graphical analysis was used in determining R_{sa}.

Determination of the Methane Generation Rate Constant (k)

1.) $D = WD + R_{sa}$

			A2	A3	A4
	Stabilized radius of influence	R_{sa} (ft)	65	306	0
	Stabilized radius of influence	R_{sa} (m)	20	93	0
	Depth of well	WD (m)	18	21	10
	Depth of landfill	D_{LF} (m)	24	28	14
Calculated value ------>	Depth of waste affected	D (m)	38	114	10
Final value ------>	Depth of waste affected	D (m)	24	28	10

Note: If the calculated value of D is > the depth of the landfill (D_{LF}), set D equal to the depth of the landfill.

2.) $V_r = (R_{sa}^2)(\pi)(D)$

		A2	A3	A4
Volume of solid waste affected	V_r (m^3)	29,696	766,446	0

3.) $M_r = (V_r)(\rho)$

Density of solid waste	ρ (Mg/m^3)	0.74	0.74	0.74
Mass of waste affected	M_r (Mg)	21,975	567,170	0

4.) $L_o' = (f)(L_o)$

Fraction of decomposable waste in LF	f	0.9026	0.9026	0.9026
Methane generation potential	L_o (m^3/Mg)	170.00	170.00	170.00
Revised methane generation potential	L_o' (m^3/Mg)	153.44	153.44	153.44

5.) $[(k)(e^{(-kA_{avg})})] - [(5.256\times10^5)(Q_f) / (2)(L_o')(M_r)] = 0$

		A2	A3	A4
Zero (defined as equaling 0.0010)		**0.0010**	**0.0010**	**#DIV/0!**
Weighted avg. age of solid waste tested	A_{avg} (year)	8.40	8.40	8.40
Final stabilized flowrate at wellhead	Q_f (ft^3/min)	3.40	106.00	0.00
Final stabilized flowrate at wellhead	Q_f (m^3/min)	0.0963560	3.00	0.000
Methane generation rate constant	k ($year^{-1}$)	0.009250	0.011000	0
Average methane gen. rate constant	k ($year^{-1}$)			**0.006750**

Note: Numerical values highlighted in gray are used in calculations.

ATTACHMENT 21.3

40 CFR 60, SUBPART WWW TIER 2 NMOC EMISSION RATE REPORTING (REPORTED OVER 50 MG/YR EMISSIONS) – JUNE 2016

New Mexico Environment Department
Air Quality Bureau
Compliance and Enforcement Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505
Phone (505) 476-4300 Fax (505) 476-4375

Version 05.02.13

NMED USE ONLY	
TEMPO	

REPORTING SUBMITTAL FORM

NMED USE ONLY	
Staff	
Admin	

PLEASE NOTE: ® - indicates required field

SECTION I - GENERAL COMPANY AND FACILITY INFORMATION

A. ® Company Name: Camino Real Environmental Center, Inc.			**D. ® Facility Name:** Camino Real Landfill		
B.1 ® Company Address: 1000 Camino Real Blvd.			**E.1 ® Facility Address:** 1000 Camino Real Blvd.		
B.2 ® City: Sunland Park	**B.3 ® State:** NM	**B.4 ® Zip:** 88063	**E.2 ® City:** Sunland Park	**E.3 ® State:** NM	**E.4 ® Zip:** 88063
C.1 ® Company Environmental Contact: Dr. Juan Carlos Tomas	**C.2 ® Title:** Landfill Manager		**F.1 ® Facility Contact:** Dr. Juan Carlos Tomas	**F.2 ® Title:** Landfill Manager	
C.3 ® Phone Number: (575) 589-9440	**C.4 ® Fax Number:** (575) 589-2427		**F.3 ® Phone Number:** (575) 589-9440	**F.4 ® Fax Number:** (575) 589-2427	
C.5 ® Email Address: JuanT@wasteconnections.com			**F.5 ® Email Address:** JuanT@wasteconnections.com		
G. Responsible Official: (Title V only): Dr. Juan Carlos Tomas	**H. Title:** Landfill Manager		**I. Phone Number:** (575) 589-9440	**J. Fax Number:** (575) 589-2427	

K. ® AI Number:	**L. Title V Permit Number:**	**M. Title V Permit Issue Date:**	**N. NSR Permit Number:**	**O. NSR Permit Issue Date:**
167	P186LR2M1	1/18/2013		

P. Reporting Period:
From: To:

SECTION II – TYPE OF SUBMITTAL (check one that applies)

A. ☐	Title V Annual Compliance Certification	**Permit Condition(s):**	**Description:**	
B. ☐	Title V Semi-annual Monitoring Report	**Permit Condition(s):**	**Description:**	
C. ☒	NSPS Requirement (40CFR60)	**Regulation:** Subpart WWW	**Section(s):** 40 CFR 60.754(a)(3)(iii)	**Description:** Tier 2 Testing Report
D. ☐	MACT Requirement (40CFR63)	**Regulation:**	**Section(s):**	**Description:**
E. ☐	NMAC Requirement (20.2.xx) or NESHAP Requirement (40CFR61)	**Regulation:**	**Section(s):**	**Description:**
F. ☐	Permit or Notice of Intent (NOI) Requirement	**Permit No.☐: or NOI No.☐:**	**Condition(s):**	**Description:**
G. ☐	Requirement of an Enforcement Action	**NOV No. ☐: or SFO No. ☐: or CD No. ☐: or Other ☐:**	**Section(s):**	**Description:**

SECTION IV - CERTIFICATION

After reasonable inquiry, I Dr. Juan Carlos Tomas **certify that the information in this submittal is true, accurate and complete.**
(name of reporting official)

® Signature of Reporting Official:	**® Title:**	**® Date**	**® Responsible Official for Title V?**
Juan Carlos Tomas	Landfill Manager	6-10-16	☒ Yes ☐ No

Reviewed By: ______________________ Date Reviewed: ______________

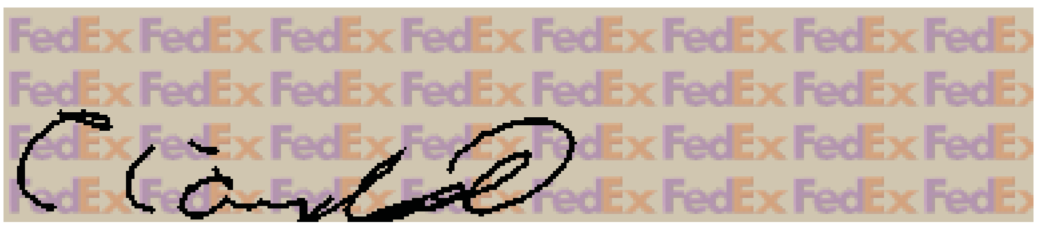
June 21,2016

Dear Customer:

The following is the proof-of-delivery for tracking number **776497264243**.

Delivery Information:

Status:	Delivered	**Delivered to:**	Receptionist/Front Desk
Signed for by:	C.CAMPBELL	**Delivery location:**	525 CAMINO DE LOS MARQUEZ 1 SANTA FE, NM 87505
Service type:	FedEx Express Saver	**Delivery date:**	Jun 14, 2016 13:57
Special Handling:	Deliver Weekday		



Shipping Information:

Tracking number:	776497264243	**Ship date:**	Jun 10, 2016
		Weight:	0.5 lbs/0.2 kg

Recipient:
Compliance and Enforcement Section
NMED, Air Quality Bureau
525 Camino de los Marquez, Ste 1
SANTA FE, NM 87505 US

Shipper:
Blaine Beck
SCS Engineers
1901 CENTRAL DR
STE 550
BEDFORD, TX 76021 US

Reference
16215134.00 T3 BB

Thank you for choosing FedEx.

SCS ENGINEERS

TIER 2 LANDFILL GAS SAMPLING & ANALYSIS REPORT

CAMINO REAL LANDFILL
SUNLAND PARK, NEW MEXICO

Prepared for:

Camino Real Environmental Center, Inc.
1000 Camino Real Blvd
Sunland Park, NM 88063

Camino Real
ENVIRONMENTAL CENTER, INC.

Prepared by:

SCS ENGINEERS
1901 Central Drive, Suite 550
Bedford, Texas 76021
(817) 571-2288

For Compliance Purposes
DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER
6/10/16
exp. 12/31/16

June 2016
SCS File No. 16215134.00 T3

Offices Nationwide
www.scsengineers.com

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For Compliance Purposes

DAVID J. MEZZACAPPA 6/10/16
NEW MEXICO
15236
PROFESSIONAL ENGINEER
Exp. 12/31/16

1.0 EXECUTIVE SUMMARY

Tier 2 sampling of non-methane organic compound (NMOC) content in landfill gas at the Camino Real Landfill was performed consistent with New Source Performance Standard (NSPS) regulations. This report documents the results of the Tier 2 sampling conducted at the landfill between May 16th and 17th, 2016.

The results discussed in this report show an average NMOC concentration (C_{NMOC}) at the landfill of 998.72 ppmv as hexane. EPA's LandGEM Model was prepared using this new value along with other NSPS-specified parameters to determine the NMOC emissions rate for 2016. Based on the LandGEM Model results for the landfill's NMOC emissions rate, the landfill is above the current NSPS gas collection trigger level of 50 Mg/year for 2016. It should be noted that a site-specific methane generation rate "k" was established on August 31, 1999 and is usable for all NMOC reporting at this landfill under the NSPS. Per §60.754(a)(4)(ii), once a site-specific methane generation rate has been established, it is valid for the life of the facility.

2.0 INTRODUCTION

2.1 Facility Description and History

The landfill is located in Doña Ana County, New Mexico, just to the northwest of El Paso, Texas. The landfill began accepting waste in 1977.

Table 1 on page 4 shows the solid waste acceptance rates for the landfill used in this report. The degradable waste totals were used as inputs to the LandGEM Model to predict NMOC emission rates. The per capita waste estimation method from EPA's Greenhouse Gas (GHG) Reporting rule (40 CFR §98.343(a)(3)(ii)) was used to estimate the waste received between 1977 and 1986 where no records were available. The population served during this time period was assumed to be approximately 5,000, as described in the February 10, 1999, Tier 2 report. No non-degradable waste was removed from the waste intake estimated between 1977 and 1986.

Camino Real received its first operating approval from New Mexico Environment Department (NMED) in 1987, and it began receiving larger quantities of waste. However, waste intake records were not available from 1987 to 1989. During the development of the February 10, 1999, Tier 2 report, a volumetric method was used to estimate the waste received in those years. The topographic differences between maps developed in 1989 and 1955 and the historic operating knowledge of the landfill were used to determine the in-place waste capacity at the end of 1989. The amount of estimated waste received in prior years (1977-1986) was originally removed from the total, and the remaining volume was evenly distributed over the three year period and was converted to mass. Although the waste intake totals assumed in this report between 1977 and 1986 are slightly higher than were estimated in the 1999 Tier 2 report due to our use of the GHG Reporting Rule per capita methodology, the previously calculated waste intake between 1987 and 1989 was retained for conservativeness. This waste intake estimated in the 1999 Tier 2 report was entered into the LandGEM model (after being converted to US tons), and no non-degradable wastes were removed from the values calculated in that report.

The waste totals received between 1990 and 1996 were taken from NMED Annual Reports. The waste history was provided in cubic yards during this period, so the values were converted to tons using a site-specific compaction rate (approximately 560 lb/cy) calculated using the recorded tonnage and cubic yardage of the waste received in later years.

Between 1997 and 2015, detailed NMED Annual Reports were available that included waste composition breakdowns in tons as well as the total cubic yards received. The tons of construction and demolition (C&D) waste and scrap tires were removed from the total tonnage accepted for each year, as these are considered non-degradable wastes for the purposes of methane and NMOC generation. In addition, these waste streams are tracked and accounted for separately from any degradable wastes. The remaining (degradable, methane and NMOC producing waste) tonnage was entered into the waste history for the LandGEM model.

2.2 Project Team

The project manager for this sampling and analysis effort was Mr. David Mezzacappa, P.E., of SCS Engineers. Sampling was performed by Chastain Environmental Services, LLC. The laboratory used for the analysis was Air Technology Laboratories, Inc., City of Industry, California. The Camino Real Landfill contact was Dr. Juan Carlos Tomas, Landfill Manager, and Matt Crockett, P.E., Waste Connections, Inc. Region Engineer.

TABLE 1
CAMINO REAL LANDFILL
WASTE ACCEPTANCE RATES

Year	Tons	Mg[1]
1977	3,650	3,318
1978	3,700	3,364
1979	3,750	3,409
1980	3,750	3,409
1981	3,800	3,455
1982	3,850	3,500
1983	3,850	3,500
1984	3,900	3,545
1985	3,950	3,591
1986	3,950	3,591
1987	93,014	84,558
1988	93,014	84,558
1989	93,014	84,558
1990	232,532	211,393
1991	243,670	221,518
1992	238,949	217,226
1993	270,938	246,307
1994	216,837	197,124
1995	263,902	239,911
1996	320,527	291,389

Year	Tons	Mg[1]
1997	389,357	353,961
1998	417,080	379,164
1999	482,079	438,253
2000	460,328	418,480
2001	451,310	410,282
2002	505,908	459,916
2003	511,933	465,393
2004	545,435	495,850
2005	483,494	439,540
2006	591,127	537,389
2007	620,348	563,953
2008	555,081	504,619
2009	358,313	325,739
2010	425,245	386,586
2011	419,308	381,189
2012	363,925	330,841
2013	340,701	309,728
2014	373,567	339,607
2015	386,196	351,088

[1] Mg values are from the LandGEM Model

3.0 SAMPLING METHODOLOGY

EPA Method 25C sampling procedures were followed for the collection of Tier 2 samples at the landfill. The NSPS rules require that two samples per hectare be taken from the landfill's surface in areas with waste two years or older, with the maximum number of samples being 50. Due to the landfill's footprint area, the maximum of 50 samples is required. However, most of the waste which has been in place two years or more is influenced by the existing active landfill gas collection and control system (GCCS). In fact, this area is equivalent to representing 44 of 50 required samples. To collect this portion of the landfill gas, four samples were collected from the main GCCS header. For the area outside of the GCCS' influence with waste in place two years or more, the final six required landfill gas samples were taken from beneath the landfill cover in Cells 9A and 10A per EPA Method 25C.

All samples were logged in the field and the field data from the portable gas analyzer is provided in Appendix B (Table B-1). The selected analytical laboratory (Air Technology Laboratories, Inc.) provided all canisters and chain-of-custody forms for the sampling activities. It should be noted that only three of the four sample canisters from the GCCS samples were analyzed as required by the NSPS rule and guidance – the fourth canister was a spare in the event any issues were encountered with the other three.

3.1 Summary of Sampling Procedure

For samples taken from beneath the landfill cover, and not from the GCCS, the first sampling activity performed was to push a pilot probe to a depth of at least one meter. The pilot probe was then pulled out. Next, a stainless steel probe, with the bottom third perforated, was pushed into the pilot hole to a depth of at least one meter below the bottom of the landfill cover. After the probe was pushed into the pilot hole, a sampling cap was placed onto the top of the probe.

Once the probe was in place, a gas meter was connected to the sampling cap and a reading was taken. Readings were taken to ensure that oxygen levels were below five percent; indicating quality landfill gas.

The sampling train was then connected to the probe cap. The sampling train consisted of a flow control valve, a purge pump, and a gas meter. The sampling train was first purged at a rate of 500 milliliters (ml) per minute for five to six minutes. This process purges more than three sample train volumes. The gas meter was then used to measure methane, carbon dioxide, and oxygen content. These values were recorded and used as an additional check to confirm that the sample was landfill gas. This field data is included in Appendix B of this report for each sampling point.

After the landfill gas composition was confirmed to be suitable, the sample canister was opened. Since each canister was delivered under a vacuum, no pumping was necessary. The incoming flow to the canister was controlled so as not to exceed 500 ml/min as required in EPA Method 25C. Multiple sample points were composited into each canister (no more than 3 sampling points per canister). An equivalent pressure drop was recorded for each sample to help ensure equivalent sample volumes were collected from each point.

For samples collected from the GCCS header, teflon tubing was first connected to a sampling port at the main header pipe. The closed canister was connected to the line which contained a pressure gauge and a flow controller. The flow controller was set to a flow rate of approximately 500 ml/min. The line was then purged and a field analyzer was used to sample the gas and make sure that air intrusion into the line was not detected. The evacuated canister was then opened and allowed to fill until its pressure reached just above 0 mm Hg.

4.0 ANALYTICAL RESULTS

Each gas canister was analyzed for NMOCs using Method 25C, as well as oxygen and nitrogen using Method 3C. The results from the laboratory analyses are included in Appendix C. As discussed in Section 3.1, two canisters were composited for each analysis where possible such that each individual result represents multiple sampling points.

Table 2 summarizes the laboratory analytical results. The corrected NMOC content (C_{NMOC}) results were averaged to determine the site-specific C_{NMOC}.

TABLE 2
SUMMARY OF ANALYTICAL RESULTS

Lab Number	Sample ID	Oxygen Content (%)	Nitrogen Content (%)	NMOC content (ppmv as Hexane)[1]
H052004-01	#6048 – Pts. 1, 2, 3	ND	ND	733.3
H052004-02	#1397 – Pts. 4, 5, 6	ND	ND	1066.7
H052004-03	#1434 – Flare 1	ND	29	1016.7
H052004-04	#3735 – Flare 2	ND	27	1016.7
H052004-05	#3670 – Flare 3	ND	28	1000.0
Site-Specific C_{NMOC} (average individual NMOC contents)				998.72

[1] Results were reported as ppmv as Carbon by the lab. These results are divided by six to yield ppmv as Hexane, the result format used in the NSPS equations.

As can be seen from Table 2 all oxygen levels were under five percent, a key level included in EPA Method 25C to indicate that the samples represent landfill gas with little influence from outside air. Also, any nitrogen content in each sample was accounted for in the analysis by correcting the NMOC content upwards per the analytical method's requirements.

Based upon the information presented, consistent with NSPS rule, and with proper weighting by area for gas system coverage, SCS computed the average site-specific C_{NMOC} to be 998.72 ppmv. Therefore, this value was used in the LandGEM Model to calculate the landfill's NMOC emissions rate.

5.0 TESTING RESULTS AND CONCLUSIONS

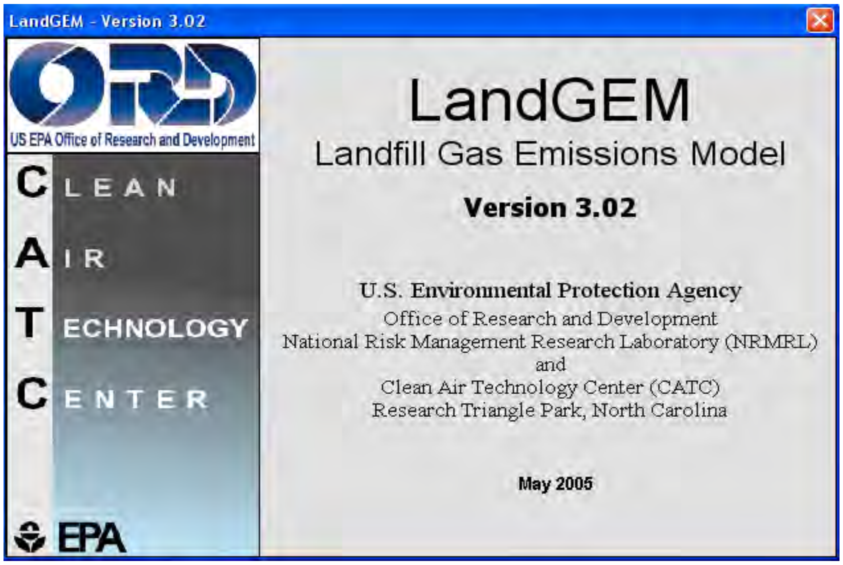
The site-specific C_{NMOC} value of 998.72 ppmv was used in the EPA's LandGEM Model to calculate 2016 NMOC emissions for the landfill. Refer to section 2.1 of this report for a summary of waste quantities used in the model.

The LandGEM Model uses an equation consistent with 40 CFR 60.754(a)(1)(i). The output result for the NMOC emission rates is included in Appendix A. Note that Appendix A includes selected pages of output from EPA's LandGEM model. The NMOC emissions rate for the landfill for 2016 is highlighted on page 3 of the model output provided. This output shows that the NMOC emissions rate is above the 50 Mg/yr trigger threshold requiring that an NSPS-compliant gas system must be installed and operating within 30 months of the Tier 2 sampling date.

It should also be noted that revisions to the NSPS rule is scheduled for later this year. Upon review of any new requirements (whenever the new rule is issued), Camino Real Environmental Center, Inc. may pursue an alternate course of action depending on the new rule's contents.

APPENDIX A

LANDGEM MODEL RESULTS OF NMOC EMISSION ESTIMATIONS



Summary Report

Landfill Name or Identifier: Camino Real Landfill (Tier 2)

Date: Friday, June 03, 2016

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)
M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1977**	
Landfill Closure Year (with 80-year limit)	**2015**	
Actual Closure Year (without limit)	***2015***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.007**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**999**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Total landfill gas**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1977	3,318	3,650	0	0
1978	3,364	3,700	3,318	3,650
1979	3,409	3,750	6,682	7,350
1980	3,409	3,750	10,091	11,100
1981	3,455	3,800	13,500	14,850
1982	3,500	3,850	16,955	18,650
1983	3,500	3,850	20,455	22,500
1984	3,545	3,900	23,955	26,350
1985	3,591	3,950	27,500	30,250
1986	3,591	3,950	31,091	34,200
1987	84,558	93,014	34,682	38,150
1988	84,558	93,014	119,240	131,164
1989	84,558	93,014	203,798	224,178
1990	211,393	232,532	288,356	317,192
1991	221,518	243,670	499,749	549,724
1992	217,226	238,949	721,268	793,394
1993	246,307	270,938	938,494	1,032,343
1994	197,124	216,837	1,184,801	1,303,281
1995	239,911	263,902	1,381,925	1,520,118
1996	291,389	320,527	1,621,836	1,784,019
1997	353,961	389,357	1,913,224	2,104,547
1998	379,164	417,080	2,267,185	2,493,904
1999	438,253	482,079	2,646,349	2,910,984
2000	418,480	460,328	3,084,602	3,393,063
2001	410,282	451,310	3,503,083	3,853,391
2002	459,916	505,908	3,913,364	4,304,701
2003	465,393	511,933	4,373,280	4,810,609
2004	495,850	545,435	4,838,674	5,322,541
2005	439,540	483,494	5,334,524	5,867,976
2006	537,389	591,127	5,774,064	6,351,470
2007	563,953	620,348	6,311,452	6,942,597
2008	504,619	555,081	6,875,405	7,562,945
2009	325,739	358,313	7,380,024	8,118,026
2010	386,586	425,245	7,705,763	8,476,339
2011	381,189	419,308	8,092,349	8,901,584
2012	330,841	363,925	8,473,538	9,320,892
2013	309,728	340,701	8,804,379	9,684,817
2014	339,607	373,567	9,114,108	10,025,518
2015	351,088	386,196	9,453,714	10,399,086
2016	0	0	9,804,802	10,785,282

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1977	0	0	0	0	0	0
1978	2.718E-02	7.582E+00	5.095E-04	2.533E+00	3.796E+03	2.551E-01
1979	5.455E-02	1.522E+01	1.022E-03	5.083E+00	7.619E+03	5.119E-01
1980	8.210E-02	2.291E+01	1.539E-03	7.650E+00	1.147E+04	7.705E-01
1981	1.095E-01	3.054E+01	2.052E-03	1.020E+01	1.529E+04	1.027E+00
1982	1.370E-01	3.823E+01	2.569E-03	1.277E+01	1.914E+04	1.286E+00
1983	1.648E-01	4.597E+01	3.089E-03	1.535E+01	2.301E+04	1.546E+00
1984	1.923E-01	5.366E+01	3.605E-03	1.792E+01	2.686E+04	1.805E+00
1985	2.201E-01	6.140E+01	4.125E-03	2.051E+01	3.074E+04	2.065E+00
1986	2.480E-01	6.919E+01	4.649E-03	2.311E+01	3.464E+04	2.328E+00
1987	2.758E-01	7.693E+01	5.169E-03	2.570E+01	3.852E+04	2.588E+00
1988	9.665E-01	2.696E+02	1.812E-02	9.006E+01	1.350E+05	9.070E+00
1989	1.653E+00	4.611E+02	3.098E-02	1.540E+02	2.308E+05	1.551E+01
1990	2.334E+00	6.512E+02	4.375E-02	2.175E+02	3.260E+05	2.190E+01
1991	4.050E+00	1.130E+03	7.591E-02	3.774E+02	5.657E+05	3.801E+01
1992	5.837E+00	1.628E+03	1.094E-01	5.439E+02	8.153E+05	5.478E+01
1993	7.577E+00	2.114E+03	1.420E-01	7.060E+02	1.058E+06	7.111E+01
1994	9.544E+00	2.662E+03	1.789E-01	8.893E+02	1.333E+06	8.956E+01
1995	1.109E+01	3.095E+03	2.080E-01	1.034E+03	1.550E+06	1.041E+02
1996	1.298E+01	3.622E+03	2.434E-01	1.210E+03	1.814E+06	1.219E+02
1997	1.528E+01	4.264E+03	2.865E-01	1.424E+03	2.135E+06	1.434E+02
1998	1.808E+01	5.044E+03	3.389E-01	1.685E+03	2.525E+06	1.697E+02
1999	2.106E+01	5.877E+03	3.948E-01	1.963E+03	2.942E+06	1.977E+02
2000	2.451E+01	6.839E+03	4.595E-01	2.284E+03	3.424E+06	2.300E+02
2001	2.778E+01	7.749E+03	5.206E-01	2.588E+03	3.879E+06	2.607E+02
2002	3.095E+01	8.634E+03	5.801E-01	2.884E+03	4.323E+06	2.904E+02
2003	3.451E+01	9.627E+03	6.468E-01	3.215E+03	4.820E+06	3.238E+02
2004	3.809E+01	1.063E+04	7.139E-01	3.549E+03	5.320E+06	3.574E+02
2005	4.189E+01	1.169E+04	7.853E-01	3.904E+03	5.851E+06	3.931E+02
2006	4.521E+01	1.261E+04	8.475E-01	4.213E+03	6.315E+06	4.243E+02
2007	4.931E+01	1.376E+04	9.243E-01	4.595E+03	6.887E+06	4.627E+02
2008	5.360E+01	1.495E+04	1.005E+00	4.994E+03	7.486E+06	5.030E+02
2009	5.737E+01	1.600E+04	1.075E+00	5.346E+03	8.013E+06	5.384E+02
2010	5.965E+01	1.664E+04	1.118E+00	5.558E+03	8.331E+06	5.598E+02
2011	6.242E+01	1.741E+04	1.170E+00	5.816E+03	8.718E+06	5.857E+02
2012	6.512E+01	1.817E+04	1.221E+00	6.068E+03	9.095E+06	6.111E+02
2013	6.739E+01	1.880E+04	1.263E+00	6.280E+03	9.412E+06	6.324E+02
2014	6.947E+01	1.938E+04	1.302E+00	6.474E+03	9.703E+06	6.520E+02
2015	7.179E+01	2.003E+04	1.346E+00	6.689E+03	1.003E+07	6.737E+02
2016	7.418E+01	2.070E+04	1.391E+00	6.912E+03	1.036E+07	6.961E+02
2017	7.368E+01	2.056E+04	1.381E+00	6.866E+03	1.029E+07	6.915E+02
2018	7.319E+01	2.042E+04	1.372E+00	6.820E+03	1.022E+07	6.868E+02
2019	7.269E+01	2.028E+04	1.363E+00	6.774E+03	1.015E+07	6.822E+02
2020	7.221E+01	2.014E+04	1.353E+00	6.728E+03	1.008E+07	6.776E+02
2021	7.172E+01	2.001E+04	1.344E+00	6.683E+03	1.002E+07	6.730E+02
2022	7.124E+01	1.987E+04	1.335E+00	6.638E+03	9.950E+06	6.685E+02
2023	7.076E+01	1.974E+04	1.326E+00	6.593E+03	9.883E+06	6.640E+02
2024	7.028E+01	1.961E+04	1.317E+00	6.549E+03	9.816E+06	6.596E+02
2025	6.981E+01	1.948E+04	1.309E+00	6.505E+03	9.750E+06	6.551E+02
2026	6.934E+01	1.934E+04	1.300E+00	6.461E+03	9.685E+06	6.507E+02

APPENDIX B

FIELD DATA

TABLE B-1
SUMMARY OF FIELD DATA

Sample ID	Date Sampled / Time Sampled	Methane Content (%)	Carbon Dioxide Content (%)	Oxygen Content (%)
6048 – 1	5/16/16 – 11:41	51.1	48.6	0.3
6048 – 2	5/16/16 – 12:14	47.1	52.6	0.3
6048 – 3	5/16/16 – 12:40	52.7	47.0	0.3
1397 – 4	5/16/16 – 13:18	N/A[1]	49.3	0.2
1397 – 5	5/16/16 – 13:44	51.1	48.5	0.3
1397 – 6	5/16/16 – 14:11	51.0	47.7	0.3
Flare 1	5/17/16 – 9:37	41.3	36.7	1.3
Flare 2	5/17/16 – 9:55	41.6	36.7	1.1
Flare 3	5/17/16 – 10:17	41.7	36.9	1.1
Flare 4	5/17/16 – 10:33	41.7	36.4	1.1

[1] Reading for methane from portable recorder did not display for this point.

APPENDIX C

LABORATORY ANALYSIS RESULTS FOR EPA METHOD 3C AND 25C

AirTECHNOLOGY
Laboratories, Inc.

June 3, 2016

ANAB ACCREDITED
ADE-1461
EPA Methods TO3, TO14A, TO15 SIM & SCAN
ASTM D1946

nelac
LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

SCS Engineers
ATTN: Joseph Krasner
1901 Central Dr., Suite 550
Bedford, TX 76021

LABORATORY TEST RESULTS

Project Reference: Camino Real Tier 2; 16215134.00 T.2
Lab Number: H052004-01/06

Enclosed are results for sample(s) received 5/20/16 by Air Technology Laboratories. Samples were received intact. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the NELAC Standards.
- The enclosed results relate only to the sample(s).

Preliminary results were e-mailed to Joseph Krasner on 6/02/16.

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

Client: SCS Engineers
Attn: Joseph Krasner

Project Name: Camino Real Tier 2
Project Number: 16215134.00 T.2
Date Received: 5/20/2016
Matrix: Vapor

TNMOC by EPA METHOD 25C
Fixed Gases by EPA METHOD 3C

	Lab Number:	H052004-01		H052004-02		H052004-03		H052004-04		H052004-05	
	Client Sample ID:	#6048 - Pts. 1, 2, 3		#1397 - Pts. 4, 5, 6		#1434 - Flare 1		#3735 - Flare 2		#3670 - Flare 3	
	Date/Time Collected:	5/16/16 NA		5/16/16 NA		5/17/16 NA		5/17/16 NA		5/17/16 NA	
	Date/Time Analyzed:	5/31/16 12:57		5/31/16 13:55		5/31/16 14:54		5/31/16 15:52		5/31/16 16:36	
	Analyst Initials:	AS		AS		AS		AS		AS	
	QC Batch:	160531GC8A1		160531GC8A1		160531GC8A1		160531GC8A1		160531GC8A1	
	Dilution Factor:	3.5		3.5		4.0		4.2		4.2	
ANALYTE	Units	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
TNMOC	ppmv C	4,400	35	6,400	35	6,100	40	6,100	42	6,000	42
TNMOC uncorr*	ppmv C	4,100	35	5,900	35	3,700	40	3,800	42	3,700	42
Nitrogen	% v/v	ND	3.5	ND	3.5	29	4.0	27	4.2	28	4.2
Oxygen	% v/v	ND	1.7	ND	1.7	ND	2.0	ND	2.1	ND	2.1
Carbon Dioxide	% v/v	45	0.035	44	0.035	33	0.040	33	0.042	33	0.042
Methane	% v/v	55	0.0035	55	0.0035	38	0.0040	38	0.0042	38	0.0042

ND = Not detected at or above reporting limit.
TNMOC = Total Non-Methane Organic Carbon.
TNMOC uncorr* = TNMOC concentration in sample without nitrogen/moisture correction.
NA = Nitrogen/moisture correction causes division by zero.

Reviewed/Approved By:
Mark Johnson
Operations Manager

Date: 6-2-16

The cover letter is an integral part of this analytical report.

ATTACHMENT 21.4

GCCS DESIGN PLAN (40 CFR 60, SUBPART WWW)

(MAY 2017)

Solid Waste Management Consultants
and Contractors

1901 Central Drive
Suite 550
Bedford, Texas 76021- 5872

817 571-2288
FAX 817 571-2188
www.scsengineers.com

SCS ENGINEERS

May 10, 2017
SCS Project No. 16216119.00

Mr. Ned Jerabek
NMED Air Quality Bureau
1301 Siler Rd., Bldg. B
Santa Fe, NM 87507

Re: New Source Performance Standards (NSPS), 40 CFR 60, Subpart WWW
Landfill Gas Collection and Control System Design Plan
Camino Real Landfill, Sunland Park, New Mexico
Title V Operating Permit No. P186LR2M1

Dear Mr. Jerabek:

On behalf of the Camino Real Environmental Center, Inc., SCS Engineers is pleased to present this Landfill Gas Collection and Control System Design Plan for the Camino Real Landfill. The current NMED Design Review Checklist is also attached for your use although the plan was also organized to facilitate review against the regulatory requirements.

Since the landfill's non-methane organic compound (NMOC) emissions were reported as being over the 50 Mg/year trigger in June 2016 based on sampling which began on May 16, 2016. NSPS rules require the submittal of this collection and control system design plan within one year of that submittal (no later than May 16, 2017). Full NSPS control requirements apply within 30 months of the original NSPS report of emissions exceeding 50 Mg/yr and will begin by November 16, 2018 in the absence of any other relevant submittals regarding the landfill's NMOC emissions rate or related to the upcoming Emissions Guideline rules implementing 40 CFR 60, Subpart Cf.

Please do not hesitate to contact David Mezzacappa, P.E. with any questions at (817) 358-6108.

Sincerely,

David Mezzacappa, P.E.
Vice President
SCS ENGINEERS

Andrew Ard, E.I.T.
Sr. Staff Engineer
SCS ENGINEERS

Attachments

Cc: Dr. Juan Carlos Tomas, Camino Real Environmental Center, Inc.
Mr. Matthew Crockett, P.E., Waste Connections, Inc. (e-copy)

NEW MEXICO
AIR QUALITY BUREAU

MUNICIPAL SOLID WASTE
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

DESIGN REVIEW CHECKLIST

Version June 7, 1999

Landfill Site Name: Camino Real Landfill___   Location of Landfill: _Sunland Park, New Mexico___

Landfill Owner: Camino Real Environmental Center, Inc. (CREC)

Date of Submittal: May 2017

Goal for the Gas Collection and Control System: control migration _X_control emissions _X_safety___
(Check all that apply or add more as appropriate)

Is the Gas collection and control system active__X__ or passive _______ ? (check one)

1. Was the design certified by a Professional Engineer? 60.752(b)(2)(i) Yes_ X_   No___

1-A. Has the owner or operator seeking to comply with 60.759 certified by a professional engineer that the devices located within the interior and along the perimeter achieve uniform control of surface gas emissions? 60.759(a)(1) and (2) Yes__X__   No____

Describe circumstances _The design is intended to control surface gas emissions. Per NSPS requirements, quarterly surface scans will be performed which will verify that the surface control is effective.___

2. Was the design submitted within 12 months of the first report of the landfill site exceeding 50Mg/yr of NMOC? 60.752(b)(2)(i)   Yes_ X__   No___

Describe circumstances This design report was submitted within 12 months of 5/16/16.

3. Is the gas collection and control system planned to be operational within 30 months of the first report of the

landfill exceeding 50 Mg/yr of NMOC? 60.752(b)(2)(ii) Yes_ X__ No___

Describe circumstances CREC already operates a voluntary gas system at the Camino Real Landfill. This system will be expanded and upgraded to achieve coverage over all area of the landfill that have had waste-in-place for 5 years or more that are not yet at final grade prior to the effective date of NSPS control requirements 11/16/18.

4. Does the gas collection and control system comply with the 2 year/5 year rule? 60.752(b)(2)(ii)(A)(2) Yes _X_ No___

Describe circumstances The 2 year/5 year rule is mentioned in GCCS Design Plan. The area that the gas system will need to be expanded to cover prior to 11/16/18 is highlighted on a plan view drawing in the plan.

4-A. Does the gas collection and control system design plan include a discussion of the compatibility with landfill filling operations? 60.759(a)(1) Yes_X__ No____

Describe circumstances _This subject is specifically addressed in Section 2 of the GCCS Design Plan.

4-B. Does the gas collection and control system design plan include a discussion of the integration with closure end use? 60.759(a)(1) Yes_X_ No____

Describe circumstances _This subject is specifically addressed in Section 2 of the GCCS Design Plan.

5. What is the design life of the gas collection and control system? 60.752(b)(2)(v) if less than 15 years describe why Although there is no specific design life of the landfill gas collection and control system presented in the plan, there is no reason that, with a typical repair and maintenance program, the design would not be able to last throughout the landfill's operating life and a 30-year post-closure care period. This is specifically addressed in Section 2 of the GCCS Design Plan.

5-A. Does the gas collection and control system design plan include a discussion of system corrosion resistance ? 60.759(b)(1), 60.755(c) and 60.755(a)(5) Yes_X_ No____

Describe circumstances Please refer to Section 3 of the GCCS Design Plan for discussions related to the landfill gas extraction well and header pipe materials, respectively. HDPE components are specified which have excellent properties with respect to corrosion resistance in landfill applications.

5-B. Does the gas collection and control system design plan include a discussion of fill settlement? 60.759(b)(1) Yes X No____

Describe circumstances Please refer to Section 3 of the GCCS Design Plan for discussions related to fill settlement and the landfill gas extraction wells and header pipes, respectively. HDPE components are specified which have excellent properties with respect to typical fill settlement rates in landfill applications.

5-C. Does the gas collection and control system design plan include a discussion of system resistance to refuse decomposition heat? 60.75 Yes X No____

Describe circumstances Please refer to Section 3 of the GCCS Design Plan for discussions related to waste decomposition heat and the landfill gas extraction wells and header pipes, respectively. HDPE components are specified which have excellent properties with respect to the heat typically generated by waste degradation in landfill applications.

5-D. Has the owner or operator seeking to comply with 60.759 designed the gas extraction components to be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other non-porous corrosion-resistant material? 60.759(b)(1) Yes X No____

Describe circumstances HDPE has been selected as the main design material, in large part due to its non-porous and corrosion resistant properties.

5-E. Has the owner or operator seeking to comply with 60.759 designed the collection devices to be constructed of PVC, HDPE pipe, fiberglass, stainless steel, or other non-porous corrosion resistant material which will not allow for air intrusion into the cover, refuse into the collection system, or landfill gas into the atmosphere? 60.759(b)(1) Yes X No____

Describe circumstances The collection devices have been designed with HDPE in part due to its non-porous, corrosion resistant properties. NSPS-required monitoring will also assist to assure that air intrusion through the cover or landfill gas into the atmosphere does not occur outside of acceptable levels.

6. Is the gas collection and control system designed for the maximum expected flow rates during its design life? 60.752(b)(2)(ii)(A)(1) Yes X No___

What is the maximum expected flow rate? Please refer to Table 3.1 of the GCCS Design Plan. It should be noted that the maximum design life is through the landfill's currently permitted fill areas (through Unit 3) such that this flow is the maximum potential flow of the landfill through filling in this unit, for which base and final grades have been approved by NMED's Solid Waste Bureau. The landfill is authorized to fill into a "Unit 4" area also; however, since the grades for this unit have not been finalized, this the GCCS Design Plan can and will be updated once it is permitted.

6-A. Does the gas collection and control system design plan include a discussion of the refuse gas generation rates and flow characteristics? 60.759(a)(1) Yes_X_ No ___

Describe circumstances __Refuse gas generation rates and anticipated flow characteristics around which the system was designed are discussed in the first portion of the Engineering Calculations section (Section 3) of the plan. Also, see the landfill gas model in Appendix A which shows the anticipated generation characteristics over time.

7. Describe the measures taken to control the lateral landfill gas migration in the design. 60.752(b)(2)(ii)(A)(4) If no measures were taken describe why. Please refer to Section 2 of the GCCS Design Plan where this topic is addressed.

8. If a passive system is planned, are the necessary liners in place?

60.752(b)(2)(ii)(B)(2) Yes__ No___ N/A _X_

Describe circumstances __Not applicable, an active system is planned.

9. Is adequate density of the collectors planned? 60.759(a)(2) Yes_X_ No___

Describe circumstances __Yes, the Engineering Calculations section (Section 3) of the GCCS Design Plan describes collector spacing methodology.

9-A. Has the owner or operator seeking to comply with 60.759 demonstrated that the siting of active collection wells, horizontal collectors, surface collectors or other extraction devices is of sufficient density throughout all gas producing areas? 60.759(a)(2) Yes_X_ No____

Describe circumstances __Yes, see the Engineering Calculations section (Section 3) of the GCCS Design Plan.

9-B. Has the owner or operator seeking to comply with 60.759 certified that the collection system siting should be of sufficient density to address landfill gas migration issue, and augmentation of the system through the use of active or passive systems at the perimeter or exterior.

60.759(a)(2) and 60.759(b)(1) Yes_X_ No____

Describe circumstances The proposed system has been designed so as to be sufficient without augmentation with additional elements at the perimeter or exterior; See Section 2 of the GCCS Design Plan.

9-C. Has the owner or operator seeking to comply with 60.759 designed the system to control all gas producing areas except those that are excluded because either (1) 60.759(a)(3)(i) they are segregated and shown to contain asbestos or nondegradeable material, (documentation must include nature, location, amount of asbestos or nondegradeable material deposited and date of deposition) or (2) they are nonproductive areas and can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill (amount, location and age of the material must be documented)?

60.759(a)(3)(ii) Yes___No_X__

Describe circumstances There are no such areas at the Camino Real Landfill so this portion of the rule was not considered in this design (all fill areas are covered).

9-D. Has the owner or operator seeking to comply with 60.759 and wishes to qualify for exclusion based on nonproductivity, calculated emissions for each section proposed for exclusion, and the sum of all such sections must be compared with the NMOC emission estimate for the entire landfill. Emissions from each section must be calculated according to the equation in 60.759(a)(3)(ii) of the NSPS? Yes___ No_X_

Describe circumstances No such areas or sections of the landfill were excluded from this design.

10. Has the owner or operator seeking to comply with 60.759 designed the system to convey the landfill gas to a control system through the collection header pipe(s)? The gas mover equipment must be of a size capable of handling the maximum gas generation flow rate expected over the intended use period of the equipment. 60.759(c) Yes_X_ No____

Describe circumstances The system is designed with a system of header and lateral pipes capable of moving the maximum amount of gas expected to be generated as are the blowers.

11. Is the landfill gas planned to be routed to a control device? 60.752(b)(2)(iii) Yes_X_ No___

Describe circumstances Yes, an open flare is currently the primary control device and will remain so (although other options may be used). A third-party landfill gas-to-energy facility is also a destruction device currently used, and this may certainly be an option in the future as well. As noted in Section 3 of the GCCS Design Plan, any control device selected will meet all NSPS destruction efficiency requirements and any site-specific, pre-construction permitting requirements.

12. Describe the control device. 60.752(b)(2)(iii)(B) Utility flare_X_ Enclosed flare________Other_X_
Describe circumstances As discussed in Section 3 of the GCCS Design Plan, an open flare is currently the primary control device at the landfill. There is also a third-party facility that can accept landfill gas to generate green power through combustion in up to two caterpillar-manufactured generators. Section 3 discusses possible future control devices. At this time it is envisioned that an open flare will remain as a control device although, of course, this can also change in the future as air rules and regulations change, in the event the LFGE facility expands, etc.

13. If the control device is a flare, does it include continuous temperature monitoring and a flow measurement device? 60.756(b) and (c) Yes_X_ No___
Describe circumstances The GCCS Design Plan specifically mentions that the flare will be required to have temperature monitoring and flow measurement capabilities in conformance with NSPS requirements. The current flare has these capabilities.

14. Is the flare sized properly? 60.756(b) and (c) Yes_X_ No___
Describe circumstances Yes, the control device sizing section in the GCCS Design Plan discusses sizing and includes the anticipated maximum control device(s) size.

15. If a control device other than a flare is planned, describe the estimated hours and duration it will be down for maintenance per year. 60.756(d)
Describe circumstances This is not applicable at this time since a flare is currently, and is anticipated to remain, as the primary control device.

16. Operational Issues 60.753 (b),(c),(d),(e),(f)
Will the gas collection and control system be operated with a vacuum at every well? Yes_X_ No___

Will the gas collection and control system be operated at the appropriate gas temperatures? Yes_X_ No___

Will the gas collection and control system be operated with minimal amounts of air? Yes_X_ No___

Will monitoring be done monthly to confirm these operational issues? Yes_X_ No___60.755

Will surface emission monitoring be completed quarterly? Yes _X_ No___ (Will skip method be used _N/A___)

Will the blower automatically be shut down if the control device is inoperable? Yes _X_ No___

Describe circumstances_The system will be designed such that a pneumatically-actuated master control valve will shut if the control device is inoperable. This is a standard design for landfill as collection and control systems to prevent free venting of uncombusted landfill gas.

16-A. Does the gas collection and control system design plan include a discussion of the air intrusion control? 60.759(a)(1), and 60.755(a)(5) Yes_X_ No____

Describe circumstances The minimization and control of air intrusion is discussed throughout the plan; especially in the Engineering Calculations (Section 3), regarding the vertical well radius-of-influence.

17. Does the gas collection and control system include fittings to allow connection of additional collectors if necessary in the future? 60.759(a)(1) Yes_X_ No____

Describe circumstances Yes, please refer to Section 3 of the GCCS Design Plan where expandability and collector addition is addressed.

17-A. Does the gas collection and control system design plan include a discussion of the gas system expandability? 60.759(a)(1) Yes_X_ No____

Describe circumstances_ Yes, please refer to Section 3 of the GCCS Design Plan where expandability and collector addition is addressed (through the use of fittings or simply though a branch saddle connection). The plan also acknowledges that although the GCCS Design Plan shows the fully built-out system, that the system may be built in phases that will be designed to facilitate expansion.

17-B. Has the owner or operator seeking to comply with 60.759 designed the collection system to be capable of any expansion needed to comply with emission and migration standards?

60.759(a)(1) Yes_X_ No____Describe circumstances Although there are no unique migration or emissions requirements at this time the system can be expanded as necessary if the need arises since the system will be built in phases prior to landfill closure.

18. Does the gas collection and control system design plan include a discussion of the depth(s) of refuse? 60.759(a)(1) Yes _X_ No___

Describe circumstances Please see Section 2 of the GCCS Design Plan where this is specifically addressed. The well schedule provided for planning purposes in the plan also takes the waste depths and liner elevations into account.

18-A. Has the owner or operator seeking to comply with 60.759 designed the collection devices to be above or below ground, but must include: a positive closing throttle valve, necessary seals and couplings, and at least one sample port? 60.759(b)(3) Yes_X_ No____

Describe circumstances Each above-ground well is designed to provide a sample port, necessary seals and couplings, and control valve to facilitate efficient system operation and NSPS compliance.

19. Does the gas collection and control system design plan include a discussion of the cover properties of the landfill? 60.759(a)(1) Yes_X_ No____

Describe circumstances Please see Section 2 of the GCCS Design Plan where this is specifically addressed.

20. Does the gas collection and control system design plan include a discussion of the leachate and condensate management? 60.759(a)(1) Yes_X_ No____

Describe circumstances Please see Section 2 of the GCCS Design Plan where this is specifically addressed. Later in the design calculations the estimated maximum amount of condensate to be generated is also calculated and discussed.

21. Does the gas collection and control system design plan include a discussion of the accessibility of the system?

60.759(a)(1) Yes_X_ No____

Describe circumstances Please see Section 2 of the GCCS Design Plan where this is specifically addressed.

22. Does the gas collection and control system design plan include a topographical map of the surface area and proposed surface monitoring route? 60.573(d) Yes_X_ No____
Describe circumstances_See Drawings (Appendix C) of the GCCS Design Plan.

23. Has the owner or operator seeking to comply with 60.759 designed the collection devices such as wells and horizontal collectors to be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. (Perforations must be situated to prevent excessive air infiltration) 60.752(b)(2)(1)(A) and 60.752(b)(2)(iii) Yes_X_ No____ Describe circumstances Yes, Section 3 of the GCCS Design Plan discusses well perforation guidelines utilized to prevent excessive air infiltration and allow for acceptable performance across the intended area of control.

24. Has the owner or operator seeking to comply with 60.759 designed the collection system so that vertical wells cannot endanger underlying liners and address the occurrence of water within the landfill? 60.75(b)(2)
Yes_X_ No__ Describe circumstances Please see Section 2 of the GCCS Design Plan for a discussion of well depths (the site does not provide any indication that leachate or water levels within the waste mass will be an issue regarding well depths).

25. Has the owner or operator seeking to comply with 60.759 designed the holes and trenches of the system to be of sufficient cross-section for proper construction and completion? For example: the design should call for the centering of pipes and allow for the placement of gravel backfill. 60.759(b)(2) Yes_X_ No____Describe circumstances Yes, please refer to Section 3 of the GCCS Design Plan for discussions related to this subject.

26. Has the owner or operator seeking to comply with 60.759 and 60.755(a)(1) determined the maximum flow rate by existing flow data Yes___ No_X_
Describe circumstances No, the existing flow data is not suitable to calibrate against the LandGEM model due to difficulty in estimating the current gas system's collection efficiency.
or by using the equation as described in 60.755(a)(1) Yes_X_ No____
Describe circumstances See the beginning of Section 3 in the GCCS Design Plan for a discussion of the calculation of the maximum flow rate (the equation specified by the above-mentioned rule is used).

SCS ENGINEERS







New Source Performance Standards (NSPS) Landfill Gas Collection and Control System Design Plan

Camino Real Landfill
Sunland Park, New Mexico

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ENVIRONMENTAL CENTER, INC.

Prepared for:

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DAVID J. MEZZACAPPA 5/10/17
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1 CERTIFICATION STATEMENT

I certify that this Gas Collection and Control System Design Plan was prepared in general accordance with the requirements of 40 CFR §60 subpart WWW, and that the existing gas collection and control system meets NSPS gas system design and construction requirements.

Signed,

5/10/17

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2 INTRODUCTION AND GENERAL SITE INFORMATION

2.1 Applicability

The Camino Real Landfill (landfill) is a municipal solid waste landfill located in Sunland Park, New Mexico. The landfill is owned and operated by Camino Real Environmental Center, Inc. (CREC). A comprehensive landfill gas collection and control system (GCCS) is currently in place on a voluntary basis. The current GCCS meets NSPS requirements as will be discussed in this plan although, as discussed in this plan, it will require expansion into some new fill areas by the GCCS' NSPS startup date of November 16, 2018. A third-party landfill gas-to-energy (LFGE) facility is present on leased site property. This LFGE facility uses landfill gas to fuel up to two landfill gas-fired electric generator(s). It should be noted that this LFGE facility is completely separate from the landfill and GCCS, and that this owner/operator will be separately responsible for NSPS requirements within their fenceline.

The landfill is subject to federal New Source Performance Standards (NSPS) for municipal solid waste landfills (40 CFR Part 60). The permitted design capacity of the landfill is over the 2.5 million Megagrams listed in the rule as requiring that emissions estimates be prepared. As such, non-methane organic compound (NMOC) emissions estimates for the landfill were submitted; eventually using site-specific NMOC content data collected through "Tier 2" testing as allowed in the NSPS rule. The resulting site-specific NMOC emissions rate was shown to be in excess of 50 Mg/yr in a report dated June 2016 based on site-specific NMOC testing that began on May 16, 2016. Since the landfill's NMOC emissions were reported as being over the 50 Mg/year trigger, current NSPS rules require the submittal of a collection and control system design plan within one year, unless further refinement of the calculations is pursued. Since no such refinements are currently being pursued, it is assumed in this plan that the landfill officially exceeded the 50 Mg/yr emissions rate on the 2016 testing date; specifically, May 16, 2016.

The submittal of this plan fulfills the requirement to prepare a GCCS design plan in accordance with 40 CFR §60.752(b)(2)(i). The plan outlines the methodology employed to design a landfill gas management system that will collect, transport, and combust the gas generated by the landfill. In addition, the proposed methods for complying with the monitoring, recordkeeping, and reporting requirements of the NSPS rule are discussed. A surface monitoring plan is also included in Section 5.

This NSPS-required GCCS design plan is based on the landfill's currently approved final grades since 40 CFR §60.752(b)(2)(ii)(A)(*1*) requires that the GCCS be designed to handle the maximum expected gas flow rate over the intended use period of the gas control or treatment system equipment. The evolution of the GCCS as the landfill is filled will ultimately produce a design meeting the criteria shown within this plan. However, until the landfill has attained these final grades, the collection and control of landfill gas pursuant to the NSPS rule may be accomplished using layout configurations not specifically included as part of the final design. This is due to the fact that the NSPS rule requires that landfill gas be controlled from areas at final grade within 2 years of waste placement, and from areas not at final grade within 5 years of waste placement. However, once the landfill has reached final grade, the GCCS will meet this plan's specified design criteria. All interim phases will be designed to facilitate future expandability and will be designed to meet the requirements outlined in this plan.

NSPS rules require that several additional items also be addressed in the design plan, such as depths of waste, cover properties, leachate management, compatibility with filling operations, integration with closure end use, and minimization of off-site migration. These items are discussed in this section.

2.2 Site Background

The Camino Real Landfill is located in Doña Ana County, New Mexico, at 1000 Camino Real Boulevard. Solid waste is being delivered to CRLF from Doña Ana County, the City of El Paso, and Chihuahua, Mexico. Camino Real Landfill receives commercially-delivered residential, construction and demolition, industrial, and commercial wastes. Public (self-haul) waste represents a substantial proportion of the daily traffic but a small percentage of waste volume.

The land now used for the CRLF site was used for dumping from the 1970's until the current property was purchased by JOAB, Inc., predecessor to CREC, in April 1987. The facility was registered with NMED initially as the Nu-Mex Landfill (Nu-Mex), and waste from across the site was collected and consolidated into the first fill area (Unit 1).

The landfill consists of three permitted "Units;" which are actually contiguous fill areas. These units are divided into cells. Unit 1 is the closed, pre-Subtitle D area of the landfill. Filling is currently taking place in Unit 2 (which is Subtitle D composite-lined). The first cell in Unit 3 is currently being planned since the final portion of Cell 2 will be lined soon. There is a permitted area for a Unit 4 also to the southeast of, and adjacent to Unit 2; however, this unit is not being included in this plan since its base and final grades have not yet been finalized.

Unit 1 is approximately 50 acres in size, while Unit 2 is approximately 126 acres in size. Unit 3 is approximately 83 acres in size. The units are shown on the GCCS layout drawings included with this plan.

The current, voluntary GCCS will be discussed in the next section.

2.3 Summary of Current and Proposed Landfill Gas Controls

As mentioned previously, the landfill currently operates an active, voluntary GCCS. This GCCS has 57 current collection points. These wells are "numbered" as follows:

- Wells A1-A5 (collection from Unit 1; pre-Subtitle D area);
- Wells B1-B12 (collection from Unit 1);
- Wells C1-C8;
- Wells D1-D9;
- Wells E1-E8;
- Wells F1-F13; and

- Collection points for both the Unit 2 leachate manhole, and the opposite end of the leachate riser pipe on southern side of Unit 2.

Drawing 1 shows a map of the existing GCCS. The GCCS in its current configuration was installed between June 1999 and March 2009. Prior to the ultimate NSPS-required date for control installation (November 2018), the GCCS will be expanded to collect all gas from additional areas that have had waste in-place for more than 5 years but that are not yet at final grade. This general area for GCCS expansion is shown on Drawing 1 as a hatched area. Although the existing GCCS piping and wellfield is adequately spaced and sized for NSPS compliance, other various improvements to the GCCS including: possible well redrilling, pipe size upgrades, and condensate management system improvements; will be considered for concurrent construction during the required GCCS expansion. These improvements may be needed due to current GCCS performance, filling over the years in and around the gas system, and pipe sizing for future gas volume needs.

The primary landfill-owned control device for the GCCS is a 3,000 cubic feet per minute (cfm)-capacity candlestick flare with two Hoffman 38303 Gas Blowers, each capable of providing 300 scfm to 1,500 scfm in flow at a vacuum of up to 60 inches of water column. The adjacent, separately owned and operated, LFGE facility includes two caterpillar G3520 C generators that, when operating, can accept just over 500 cfm of landfill gas each. Section 3.11 discusses future control device requirements in more detail.

The proposed GCCS as set forth in this plan for final landfill build-out (Drawing 2), consists of vertical landfill gas collection wells connected to below-grade header piping. The landfill gas collection wells will be spaced and designed such that their radius-of-influence covers the landfill mass, helping to facilitate efficient landfill gas collection. The header piping will be sized such that negative pressures can be maintained throughout the system, and so that blowers can adequately convey the landfill gas to the control device(s). The landfill gas will be conveyed to a control device(s) meeting NSPS requirements (minimum 98% destruction efficiency of NMOCs). Please refer to the drawings and more detailed descriptions in later portions of this plan for more details and specifics about the proposed system.

2.4 Landfill Configuration and Depths of Waste

The pre-Subtitle D portion of the landfill consists of approximately 50 acres. These sectors are not composite-lined. The liner system for the Subtitle D cells, Unit 2 and future Unit 3, includes (from bottom to top) a geosynthetic clay liner (GCL), a 60-mil high density polyethylene (HDPE) geomembrane layer, and a 2-foot protective soil layer.

The landfill's base grades (in Subtitle D Units 2 and 3) extend to approximately elevation 3,896 while the final grade peak is at approximate elevation 4,225. The waste column thickness will exceed 100 feet in many areas. For this plan, vertical well depths will be limited to 140 feet maximum depth although depending on the drilling technology, they may be drilled deeper in the future (as long as the borehole is maintained a safe distance (preferably 15 feet minimum above the liner)). Of course, the elevations cited above are approximate maximums and the landfill final and base grades vary as will the waste column thickness depending on where the wells are installed. Exact surface elevations and verification of best-known base grades will be gathered prior to any well drilling on-site as the GCCS is constructed/expanded.

2.5 Final Cover Properties

Unit 1 of the landfill has been closed with a soil-based cap. This Unit already has comprehensive gas system coverage. This coverage will be maintained and should create no adverse impacts with respect to this cap.

For Units 2 and 3, the currently approved cap is a soil-based evapotranspirative (ET) cap. This 4-foot overall cap layer consists of the following layers form bottom to top:

- 6-inch-thick topsoil/vegetative layer;
- 30-inch-thick infiltration layer (compacted); and
- 12-inch-thick intermediate cover (compacted).

Each of the layers that comprise this ET cap will be subject to various construction and/or materials requirements; please refer to the solid waste permit and application for full details. It should be noted that other configurations may be approved in the future as well. The gas system designed here can also accommodate geosynthetic-based final covers.

A collection efficiency of 85 percent of landfill gas generated was assumed in this plan since the final cover will generally serve to increase landfill gas collection efficiency by allowing less landfill gas to escape through the landfill cover prior to collection.

2.6 Condensate and Leachate Management

Leachate is collected in Unit 2 through sloped cell grades, which drain into a leachate collection pipe network that conveys the leachate to a manhole located on the northeast end of Unit 2. Future cells in Unit 3 will drain leachate to one of several sumps in Unit 3.

Condensate is generated within the current gas system at low points and is managed through the following methods:

- Various u-traps in the system allow condensate to drain into the landfill's leachate collection system and be managed with the leachate;

- Both a knockout pot located near the blower/flare and a wet well in the gas system near the flare (collecting condensate from Unit 1) are used to convey condensate to the landfill's leachate collection manhole; and

- Although not a part of the landfill's system, condensate from the LFGE facility at the landfill is stored in condensate tanks and separately managed from the condensate generated at the landfill.

The expanded GCCS will be designed and operated to manage impacts from leachate and condensate and to maintain compliance with NSPS requirements as discussed later in this plan.

Although not anticipated, wells will be dewatered as needed if excess liquids accumulate in them for any reason such that NSPS compliance cannot be maintained.

It is anticipated that, as is currently done, condensate will continue to be managed along with the landfill's leachate through various methods approved in the landfill's permit (disposed of at a publically-owned treatment works (POTW), or used for dust control over lined landfill areas). Future approvals from the Solid Waste Bureau may allow for other management methods. Additionally, condensate may be managed separately from leachate if necessary in the future for any reason.

2.7 Compatibility with Filling Operations

It is most desirable to place vertical wells in areas which have reached their maximum permitted grades; however, due to the landfill's development sequence, landfill gas collection will be required for areas at "interim" grades in order to meet the NSPS requirement to collect gas from areas not at final grade within 5 years of waste placement. These interim collection points will likely be in the form of vertical wells or horizontal collectors. If vertical wells are used, these wells may be raised with additional lifts of waste unless they are deemed to have reduced functionality or no longer meet relevant NSPS operational requirements, at which time they may be replaced/redrilled. In any event, collection will be maintained in and around filling operations as required by the NSPS rule. As set forth in this plan, GCCS materials are designed to be compatible with landfill operations, corrosiveness, and pressures. Section 4 of this plan specifically includes requested operational flexibilities designed to accommodate GCCS operation around landfilling activities.

2.8 Integration with Closure End Use and Accessibility

No future land use other than open space has currently been designated for this landfill. If an alternate end use plan is pursued in the future, CREC acknowledges that this end use must be compatible with the integrity of the GCCS, final cover system, or any other components of the containment and monitoring system. CREC also acknowledges that the specification of a certain type of end use will in no way provide an exemption from landfill gas collection requirements contained in the NSPS.

Accessibility to the GCCS will be maintained throughout the landfill's life and throughout the post-closure period for maintenance and monitoring until the system is decommissioned with the understanding that decommissioning cannot occur until all NSPS requirements are met.

2.9 Minimization of Off-Site Migration

The GCCS will cause an inward pressure gradient at the landfill, which will serve to minimize off-site migration of landfill gas. Below-grade bottom and sideslope liners in Units 2 and 3 of the landfill will also serve to deter migration. The landfill already performs perimeter landfill gas probe monitoring around fill areas to detect potential landfill gas migration on a quarterly basis. This quarterly monitoring will also help to measure the effectiveness of the gas collection system at minimizing off-site migration. The extraction well configuration and density shown in this design plan should be sufficient to help minimize lateral migration issues.

2.10 Collection and Control System Design Life

The components of the GCCS should last through the anticipated life of the landfill and at least an additional 30-year post-closure care period. Although regular maintenance and periodic replacement parts will be required, the design provided in this plan should be adequate for the anticipated life of the landfill and any required operation after landfill closure.

2.11 Startup, Shutdown, and Malfunction Plan

CREC is aware that, per 40 CFR §63.1945(c), an NSPS-required Startup, Shutdown, and Malfunction Plan (SSM Plan) is currently required to be in place by the date that the landfill is required to operate the collection and control system by the NSPS rule (by November 16, 2018 for this landfill). As such, an SSM plan per 40 CFR §63.1960, will be maintained on-site by that time. It should be noted that the SSM Plan is not included in this plan, since it is only required per 40 CFR §63 upon collection system operation and then only required to be maintained on-site.

3 ENGINEERING CALCULATIONS

3.1 Calculation of Maximum Gas Flow Rate

Introduction

NSPS rules require that “gas mover equipment... be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment” (40 CFR §60.759(c)). A calculation to estimate this maximum gas generation flow rate must be performed in accordance with 40 CFR §60.755(a)(1).

40 CFR §60.755(a)(1) requires sites to utilize the following equation for calculation of the maximum gas flow rate:

$$Q_M = \sum_{i=1}^{n} 2k\, L_o\, M_i\, (e^{-kt_i})$$

Where: Q_M = maximum expected gas generation flow rate, cubic meters per year;
k = methane generation rate constant, year $^{-1}$;
L_o = methane generation potential, cubic meters per megagram solid waste;
M_i = mass of solid waste in the i^{th} section, megagrams; and
t_i = age of the i^{th} section, years.

The NSPS rules state that the k and L_o factors “should be those published in the most recent compilation of Air Pollutant Emission Factors (AP-42) or other site-specific values demonstrated to be appropriate and approved by the Administrator.”

To employ the equation listed above a model such as the U.S. Environmental Protection Agency’s (EPA’s) LandGEM is typically utilized. SCS used the LandGEM model in preparing landfill gas generation and recovery rate projections. The LandGEM model output prepared for the landfill is included in Appendix A.

Overall Approach

In this section, the calculation of the maximum landfill gas generation rate is presented, along with estimates of the expected amount of landfill gas flow to be recovered from the proposed GCCS at that time. As required by the NSPS rule, the calculations have been performed in accordance with 40 CFR §60.755(a)(1).

For landfill gas modeling, the NSPS rule requires that the k and L_0 kinetic factors used be those published in the most recent compilation of Air Pollutant Emission Factors (AP-42) or other site-specific values demonstrated to be appropriate and approved by the Administrator. SCS has chosen to use EPA's LandGEM Landfill Gas Emission Model (version 3.02) to estimate landfill gas generation. This model uses the equation presented in the introduction. As recommended by EPA's AP-42 emissions estimation guide for landfills, the k and L_0 factors used in the model were 0.02/year and 100 m^3/Mg (3,204 ft^3/ton), respectively. These values were then input into the LandGEM model, which provided the landfill gas generation rate projections. Although a site-specific NMOC rate was recently calculated for the landfill using Tier 2 testing in 2016, the LandGEM default NMOC concentration was used for this modeling since the NMOC content will vary over time, and since NMOC content has no bearing on landfill gas generation. Also, although a site-specific "k" factor for the landfill of 0.007 was determined through "Tier 3" NSPS testing in 1999, the k value of 0.02 is being used here for conservativeness since this will result in a sharper landfill gas generation "peak" on the gas curve.

Although the landfill has an active, voluntary gas system, the flows from this system were deemed too difficult to calibrate against an actual recovery percentage to be used effectively.

Projection of Maximum Landfill Gas Generation and Recovery

Using both historical and projected annual waste disposal rates and the default k and L_0 factors discussed above, a LandGEM model was prepared to project the maximum landfill gas generation rate for the GCCS design.

At maximum landfill gas generation (the assumed landfill closure year), a GCCS collection efficiency of 85 percent of generated landfill gas was assumed. This percentage is higher than the 75 percent substantiated by AP-42 as being within the typical range of collection efficiency for landfills since the final cover should help increase collection efficiency.

The LandGEM models require that waste intake be input for every year (past and future). Historical and future disposal rates input to the LandGEM models were obtained from landfill records and based on the following assumptions:

- Waste disposal rates for 1977 through 1996, were referenced from the NSPS Non-Methane Organic Compound Emission Rate Estimate Report (NSPS Tier 2, prepared by Weaver Boos & Gordon, Inc., February 1999).
- Waste disposal rates between 1997 and 2015 were as reported on New Mexico Environmental Department (NMED), Solid Waste Bureau (SWB) Annual Reports.
- The waste disposal rate for 2016 was obtained from the site's monthly summaries that are included in Title V air operating permit reporting.
- Based on landfill volumetrics and current compaction rates, it was calculated that Units 2 and 3 had approximately 13.057 million cubic yards of airspace remaining as of January 1, 2017.
- Based on current solid waste projections, annual waste intake is assumed to increase at the rate of 0.5 percent per year. This increase was used from 2017 through landfill closure.
- Based on these assumptions Units 2 and 3 are assumed to reach capacity sometime in 2038. Of course, the ultimate date will depend on future waste intake, ongoing compaction rates, and the ultimate constructed capacity of future cells.

The historic and projected future disposal rates developed for the landfill are shown in the model results included in Appendix A. Based on the model results provided in Appendix A, the following conclusions can be drawn and are shown in Table 3.1. In the table below, the assumed recovery column shown is 85 percent of generation – the collection efficiency assumed for the closed, capped landfill. No additional factor-of-safety was added to this result since the landfill is in a very arid environment and generation may be lower than predicted in the LandGEM model using default coefficients.

Table 3.1 Camino Real Landfill Projected Maximum Recovery

Year	LandGEM LFG Generation (cfm)	Design Recovery (cfm)[1]
2039	3,663	**3,113**

3.2 Well Placement (Radius-of-Influence)

The initial step in performing a gas system design is to layout the location of the extraction wells. This is also the first design requirement listed under 40 CFR §60.759: Specifications for Active Collection Systems. Specifically, "Each owner or operator seeking to comply with §60.752(b)(2)(i) shall site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing area using the following procedures unless alternative procedures have been approved by the Administrator…"

Vertical collection wells will be used in the final GCCS build-out (although horizontals and other types of collectors may be used in interim phases prior to final build-out). The spacing (or horizontal distance) between vertical wells is determined through a "Radius of Influence" (ROI) calculation. The ROI defines an area from which gas can be extracted without inducing excessive air into the landfill.

General design criteria, the method for determining ROIs, and well construction techniques are discussed in the following subsections. In addition, the following NSPS design plan requirements related to well spacing and construction are addressed in this section, as required by 40 CFR §60.759(a)(1):

- Air intrusion control;
- Corrosion resistance; and
- Resistance to waste decomposition heat.

3.3 General Design Criteria

Well Depth:
The base of vertical gas collection wells in this plan will be maintained at a minimum distance of 15

feet from the bottom of the landfill (top of liner) in order to avoid the potential for damage to the liner during well drilling/installation. Since all well depths shown in this plan are planning-level only, prior to construction *all well depths must be re-examined against available as-built section liner information (liner elevations and thickness) and actual surveyed elevations at drilling locations; and the well schedule adjusted as appropriate.*

Well Perforations:
When initially drilled, vertical landfill gas collection wells over 40 feet in total depth are generally designed to have a minimum of 20 feet and a maximum of 40 feet of solid pipe from the landfill surface down. After this, the pipe is perforated to allow the gas to flow into the pipe for collection. For wells greater than 40 feet in depth, if the perforated sections are placed at depths shallower than 20 feet from the landfill surface, the induced vacuum on the well can draw excessive amounts of air (specifically oxygen) into the waste and potentially cause a condition of subsurface oxidation or landfill fire. If the perforated pipe is started deeper than 40 feet, the applied vacuum on the upper layers of waste is minimized, which reduces gas collection efficiency. For wells less than 40 feet in total length the solid depth is typically set at no less than 15 feet. For such shallow wells, it is assumed that they would be needed for coverage, and that a shorter solid length is justified (and will be operated at lower vacuum than normal to limit air infiltration). Current gas wells meet these general criteria although as noted below some have been extended with solid pipe as filling occurred around them.

The solid/perforated ratio may be further adjusted prior to construction depending on the quality of the landfill gas that is required. However, in any case, the ratio will always fully accommodate NSPS operational requirements and allow for air intrusion to be limited while sufficient landfill gas collection occurs.

Existing wells that are extended with solid pipe as waste is filled around them may vary from these solid/perforated ratios. At some point in the future these may be replaced with new redrills to more effectively capture waste above the extended well's perforations.

Overlap:
The intersection of the ROIs of two adjacent wells is called the overlap. The degree to which the ROIs of the entire wellfield intersect is called the overlap factor. A target overlap range of 15-20 percent typically provides a reasonable coverage of the landfill area requiring control without over-stressing the landfill by installing too many wells. The current system conforms to this general overlap guidance.

3.4 Design Methodology: Radius-of-Influence

The correct placement of vertical gas extraction wells is a critical component of the GCCS design. The goal for the designer is to maximize the volume of gas extracted from the landfill without harming the landfill environment. Maximizing the volume of methane gas extracted will help minimize landfill gas emissions, minimize vegetative stress, and control potential subsurface gas migration. Wells that are incorrectly spaced (i.e., too far apart) may cause the system operator to place too much vacuum on the wellfield in order to achieve gas control. If the vacuum is too high on a well, it may draw air in through the cover or sideslopes. Air intrusion is a major concern which can potentially lead to subsurface oxidation. It may also create an environment toxic to the anaerobic methanogenic bacteria, which slows down the rate of gas production and extends the length of time that a gas control system must be operated.

When a well is placed under vacuum or negative pressure, the recoverable landfill gas in the immediate vicinity will begin to move towards it. This area of gas movement is called a well's radius-of-influence (ROI). For ease of calculation, the area is assumed to be cylindrical with the vertical well in the center of the cylinder. The edge of the ROI is reached when the pull of vacuum exerted by the well is zero; i.e., landfill gas will no longer move towards the well from beyond a certain point. The actual extent of influence will vary from well to well and cannot be measured until the well is actually installed. However, for design purposes a theoretical ROI can be calculated based on certain assumptions made about the well and its surrounding waste environment.

Although formulas and elaborate procedures are available to calculate a well's ROI, the variability inherent in landfill environments renders these calculations as generally more complex than necessary to accurately predict what will happen in the landfill environment. As such, a rule-of-thumb calculation is used to space landfill gas wells based on an ROI set at 2.5 times the overall well depth. A maximum allowable ROI of 200 is utilized on topslopes in this plan, and 150 feet on sideslopes to make sure that well spacing does not become too diffuse when deep wells are utilized. The current wellfield includes spacing at these standards.

Specific Inputs for Each Well Location

Table 3.2 at the end of this section provides a spreadsheet with a well schedule. The spreadsheet utilizes well depth information to confirm the ROI, assists the designer in setting the solid versus perforated pipe lengths, and establishes an estimate of the flow to each well based on the overall well length. Certain historical wells that may not require redrilling are included in this schedule with an asterisk next to them. The required well depth information was obtained from Drawing 2 in Appendix C, which shows a map of the landfill at final grade, and from permit-level base grade information provided to SCS. The following subsection describes each column and its use in the spreadsheet.

Well ID:
A unique well ID is assigned to each well so that its location and characteristics can easily be identified.

Surface Elevation:
The surface elevation of the landfill where the well is located is entered here, in units of feet above sea level. The drawing (Drawing 2 in Appendix C) used to determine each well's elevation shows the landfill's currently approved final grades.

Base Elevation:
The elevation of the landfill's top of liner grades in feet above sea level is input into this column. Base grades were obtained from permit-level base grade information and prior construction reports. Prior to construction, all as-built liner/bottom of waste elevations must be verified and the final well schedule adjusted accordingly to help minimize the chance that drilling will damage the composite

liner. This column satisfies 40 CFR §60.759(a)(1), which states that waste depths must be addressed in the design.

Depth Off Base:
The distance that the designer wishes to keep the bottom of the well from the liner is entered here. A minimum value of 15 feet is used here for vertical separation to help avoid the chance that liner damage will occur during well drilling activities.

Well Depth:
The spreadsheet calculates the well depth automatically by subtracting the base elevation and the depth off base from the surface elevation. The well depth is important because it is used to set both the ROI and to help determine the projected landfill gas that will be collected from each well (this is used to size the landfill gas piping).

Length of Pipe (Solid and Perforated):
These columns refer to the length of vertical gas extraction piping below the ground surface which is either solid, or has perforations for the landfill gas to enter the pipe.

In these columns the designer assigns a solid pipe length between 20 and 40 feet (from the ground surface down) as long as the well is over 40 feet in total depth. If the well is less than 40 feet in total depth the solid portion may be as little as, but not less than 15 feet in length. This minimum solid pipe length reduces the potential for air to be drawn through the cover and into the waste by the vacuum placed on the extraction well. Air intrusion could cause a condition of subsurface oxidation (landfill fire). Perforated pipe lengths are calculated by subtracting the solid pipe length in the previous column from the total well depth.

The Lp/Lt ratio discussed in the next subsection is then examined and the length of solid pipe adjusted such that the ratio of perforated pipe to the total well depth is approximately 0.66 although for perimeter wells this ratio can be as low as 0.5.

(Lp/Lt) Ratio:
This is the ratio of the length of perforated pipe to the total length of the well. The ratio of perforated to total well depth has an impact on the collection efficiency of the well. Wells with high Lp/Lt ratios must apply the available vacuum over a greater vertical distance along the well, which could reduce the vacuum available to the well horizontally (thus decreasing the well's ROI and gas flow rate). Wells with Lp/Lt ratios between approximately 0.5 and 0.66 (perimeter wells) and approximately 0.71 (interior wells) will have optimum available vacuums, thus maximizing the ROI.

ROI and Gas Flow (SCFM):
The radius of influence of the well is calculated as previously discussed. The ROI column shows this value.

To determine the landfill gas flow to each well for design purposes, the design recovery total from Table 3.2 was first used (since this provides the amount of landfill gas available to all wells). For the pipe design, the maximum flow in the year 2039 was used.

To distribute recovered landfill gas flow to the wells at maximum flow in 2039, the flow was proportionally assigned to each well based on well depths. It should be noted also that the leachate cleanout/sump collectors, although shown, are optional for the overall GCCS.

A piping crossover to create loops is included in the system so that if more gas is generated in an area it will have alternate routes to the control device.

3.5 Well Construction

Description of Vertical and Horizontal Gas Wells:

The gas wells proposed for installation will consist of 6-inch diameter SDR 11 HDPE pipe (or alternately, Schedule 80 polyvinyl chloride (PVC) pipe) set into a 36-inch diameter borehole (or alternate borehole diameter as approved by the engineer but not less than 24 inches). The pipe will be solid from the ground surface down to a distance as shown in Table 3.2, and is then perforated for the remainder of the well depth (also as discussed in Section 3.3 – General Design Criteria); a typical perforation detail is provided in the drawings, which are included in Appendix C.

The borehole will be backfilled with non-calcareous gravel around the lower perforated portion of the well casing. Bentonite seals and backfill will isolate the permeable gravel layer from the ground surface in order to minimize landfill gas leaks around the wells, air intrusion into the wells, and surface water infiltration into the well.

The wellhead design allows for system monitoring and control. Sampling ports allow for the measurement of gas flow from each well. The wellheads will contain a valve which will allow for variable rates and vacuum to be applied. Sampling ports will be strategically located so that landfill gas quality, pressure, and temperature from the well can be measured. A flexible hose will connect the well to the header in order to allow differential settlement between the well and header.

As previously mentioned, some wells may need to be installed prior to an area reaching final grade to meet NSPS requirements. To avoid operational problems associated with extending the well as filling progresses, the well may be configured such that a lateral is constructed from where the well surfaces to a location of the landfill which is at final grade where a remote wellhead is installed. This remote wellhead will allow for measurement of temperature, gas flow and gas quality.

Horizontal gas wells may also be used as an interim control method as filling progresses. A typical type detail for a horizontal collector is included in the Appendix C drawings. This detail may vary as the design is refined to enhance collection, for horizontals that will only be temporary, or depending on the actual configuration of waste where the landfill gas is to be controlled. However, any horizontal will include a wellhead for appropriate control and be designed such that it can be monitored and meet NSPS requirements.

Materials:

Vertical well pipe will be constructed of 6-inch diameter SDR 11 HDPE or Schedule 80 PVC pipe. These materials have been proven to exhibit excellent compatibility with landfill materials, so that it will resist corrosion and provide good chemical resistance. They provide enough flexibility and strength that the well will have less of a chance of being broken during landfill settlement. HDPE and PVC have also been shown to perform adequately at the temperatures generated within landfills and have adequate flexibility to perform well under typical stresses generated by waste settlement.

Horizontal collectors will generally be constructed of HDPE pipe although the SDR may vary depending on the anticipated depth of waste that will be over the collector.

Installation:

Surveying: Locations and existing drilling site elevations of vertical gas wells must be surveyed prior to drilling and the well schedule verified against as-built liner depths to help minimize the chances of drilling into the landfill liner. The bottom of the well should also not exceed the minimum recommended distance (15 feet) above the liner to provide an additional factor-of-safety.

Well Drilling: Vertical well boreholes (and chimney wells that may be drilled along horizontal collectors), are typically drilled using a three-foot diameter bucket auger, modified to penetrate through waste. The landfill spoils will be periodically removed from the side of the borehole and properly disposed of (usually at the landfill working face if the landfill is not closed). The drilling will continue until the design depth is reached or until the auger reaches an obstruction that cannot be penetrated. In the event of an obstruction, the well may be relocated to an adjacent area. The engineer should, however, be contacted to check on the liner depth if a well is relocated in the field, or if an alternate borehole diameter is proposed.

Well Installation: After the design depth is reached, the borehole will be backfilled with one foot of gravel. The perforated sections of pipe can then be lowered into the hole. When the perforated pipe length has been reached, solid sections are added until the pipe is raised above the ground surface.

The pipe will then be centered in the borehole, and gravel added around the outside until it has reached the depth shown on the plans. Soil backfill and the bentonite plug layers are then added as shown on the plans until the fill extends to the landfill surface. The borehole should be slightly overfilled and compacted to help minimize settlement of the well area which could result in collecting water around the well.

Lastly, the well will be temporarily capped off until the header or lateral line is installed. This prevents emissions of raw landfill gas to the atmosphere. After the lateral line has been brought to the well, the wellhead assembly will be installed.

Horizontal collector installation is more straightforward in that the excavation is much longer and shallower. However, handling the spoils, and installation of gravel or other media around the horizontal, pipe fusion work, and wellhead installation, are similar to the guidance provided for vertical wells.

Record Drawings:

Well construction logs will be prepared for each gas well to document installation. Information recorded on the log will include borehole and pipe sizes, bore depth, lengths of solid pipe above and below-ground, slotted or perforated pipe length, depths of backfill materials and waste type, level of decomposition, and temperature (optional).

The record drawings will include the surveyed well locations. The drawings should show changes or field modifications to the original design, such as relocation due to obstructions encountered during drilling.

NSPS Compliance:
The gas collection wells described in this section (and installed to date) meet the following requirements listed in 40 CFR §60.759: minimization of air intrusion, designed based on waste depths, required materials of construction, corrosion resistance, sufficient density of wells, avoidance of damage to any underlying liners, occurrence of water within the landfill (not anticipated at this time), gravel dimensions, and proper connector assembly (closing valves, sampling ports, etc.).

Header Pipe Sizing:
The next step in designing a gas collection system is to layout the header line and laterals to connect each of the gas wells into the system, and to convey the collected gas to a central location for destruction. After the design engineer has routed an efficient header system for collecting gas from the extraction wells, the header pipe must be sized appropriately to convey the maximum expected gas flow. Typical design criteria, the typical method for sizing the header pipe and typical header construction are discussed in the following subsections.

3.6 Header and Lateral Pipe Sizing

General Methodology

Introduction
Once the wells are placed on the landfill final grading map, as previously described, the designer draws the piping network onto the map connecting each well. All proposed header pipes were designed to have a slope of not less than 3 percent on landfill sideslopes inside waste limits (5 percent is preferred). Slopes can be as little as 1 percent outside of waste limits since there will be less settlement). Slopes greater than the minimum values provided here are beneficial and should be used where possible due to site grades without creating too many low points that would require condensate management. Lateral pipe slopes may also be as low as 2 percent where installed in flatter topslope areas or interim fill areas where collection is required, but where landfill existing slopes are not conducive to higher slopes. The current GCCS has been designed and constructed using these guidelines.

The optimum diameter of the header pipe has been determined using the KYGAS program, as will be described. The diameter of each segment of the header pipe varies in size, depending on the volume of landfill gas that it will be expected to convey and allowable velocity and pressure loss constraints.

The header line that connects the gas wells furthest from the source of vacuum will carry the least amount of gas flow. As the header piping gets closer to the source of vacuum, more and more gas wells “contribute” flow to the line which will necessitate an increase in pipe size. Header systems usually incorporate some degree of “loops” in the piping network in order to allow for partial or total loss of header function in one direction without losing gas management system functionality.

Procedures

The sizing of the header pipe begins by taking the proposed gas system design layout and dividing the main header into individual segments within the KYGAS program. Each segment is assigned a label by the program in order to identify the segment properties.

The segments are then divided so that each one receives a flow contribution from a single lateral line. Laterals are short lengths of collection header which connect wells to a main header pipe. Gas volumes feeding into each lateral and header segment are determined and entered into the model based on assumed contribution values from each well. The model then adds flows in each pipe segment as the segments proceed to the vacuum source; in this case the blower at the control device(s) location.

A pipe diameter (in inches inner diameter) is then assumed for the pipe segment and is entered into the KYGAS model. The flow velocity and vacuum loss are calculated by the model for the diameter of pipe selected. If the velocity is too high or head loss too great, then a larger diameter of pipe is chosen and entered into the model. This continues until a pipe size is found that meets the pressure and velocity criteria. For these calculations, an inner diameter for an SDR 17 HDPE pipe was chosen. For larger diameter header piping outside of waste limits, a thinner-walled pipe (larger SDR) may be used; however, the SDR 17 thickness assumption will be conservative since it will increase the vacuum loss for these calculations, thereby providing more pipe sizing flexibility for the final design.

As flow accumulates the vacuum is also cumulatively added so that once the flow has been traced back to the blower the vacuum loss throughout the system will be computed. This number will be used again in the section of this plan on the sizing of the gas moving equipment.

Pipe Sizing Design Criteria

Several design criteria were used in sizing the header pipes as follows:

- KYGAS was used to simulate the GCCS network in order to size the piping, model output is provided in Appendix B;
- The maximum flow at closure was considered in all pipe sizing;
- Gas velocity in pipes was generally limited to 20 feet/sec for countercurrent flow of LFG and condensate, and 40 feet/sec for concurrent flow of LFG and condensate (the values can be exceeded in some cases to avoid inconsistent pipe sizing for short pipe lengths, etc.);
- Pipes were sized so that vacuum loss did not exceed 1 inch of water column (1” W.C.) per 100 feet of pipe;
- A vacuum at the blower/flare station of 40” W.C. was used in the models. The 40-inch reduction provides a factor-of-safety for losses in the blower/flare station area. It should be noted that, depending on the losses from equipment at the blower/flare station, the actual vacuum capacity of the blowers would usually be specified to be higher than 40 inches; and
- It was verified that a vacuum of no less than 20” W.C. would be available for every well.

Drawing 2 shows the GCCS layout and indicates the size of all piping to meet these criteria. By assuring that LFG velocity in the pipes generally met the 20 and 40 feet/sec criteria listed above for countercurrent and concurrent pipes, respectively, there was more than sufficient vacuum available at all wells to meet the 20" W.C. limit at all wells, and to meet the 1" W.C. per 100 feet of pipe limit listed above.

The outer header loop was sized at no smaller than 12-inches, transitioning up to a maximum size of 18-inches with only one exception. Near the blower/flare location, a 24-inch pipe from the perimeter header to the blower stations was included in the design due to the large gas volumes conveyed in this section. The crossover headers were sized to be 12-inch diameter pipe.

Discussion Regarding the use of KYGAS

The computer program KYGAS was utilized to size the landfill gas system piping. KYGAS was developed by Dr. Don J. Wood and Dr. James E. Funk at the University of Kentucky. The program was modeled after KYPIPE, which models water distribution systems. The gas system piping was sized using KYGAS because the program can determine head losses, system pressures, and velocities in piping systems under vacuum. KYGAS operates under the assumption that all flow in the piping system is steady, one-dimensional, isothermal flow for an ideal gas. The program uses the Darcy-Weisbach equation for head losses and the Ideal Gas Law for pressure-temperature-density relationships. The program balances the wellfield and computes variations in the friction factor with changes in temperature more rigorously than manual calculations.

KYGAS has several useful options to appropriately size the piping in a GCCS. The program allows the user to model different types of pipeline system materials or configurations to coincide with field conditions. The program includes tabular and graphic interfaces for the input of information regarding the system. The following parameters are required for operation of KYGAS:

- Pipe inside diameter (adjusted by user to meet maximum allowable velocities and friction losses);
- Pipe length (measured from layout map);
- Roughness within the pipeline (0.005, based on smooth HDPE pipe);
- Landfill gas flow rate into the system at each extraction well or node (calculated based on the contribution from the overall recovery shown in Table 3.1);
- Landfill gas operating temperature (T = 120 °F);
- Specific gravity of the landfill gas (G = 1.01);
- Ratio of specific heats ($k = C_p/C_v = 1.303$);
- Absolute viscosity of landfill gas ($\mu = 2.7 \times 10^{-7}$ lb_F*sec/ft^2 = 8.687×10^{-6} lb_M/ ft*sec); and
- Acceleration of gravity constant ($g_C = 32.17$ lb_M*ft/lb_F*sec^2).

Once all of the required information is entered into the program, the user can begin to evaluate the system and select different pipe sizes. Evaluation of the system is an iterative process. The initial design is based on the engineer's previous design experience for similar sized systems. Once the results of the initial model are reviewed, the iterative process begins by balancing the system through varying pipe sizes to control landfill gas velocity, pressure loss, and pipeline diameter for various parts of the system. The initial flow rates and their input locations into the system remain unchanged throughout this process. The main factor adjusted for each model iteration is pipe diameter. The inner pipe diameter determines the landfill gas velocity and pressure drop in each pipeline segment. Once the velocities in the system and the vacuum pressure remaining at the furthest node meet design requirements without grossly over-sizing system components, the designer may proceed with developing and finalizing the system.

The design criteria used for the header and lateral pipe system are shown below (as previously discussed). These are general rules and small segments of pipe may exceed these values to maintain sizing consistency, avoid unique sizes, etc.

Concurrent Velocity	*40 feet per second (fps)*
Countercurrent Velocity	*20 fps*
Maximum Pressure Drop	*1" water column per/100' pipe*
Minimum Vacuum Available at Most Remote Well	*20" of water column*

Model output pages are included in Appendix B for the analyses at peak recovery. Maps are included after the detailed output, showing the well-ID, pipe sizes (in inches), pipe segment vacuums, pipe segment flow and velocities, and the naming convention for each pipe segment.

The KYGAS output files show that there is a total system pressure drop of approximately 5 inches of water column from the blower (which is assumed to have a vacuum of 40 inches of water column for modeling purposes) to the most remote well, such that approximately 35 inches of water column of vacuum is available at the most remote well.

3.7 Header Construction

<u>*Description of Header Collection Pipe Network*</u>

The header pipe proposed for installation is high density polyethylene (HDPE) pipe. HDPE pipe is ideal for this application due to its compatibility with landfill gas and waste, its flexibility (as settlement occurs), its long-term stability, and its excellent chemical and heat resistance properties. The pipe will be fusion-welded and placed below-ground. All pipe will be pressure tested and any leaks repaired prior to placing the pipe into service. At road crossings, the pipe will be protected by a section of corrugated metal pipe or other suitable material. A steel pipe sleeve may be used in any location where the gas line crosses a perimeter drainage feature above-grade.

Isolation valves are located at key locations in the collection header network. These valves can manually shut off the applied vacuum to a particular section of header pipe. This allows portions of the wellfield to be isolated for monitoring and maintenance purposes. Optional header access risers are also shown. These may be used to easily access header pipes in the event of any problems.

<u>*Record Documentation*</u>

Record drawings will be prepared for each phase of collection and control system construction and maps showing the complete system will be maintained. The record drawings will include surveyed piping locations. Locations of header access risers, control valves and condensate management structures will be recorded. The drawings will also show changes or field modifications to the original design.

NSPS Compliance and System Expandability
Blind flanges are and will continue to be incorporated into the collection system as it is being built in interim phases to facilitate future gas system expansions. Additionally, the header and lateral will be HDPE which is easily tied-into for future expansion and/or the addition of additional collectors. The header system as described in this section will meet the following requirements listed in 40 CFR §60.759: gas system expandability, accessibility, corrosion resistance, fill settlement, required materials of construction, and ability to withstand planned overburden or traffic loads.

3.8 Condensate Generation/Management

Landfill gas is saturated with water vapor. Liquid condensate is generated when landfill gas experiences a temperature and/or pressure decrease when extracted and the saturated water vapor condenses out of the vapor state. All condensate generated from the system must be collected and managed. The condensate must be removed from the system at engineered low points in the extraction system header piping, or it will eventually fill up the header lines and impede gas flow. Calculations for maximum condensate generation rates and proposed condensate management techniques are provided in the following subsections. A discussion of condensate and leachate management is required by 40 CFR §60.759. The header collection system alignment is designed to utilize the vertical relief provided by the landfill contours for gravity flow of condensate.

Procedures for Calculating Condensate Generation

1. Utilize the maximum gas flow rate previously calculated, in cubic feet per minute.

2. Determine an average maximum gas temperature during the winter. This period is when the temperature of the landfill gas should change the most, thereby causing the most condensate to form.

   This temperature can be measured directly if an existing system is present or may be assumed based on typical mesophilic or thermophilic temperatures published in scientific research journals. A typical winter temperature in the landfill is assumed to be approximately 60° F to 100°F based on thermophilic conditions. A maximum winter gas temperature of approximately 100°F was assumed for this calculation.

3. Estimate the minimum winter gas temperature. Factors such as local climate, depth of frost line, cover soils, etc. should be considered. If minimum extracted gas temperatures are available, they should be used as a reference. A minimum temperature of 60°F was assumed to provide the lower temperature range when gas is extracted in the winter.

4. Determine the weight of water at the temperatures specified in grains per cubic feet assuming full saturation where 1 pound is equivalent to 7,000 grains. The difference is equivalent to the amount of condensate produced. These values are taken for the assumed temperatures from a reference data table on saturated water vapor values from the

Refrigeration Services Engineers Society.

Calculations

Given:	q	= maximum anticipated gas flow rate	= 3,113 std. ft^3/min
	T_{MAX}	= maximum anticipated gas temperature	= 100° F
	W_{MAX}	= weight of water in saturated vapor at T_{MAX}	= 19.9 grains/ft^3
	T_{MIN}	= minimum anticipated gas temperature	= 60° F
	W_{MIN}	=weight of water in saturated vapor at T_{MIN}	= 5.8 grains/ft^3

Therefore: The difference in the weight of water of saturated gas would be as follows:

19.9 grains/ft^3 – 5.8 grains/ft^3 = <u>14.1 grains/ft^3</u>

The amount of condensate produced per cubic foot of gas would therefore be:

(14.1 grains/ft^3)(1 lb/7,000 grains)(1 gal/8.34 lb) = <u>2.42x10^{-4} gal/ft^3</u>

The daily gas flow at the maximum rate of 3,113 std. ft^3/min is as follows:

(3,113 std. ft^3/min)(60 min/hour)(24 hours/day) = <u>4,482,720 ft^3/day</u>

And finally, the amount of condensate produced per day at maximum flow would be:

(2.42x10^{-4} gal/ft^3)(4,482,720 ft^3/day) = ~**<u>1,083 gallons of condensate per day</u>**

3.9 Condensate Management

Condensate generated as landfill gas is collected and will flow within the gas system piping to one of multiple condensate sumps throughout the gas collection and control system. The drawings in Appendix C include typical condensate management details.

Pneumatic pumps are to be used in the condensate management system. At this time, this is expected to continue into the future although this is not a requirement. The compressor to provide air to this system will be sized appropriately at each phase of operation to accommodate all required pumps (which may not only be in the condensate sumps, but may be required to dewater some wells depending on future conditions). The pumps within each sump should be sized to handle at least one gallon per minute of condensate generation (1,440 gallons per day). At this rate with the number of sumps included in the design, and considering the likely maximum amount of condensate to be generated above, the pumps will have more than sufficient capacity. In addition to designing the ultimate pump capacity, each pump must be checked to assure that it can pump to the elevation required and pump against the anticipated friction losses in the discharge pipe.

Condensate generated through the collection and control of landfill gas will continue to be managed with leachate (see Section 2.6 for a summary of current condensate management methods). In the future, condensate may be managed separately from leachate if required to by POTW standards or for any other reason. As with leachate management on-site, other management methods than those mentioned in Section 2.6 may be used now or in the future if approved by NMED and as long as they do not interfere with NSPS compliance. The landfill will expand condensate management capacity also as needed to keep pace with generation.

All condensate forcemain around the site must also be designed to handle the needed volume of liquids to be sent through it. Although maximum condensate volume over the entire landfill was calculated in Section 3.8, the designer will need to accommodate any other liquids that might be added into the forcemain from extraction wells or other dewatering (if those are ever needed). Since this is unknown at this time (depending on the condition of future wells), this section simply acknowledges that other liquid sources may need to be factored into the future condensate forcemain design. Optional forcemain cleanouts are also shown; these may be used to help diagnose and repair forcemain issues. Also shown are optional forcemain and air supply isolation valves; these may be used to manually shut off and isolate portions of the forcemain or air supply piping.

Liquids such as leachate or condensate will be managed if they impact the wellfield in any way so that full NSPS operational requirements can be maintained.

3.10 Gas Mover Equipment Sizing

Per 40 CFR §60.759(c), the active gas extraction system must be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control, over the intended use period of the gas control system equipment.

The 3,000 cfm flare has more than sufficient capacity to handle the current landfill gas flows. This capacity will be expanded to keep pace with expansions of the wellfield as required for NSPS operation.

Since the blowers are responsible for providing the vacuum that actually extracts the gas from the wellfield and moves it through the system, the sizing of the blowers is crucial to demonstrating compliance with NSPS requirements. Other general design criteria and the method for determining the required blower size are discussed in the following section.

General Design Criteria

Flow Volumes:
The blower must provide a uniform source of vacuum over a wide range of flow rates, since gas flow volumes will vary over the life of the gas extraction system. Although this section discusses the ultimate blower capacity required, blower capacity is only necessary to handle the maximum gas flows expected at each stage of construction as the landfill and collection system develops.

Once the final collection and control system is in place and the landfill is generating its peak flows, the blower system will need to have the capacity to handle the entire flow. This is the configuration calculated in this subsection. Then, as flows decrease and the closed landfill ages, the blowers typically are designed to provide flexibility so that they can effectively operate at the lower flows as landfill gas generation decreases. Multiple blowers will be needed based on the ultimate flows calculated for this landfill although the exact number will be decided at a later date and may vary depending on ultimate blower size chosen. Multiple blowers have an advantage in that some or all of the blowers can operate as necessary to meet capacity requirements. In addition, if one blower becomes inoperative for any reason, a backup blower(s) can maintain system operation.

Pressure Requirements:
The blower must be capable of supplying sufficient negative pressure to overcome pressure drops and resistance through piping and equipment at the maximum gas flow rate, as well as supplying sufficient positive pressure for delivery of the collected gas to the flare for combustion.

Design Methodology:
Flow Volumes:
As referenced in the introduction, the blower(s) will be required to handle the maximum expected gas flow rate upon construction of the final phase of the overall system. This value was calculated to be 3,113 scfm. The number, configuration, and types of blowers will ultimately be determined by the final control device(s) used, actual final flows, and the capacities of blowers available for use at that time. Different blowers have a wide range of available flows such that, depending on the model, the total number needed to accommodate, for example, 3,113 scfm could vary, but will be sized to meet the flow demand necessary.

Pressure Requirements:
Pressure Losses in Gas System: A discussion of the criteria used for calculating pressure losses in the header piping was provided in the discussion on header pipe sizing. In order to calculate the maximum pressure drop in the system, P_H, the designer must assume a pressure drop across the system for frictional losses from flow in the pipe itself. These losses are variable and depend on the size of the gas collection system. The value of P_H here is taken from the system header design and is approximately 5 inches of water column vacuum from the KYGAS modeling.

Applied Well Vacuum: For design purposes, it is assumed that at least 20 inches of vacuum should be available at each gas well (P_W) in order to provide sufficient vacuum for gas extraction.

Pressure Loss through Control Device (Discharge Pressure): A pressure loss, P_{CD}, on the positive side of the blower is created by the blower discharge piping and the control device components. Assuming the control device is a flare, the pressure loss is created by the flame arrestor, orifice plate, and the flare itself. This typically totals approximately 12 inches of water column loss. However, other modulating valves, etc. can add more loss. As such, for this plan, an assumed pressure drop of 20 inches is assumed. However, this will need to be verified by the designer at each phase depending on the "upstream" fixtures and pressure losses that must be accommodated, and 20 inches should be considered a minimum.

Required Vacuum: Based on these pressure losses for the gas management system, the blower must be capable of providing the following vacuum:

$$P_{total} = P_H + P_W + P_{CD}$$

= 5” w.c. + 20” w.c. + 20” w.c.

= 45” w.c. total static pressure

The ultimate blower system(s) installed at the landfill will be able to accommodate flows up to 3,113 scfm while providing a static pressure of at least 45” w.c. in order to meet NSPS design requirements. It should be noted that this is a minimum and that generally this number actually varies from 60-80” w.c. to provide a factor-of-safety for additional losses that may occur or be needed as gas systems age, as additional equipment is added, etc.

Also, as previously mentioned, at least 3,113 scfm represents the provided *ultimate* blower capacity required. As the landfill and collection system is developed prior to the final configuration, blower capacity is only necessary to handle the maximum gas flows expected at each stage development.

3.11 Control Device Sizing

The last requirement in designing a gas collection system is to size and select control device(s) meeting the requirements of 40 CFR §60.752(b)(2)(iii). If an open flare is used, it must meet the provisions of 40 CFR §60.18 for heat content, velocity, and opacity. Per 40 CFR §60.752(b)(2)(iii)(A), if another type of combustion device is used, it must be shown to reduce NMOC concentration by 98 percent although when an enclosed combustor (including an enclosed flare) is used, it is also acceptable to show that outlet NMOC concentrations are reduced to less than 20 parts per million.

Control devices used by this system currently includes an existing, 3,000 cubic feet per minute (cfm)-capacity open flare. Control device capacity will continue to be expanded as needed to accommodate the maximum landfill gas flows to be expected. Control device capacity will be considered depending on capacity needed and the emissions to be generated from such a device to accept generated landfill gas. The control device may change or multiple control devices may be used throughout the landfill’s life.

As previously mentioned, a third-party landfill gas-to-energy facility is used on-site as supplemental control capacity. This facility is not be owned or operated by CREC and, as such, all requirements for any future additional control device(s) will be satisfied by that owner/operator.

Any control device used will be appropriately permitted prior to construction and will be designed and source tested to meet all applicable NSPS requirements. Any control device combination used will also meet all NSPS emissions-related control requirements and will be sized to accommodate the full range gas flows that will be expected at the time of construction and during the planned control device life.

TABLE 3.2
WELL SCHEDULE AND RADIUS OF INFLUENCE CALCULATIONS

Date:	May 2017
Project Number:	16216119.00
Project:	Camino Real Landfill GCCS Design Plan
Location:	Sunland Park, New Mexico

By:	A. Ard
Check By:	D. Mezz

For computer calculation, shaded areas have formulas and should not require any data entry.

	WELL NO.	FINAL COVER ELEV.* (elevation)	BASE ELEV. (elevation)	DEPTH OFF BASE (ft)	WELL DEPTH (ft)	LENGTH OF PIPE		(Lp/Lt) RATIO	ROI (ft)
						SOLID (ft)	PERF. (ft)		
*	A1	3990.1	-	-	-	-	-	-	-
*	A2	3992.1	-	-	-	-	-	-	-
*	A3	4000.3	-	-	-	-	-	-	-
*	A4	3958.6	-	-	-	-	-	-	-
*	A5	4020.9	-	-	-	-	-	-	-
*	B1	3945.3	-	-	-	-	-	-	-
*	B2	3948.1	-	-	-	-	-	-	-
*	B3	3951.9	-	-	-	-	-	-	-
*	B4	3952.0	-	-	-	-	-	-	-
*	B5	3955.5	-	-	-	-	-	-	-
*	B6	3951.3	-	-	-	-	-	-	-
*	B7	3955.5	-	-	-	-	-	-	-
*	B8	3991.1	-	-	-	-	-	-	-
*	B9	4032.3	-	-	-	-	-	-	-
*	B10	3969.2	-	-	-	-	-	-	-
*	B11	3951.0	-	-	-	-	-	-	-
*	B12	3946.2	-	-	-	-	-	-	-
	C1R	3974.0	3902.5	15	56	20	35	0.63	140
	C2R	4037.0	3913.3	15	108	36	71	0.66	150
	C3R	4072.9	3945.6	15	112	37	74	0.66	150
	C4R	4085.3	3952.7	15	117	39	77	0.66	150
	C5R	4025.9	3916.3	15	94	31	62	0.66	150
	C6R	3977.0	3906.0	15	55	20	34	0.62	138
	C7R	3997.4	3911.4	15	70	23	46	0.66	150
	C8	4039.0	3920.3	15	103	34	68	0.66	150
	C9	4103.0	3963.8	15	124	40	83	0.67	150
	C10	4060.6	3926.3	15	119	39	79	0.66	150
	C11	4099.5	3930.9	15	140	40	99	0.71	150
	D1R	4115.0	3991.2	15	108	36	71	0.66	150
	D2R	4079.7	4030.0	15	34	17	16	0.47	85
	D3R	4135.4	4012.1	15	108	36	71	0.66	150
	D4R	4147.4	4031.6	15	100	33	66	0.66	150
	D5R	4109.2	3961.8	15	132	40	91	0.69	150
	D6	4149.5	4002.4	15	132	40	91	0.69	150
	D7R	4090.5	4044.7	15	30	15	14	0.47	75
	D8R	4103.5	4047.5	15	41	20	20	0.49	103
	D9R	4157.4	3951.3	15	140	40	99	0.71	150
	D10	4147.5	3985.2	15	140	40	99	0.71	150
	D11	4175.2	4021.2	15	138	40	97	0.70	150
	D12	4163.1	4037.2	15	110	36	73	0.66	150
	E1R	4165.0	3965.0	15	140	40	99	0.71	150
	E2R	4199.8	4005.3	15	140	40	99	0.71	150
	E3R	4208.1	4003.6	15	140	40	99	0.71	150
	E4R	4153.1	3954.0	15	140	40	99	0.71	150
	E5R	4131.6	3953.5	15	140	40	99	0.71	150
	E6R	4176.8	3994.6	15	140	40	99	0.71	150
	E7R	4129.3	3964.8	15	140	40	99	0.71	150
	E8R	4070.0	3990.8	15	64	21	42	0.66	150

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Date:	May 2017
Project Number:	16216119.00
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Location:	Sunland Park, New Mexico

By:	A. Ard
Check By:	D. Mezz

For computer calculation, shaded areas have formulas and should not require any data entry.

	WELL NO.	FINAL COVER ELEV.* (elevation)	BASE ELEV. (elevation)	DEPTH OFF BASE (ft)	WELL DEPTH (ft)	LENGTH OF PIPE SOLID (ft)	PERF. (ft)	(Lp/Lt) RATIO	ROI (ft)
	E9	4190.6	3986.7	15	140	40	99	0.71	150
	E10	4086.2	3955.4	15	115	38	76	0.66	150
	E11	4068.3	3979.7	15	73	24	48	0.66	150
	E12	4120.0	3994.5	15	110	36	73	0.66	150
	F1	4100.6	3943.2	15	140	40	99	0.71	150
*	F2	4058.2	-	-	-	-	-	-	-
	F3R	4037.8	3954.7	15	68	22	45	0.66	150
	F4R	4059.9	3941.2	15	103	34	68	0.66	150
	F5	4063.4	3932.6	15	115	38	76	0.66	150
*	F6	4006.6	-	-	-	-	-	-	-
	F7R	4007.1	3945.2	15	46	20	25	0.54	115
	F8R	4052.1	3924.4	15	112	37	74	0.66	150
*	F9	3995.3	-	-	-	-	-	-	-
	F10	3972.3	3908.3	15	49	20	28	0.57	123
*	F11	3984.8	-	-	-	-	-	-	-
*	F12	3963.5	-	-	-	-	-	-	-
	F13R	4027.6	3909.9	15	102	34	67	0.66	150
	F14	3998.7	3936.6	15	47	20	26	0.55	118
	F15	4048.3	3916.3	15	117	39	77	0.66	150
	F16	4050.3	3916.5	15	118	39	78	0.66	150
	F17	4103.4	3924.9	15	140	40	99	0.71	150
	F18	4109.8	3931.8	15	140	40	99	0.71	150
	F19	4115.0	3939.5	15	140	40	99	0.71	150
	G1	4129.7	4050.7	15	64	21	42	0.66	150
	G2	4182.3	4042.9	15	124	40	83	0.67	150
	G3	4160.0	4051.9	15	93	31	61	0.66	150
	G4	4189.9	4031.9	15	140	40	99	0.71	150
	G5	4219.9	4036.2	15	140	40	99	0.71	200
	G6	4216.7	4042.4	15	140	40	99	0.71	200
	G7	4092.4	4016.9	15	60	20	39	0.65	150
	G8	4148.1	4015.5	15	117	39	77	0.66	150
	G9	4204.1	4016.8	15	140	40	99	0.71	150
	G10	4222.7	4022.8	15	140	40	99	0.71	200
	G11	4195.5	4027.7	15	140	40	99	0.71	150
	G12	4223.1	4030.4	15	140	40	99	0.71	200
	H1	4135.9	4062.7	15	58	20	37	0.64	145
	H2	4183.3	4052.7	15	115	38	76	0.66	150
	H3	4100.0	4023.5	15	61	20	40	0.66	150
	H4	4143.7	4024.2	15	104	34	69	0.66	150
	H5	4159.7	4034.7	15	109	36	72	0.66	150
	H6	4211.0	4037.5	15	140	40	99	0.71	200
	H7	4221.3	4045.4	15	140	40	99	0.71	200
	I1	4144.8	4063.9	15	65	21	43	0.66	150
	I2	4165.4	4083.6	15	66	22	43	0.65	150
	I3	4188.3	4045.0	15	128	40	87	0.68	150
	I4	4209.5	4046.2	15	140	40	99	0.71	150
	I5	4225.0	4051.9	15	140	40	99	0.71	200
	I6	4174.3	4069.4	15	89	29	59	0.66	150

TABLE 3.2
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Date:	May 2017
Project Number:	16216119.00
Project:	Camino Real Landfill GCCS Design Plan
Location:	Sunland Park, New Mexico

By:	A. Ard
Check By:	D. Mezz

For computer calculation, shaded areas have formulas and should not require any data entry.

WELL NO.	FINAL COVER ELEV.* (elevation)	BASE ELEV. (elevation)	DEPTH OFF BASE (ft)	WELL DEPTH (ft)	LENGTH OF PIPE SOLID (ft)	PERF. (ft)	(Lp/Lt) RATIO	ROI (ft)
I7	4155.4	4093.9	15	46	20	25	0.54	115
I8	4198.4	4056.2	15	127	40	86	0.68	150
I9	4161.9	4083.8	15	63	21	41	0.65	150
I10	4208.2	4058.9	15	134	40	93	0.69	150
I11	4177.0	4070.5	15	91	30	60	0.66	150
I12	4177.8	4077.9	15	84	28	55	0.65	150
I13	4171.3	4070.0	15	86	28	57	0.66	150
I14	4162.6	4061.9	15	85	28	56	0.66	150
I15	4225.0	4061.6	15	140	40	99	0.71	200
J1	4105.0	4044.6	15	45	20	24	0.53	113
J2	4055.5	3985.7	15	54	20	33	0.61	135
J3	4081.1	3999.5	15	66	22	43	0.65	150
J4	4039.2	3937.6	15	86	28	57	0.66	150
J5	4090.7	3960.5	15	115	38	76	0.66	150
J6	4042.4	3898.6	15	128	40	87	0.68	150
J7	4070.2	3920.4	15	134	40	93	0.69	150
J8	4033.9	3918.7	15	100	33	66	0.66	150
J9	4025.0	3923.0	15	86	28	57	0.66	150
J10	4013.1	3859.9	15	138	40	97	0.70	150
J11	4002.0	3884.6	15	102	34	67	0.66	150
J12	4050.9	3872.4	15	140	40	99	0.71	150
J13	4005.4	3913.4	15	76	25	50	0.66	150
J14	4056.9	3879.5	15	140	40	99	0.71	150
J15	4014.8	3937.6	15	62	20	41	0.66	150
J16	4029.5	3940.1	15	74	24	49	0.66	150
J17	4075.7	3985.7	15	74	24	49	0.66	150
J18	4126.2	4049.3	15	61	20	40	0.66	153
J19	4117.0	4010.0	15	92	30	61	0.66	200
J20	4140.0	4081.4	15	43	20	22	0.51	108
K1	4024.9	3962.6	15	47	20	26	0.55	118
K2	4054.2	3999.3	15	39	20	18	0.46	98
K3	4084.3	3997.2	15	72	24	47	0.65	150

Notes:

* These are existing wells that may not require redrilling. Information provided is from original well schedule.

1. All as-built liner elevations and surface grades for drilling must be verified prior to construction to minimize the possibility of liner damage during drilling.
2. Although the radius of influence (ROI) is set at 2.5 times the overall well depth, this value is capped at no more than 200 feet for topslope wells and 150 feet for sideslope wells.

4 REQUEST FOR NSPS FLEXIBILITIES

4.1 Introduction

Per 40 CFR §60.752(b)(2)(i)(B), the design plan shall include proposed alternatives to the prescriptive monitoring, record keeping and reporting requirements in the NSPS. This section addresses exemptions/alternatives proposed in this submittal.

Operational Standards

1) Section 60.753(a) Operational Standards for Collection and Control Systems: *"Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:*

- *5 years or more if active; or*
- *2 years or more if closed or at final grade."*

In some cases CREC may need or wish to install wells at an accelerated pace compared to NSPS installation requirements. Since these wells will have been installed in advance of NSPS requirements, CREC proposes that surface scans will not be performed over such areas and that the monitoring results from such wells will not be subject to NSPS requirements or reported with other NSPS data for wells that were installed in areas where waste has been in place for less than 5 years (active areas) or 2 years (closed areas or areas at final grade) until these time periods have expired.

It should be noted, however, that although the monitoring data for such wells will not be subject to NSPS requirements or reported with other NSPS data, each such well will still be monitored for pressure, temperature, and oxygen content on a minimum monthly basis. These monitoring readings will be recorded and available for NMED inspection on-site for a minimum of 5 years to match the records retention requirements for typical NSPS wellfield monitoring data.

2) Section 60.753(b)(3) Operational Standards for Collection and Control Systems (Formalization of the process to decommission or abandon a well): *"A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows."*

NSPS rules contain no special procedures for decommissioning a well. This request for alternative procedures would formalize the process to be used for decommissioning a well subject to NSPS requirements.

It should be noted that decommissioning is not meant to be used in the same way as the term "abandonment" here. A decommissioned well is simply shut down for a period of time (by fully closing the well valve or by disconnecting the well from the collection lateral) but is maintained for potential future use. This might be necessary if, for example, a well's temperature becomes elevated and it is turned off as a remedial method for a period of time, or if a well is shut down based on poor gas quality until the gas is able to recharge sufficiently.

With this revision, when a well needs to be decommissioned for any reason, this reason will be noted in the monthly monitoring report. The well will, however, still be monitored on a monthly basis per NSPS requirements. Although the pressure may be positive for a decommissioned well, the temperature and oxygen levels must still continue to meet and be monitored according to NSPS rules and requirements. In many cases, the well may be temporarily opened during a monitoring event or left open only very slightly to relieve pressure buildup. Additionally, quarterly surface scans will still be conducted as if the well was still active to make sure fugitive landfill gas emissions are still controlled.

If a well remains decommissioned for six consecutive months, then a notification to NMED will be included in the first semi-annual NSPS report after this six-month consecutive period of decommissioning. This notification will describe whether the well is proposed for abandonment or will provide a plan as to how this well will eventually be brought back online. This notification will allow NMED the option to respond to CREC with a request for further follow-up or information requests, etc.

Unless CREC requests otherwise, normal procedure will be to re-drill any abandoned well within 6 months. As with a decommissioned well, the area around an abandoned well will still be subject to surface scan requirements.

3) Section 60.753(c)(2) Operational Standards for Collection and Control Systems: *"...oxygen shall be determined by an oxygen meter using Method 3A or 3C..."*

This item is simply included to clarify that Method 3C will be used, which enables the use of a gas chromatograph (GC) or a portable GEM-type analytical meter to measure oxygen concentrations. The proposed method is the typical procedure for landfills throughout the country.

4) Section 60753(d) Operational Standards for Collection and Control Systems: *"...A surface monitoring design plan shall be developed...Areas with steep slopes or other dangerous areas may be excluded from surface testing."*

It is proposed to exclude dangerous areas such as active roads, the active working face area, truck traffic areas, and slopes steeper than 4H:1V and/or dangerous slopes due to surface features/conditions from surface testing as set forth here and in the surface monitoring section of this plan. Any such areas will be noted on a map including the reason that the area was considered dangerous during the monitoring event. Such information will be submitted with the quarterly surface monitoring report which will be included in the semi-annual NSPS reports that will be transmitted to NMED.

Compliance Provisions

5) Section 60.755(a)(3) Compliance Provisions: *"…shall measure gauge pressure in the gas collection header at each individual well, monthly."*

This would seem to indicate that the pressure is to be measured on the header side of the wellhead valve instead of the well side of the wellhead valve (landfill side). Other sections of the NSPS rule simply state "at the wellhead." In order to prevent confusion between regulators and operators, the facility proposes to measure each well's gauge pressure on the landfill side. This represents a more conservative approach.

6) Section 60.755(a)(3) and (5) Compliance Provisions (Formalization of the process to request an alternate timeline for a well monitoring exceedance): *"…action shall be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under §60.753(b). If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement…" and "…action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement…"*

NSPS rules require that, if a well shows an exceedance in pressure, temperature, or oxygen requirements, that action must be taken within 5 days and that re-monitoring must show that within 15 days that the well is within compliance. If compliance is not achieved within 15 days, a new well (or construction repair) must be in place within 120 days; however, some exceedances cannot be remedied within the allowable 15-day timeframe or new construction completed within the 120-day timeframe. An example of this would be if a lateral needs repair and pipe must be ordered, or if a well becomes watered-in and must be pumped down over a number of days. Weather or drilling equipment availability may also be a limiting factor; especially during the winter months. Table 4 below provides general procedures that will be followed when an initial exceedance of the NSPS-required parameters for oxygen, pressure, or temperature is measured. These procedures are listed for each parameter in the order that they might typically be implemented.

Table 4
General Actions to be Taken for Landfill Gas Well Exceedances

NSPS Parameter	General Response to Exceedance
Oxygen	• Reduce vacuum to well to prevent over-pulling which may introduce air. • Inspect well, piping, and surrounding landfill surface for damage (e.g.. broken hose or surface cracks) that could introduce air into the well and repair. • Evaluate internal well condition using measuring tape or water level meter to determine if casing is pinched or kinked or if wellscreen is watered-in due to elevated liquid level. If pinched or kinked and repair is impracticable, then abandonment of well may be necessary. Elevated liquid levels can be addressed by pumping fluids out of the well. • If high oxygen persists after implementing above actions, then decommission well to see if production recovers or high oxygen trend can be reversed.
Pressure	• Increase vacuum to well in an attempt to achieve negative pressure and allow for more landfill gas collection. • Measure lateral vacuum to ensure that adequate vacuum is available to well and confirm that lateral pipe is not watered-in or damaged. If blockage of lateral pipe is determined, then schedule and implement repair or replacement of lateral. • If no blockage is found check to make sure piping and blowers are not undersized. This can be done by tracking the vacuum throughout the wellfield and looking for trends as portions of the wellfield become more remote.

Table 4
General Actions to be Taken for Landfill Gas Well Exceedances

NSPS Parameter	General Response to Exceedance
Temperature	• Reduce vacuum to well to prevent over-pulling which may introduce air and increase temperature. • Inspect well and surrounding landfill surface for damage (e.g., broken hose or surface cracks) that could introduce air into the well and repair. • If high temperature persists decommission well to see if temperature drops. • Evaluate potential for a fire. If data in addition to temperature indicates the likelihood of fire, notify NMED promptly and decommission well while additional steps are assessed. • Some wells operate at higher temperatures with no evidence of a fire. If this appears to be the case after a thorough investigation, consider preparing a high operating value (HOV) request for that well to submit to NMED. This request should include historical monitoring data along with the results from all investigations of possible fire-related causes.

When an extension to the aforementioned 120-day timeframe is necessary, a notification to the file for an alternate timeline will be prepared. Each notification will contain a detailed explanation of the proposed alternate timeline with a plan of action and dates for anticipated final action. Each notification will be prepared for the landfill files at least 30 days prior to the end of the 120-day timeframe. Each notification will be provided to NMED in the first semi-annual NSPS report after the time for which the notification was prepared. If this procedure is followed, no deviation or exceedance will have occurred if the 15-day or 120-day timeframe (whichever is requested) is not met. This procedure will eliminate the need for interim paperwork and frequent NMED approval for individual wells. Instead, NMED may review the notification and details provided (as well as any follow-up data provided) with the semi-annual reports and respond to CREC with further follow-up requirements, information requests, etc.

It should be noted that throughout any requested alternate timeline period, monthly well monitoring and recording of these values will continue. However, once an alternate timeline is filed because of a specific parameter, the 5-day action period and 15-day re-monitoring for that parameter would not be required for subsequent months until the end of the alternate timeframe request.

7) Section 60.755(a)(4) Compliance Provisions: *"Owners or operators are not required to expand the system as required in paragraph (a)(3) of this section during the first 180 days after gas collection system startup."*

The GCCS shown in this design plan will be built in phases. The installation of additional wells can cause challenges with the balancing of the entire system and therefore, additional time may be needed to achieve proper operating conditions. It is proposed to expand this condition to include the installation of new wells or the replacement of existing wells. During this 180-day time period, these new wells would be exempt from system expansion required as a result of exceedances of the pressure, temperature, or oxygen concentrations recorded during monthly monitoring.

***8) Section 60.755(a)(5) Compliance Provisions:** "For the purposes of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in §60.753(c). If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days."*

Since this provision in the regulations allows the site to monitor for oxygen or nitrogen, and since most monitoring equipment to be used measures oxygen directly (as opposed to nitrogen which is usually assumed from a balance gas total) the landfill will measure oxygen, not nitrogen, for compliance with this provision unless otherwise indicated.

***9) Section 60.755(c)(4)(v) Compliance Provisions (Formalization of the process to request an alternate remedy for a surface scan exceedance):** "For any location where monitored methane concentrations equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval."*

NSPS rules require that, if a surface scan exceedance occurs three times within a quarter, that a new well or collection device (or other constructed gas system improvement) must be in place within 120 days; however, in some cases the construction cannot be completed in this timeframe or other methods may be used in an attempt to mitigate the exceedance (i.e. upgrading the blower).

When an extension to the 120-day NSPS timeframe is necessary or another alternative remedy proposed, a notification to the file for alternate remedy and installation timeline will be prepared. Each notification will be prepared for the landfill files by no later than 30 days prior to the end of the 120-day period. Each notification will be provided to NMED in the first semi-annual NSPS report after the time for which the notification was prepared. Each notification will contain a detailed explanation of the proposed alternate remedy and/or timeline, with a plan of action and dates for anticipated final action. If this procedure is followed, no deviation or exceedance will have occurred if the 120-day timeframe is not met.

It should be noted that throughout any requested remedy period, quarterly surface scans will continue and the location for which the exceedance occurred will be included in the scan. However, once an alternate remedy is filed, that particular location will not require 10 or 30-day re-monitoring for any exceedances during quarterly surface scans during the alternate remedy period.

<u>Reporting Requirements</u>

***10) Section 60.757(f)(3) Reporting Requirements:** "Description and duration of all periods when the control device was not operating for a period exceeding one hour and length of time the control device was not operating."*

This item is actually a clarification based upon experience from submitting numerous NSPS annual and semi-annual reports. The provision listed here is separate from 60.757(f)(4) which requires reporting of all periods when the collection system was not operating in excess of 5 days. It should be noted that these two rules differ in that one references the control device and the other references the collection system. These NSPS provisions were purposely written this way because 60.757(f)(3) is meant to refer *only* to cases where the control device is down but the overall collection system is still operating.

Therefore, this request is included here to clarify that, for NSPS reporting purposes, it will be assumed that this reporting requirement is for the case where the collection system is operating but the control device is not operating such that uncombusted landfill gas is being vented for a period in excess of 1 hour.

Miscellaneous

11) Individual Well Monitoring in Dangerous Areas

NSPS regulations do not address individual well monitoring which takes place in potentially dangerous areas. Daily conditions exist, especially for active landfills, which pose safety concerns for field technicians such as waste filling/compacting operations, cap construction operations, raised wells, and seasonal weather-related dangers, etc. Because the health and safety of personnel must be considered tantamount, the facility must be given wide latitude in making dangerous area determinations.

Therefore, the facility proposes to temporarily exclude any dangerous areas from individual well monitoring. Such unsafe areas will be documented by site personnel in the wellfield monitoring records as reasons for not monitoring individual wells. It is proposed that the facility be allowed up to 30 days from cessation of filling activity or other dangerous activity in a designated area to bring new or disconnected/decommissioned infrastructure back online. If additional time is needed the well will be decommissioned or abandoned per the procedures set forth in this plan until normal operation can proceed.

5 SURFACE MONITORING PLAN

5.1 Introduction

40 CFR §60.753(d) requires that the GCCS be operated so that the methane concentration is less than 500 ppm above background at the surface of the landfill. This section specifies the monitoring procedures that will be used to meet this requirement. A map is included (Drawing 9 in Appendix C) showing a sample monitoring route for the fully developed landfill, and a monitoring form is included in Appendix D.

5.2 Areas Monitored

40 CFR §755(c)(1) requires monitoring of the surface of the collection area for methane. The NSPS rules require monitoring along the entire perimeter of the collection area and along a serpentine pattern spaced 30 meters apart for each collection area on a quarterly basis.

Drawing 9 in Appendix C shows a sample monitoring route on a map of final grades for the fully developed landfill. Before the collection system is complete, the surface monitoring route will vary depending on the construction status of both the landfill and the collection system. A topographic map showing the current monitoring route will be maintained at the landfill along with a copy of this plan once surface monitoring is required. This surface scan map will also show the location of all constructed portions of the collection and control system. The map will be updated as necessary to show changes in the monitoring route or the collection and control system. Specifically, the surface monitoring route will be updated if the collection system was modified since the previous monitoring event such that a change in the monitoring route is required, or if field personnel cover the same area in a different sequence to make the process more efficient.

Areas which may be excluded from monitoring include:

- Active areas of the site – Active areas include the working face and areas which only have daily cover. Active areas of the landfill also include those areas which have a large volume of equipment traffic which could pose an unacceptable health and safety risk to an individual in the area.

- Areas of the landfill with slopes steeper than 4H:1V. These “steep” areas could also present a safety hazard for a monitoring technician traversing them.

- Areas with snow or ice on them are also exempted from monitoring due to health and safety concerns.

Prior to each quarterly monitoring event as necessary, route planning will be performed. This planning will identify dangerous areas or other areas to be excluded from monitoring. These areas will be marked on the surface monitoring map for that quarterly event and excluded from monitoring for that period and may be reconsidered for the next monitoring event.

5.3 Monitoring Frequency

Surface monitoring will occur on a quarterly basis. Monitoring will begin within the first quarter that the facility is required to have the collection system operating pursuant to NSPS. Monitoring will be rescheduled if it cannot be conducted because conditions are outside of what could reasonably considered as typical; (40 CFR §60.755(c)(3) states that monitoring shall be performed under typical meteorological conditions). The monitoring event will be rescheduled as soon as practicable after the original scheduled date.

5.4 Surface Monitoring Instrument

The monitoring will be conducted with an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications located in 40 CFR §60.755(d):

> "The portable analyzer shall meet the instrument specifications provided in Section 3, Method 21 of Appendix A of 40 CFR Part 60 (Method 21), except that "methane" shall replace all references to VOC."

To meet the performance evaluation requirements in Section 3.1.3 of Method 21, the instrument evaluation procedures of Section 4.4 of Method 21 shall be used. The performance evaluation results include response factor, calibration precision, and response time. These results will be documented in an instrument logbook or on the form included in Appendix D for each monitoring event.

5.5 Surface Monitoring Survey

Immediately before commencing a surface monitoring survey, the instrument shall be calibrated. The calibration gas shall be methane, diluted to a concentration of 500 parts per million in air. Calibrations will be documented in an instrument logbook or in the form included in Appendix D.

The background concentration will be determined immediately prior to conducting the survey. The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at least 30 meters from the outermost perimeter wells. The background concentration, measurement location, and basic meteorological conditions will be recorded on the form included at the end of this section. Any other factors that could affect the background concentration should also be noted.

Per Section 4.3.1 of Method 21, the surface monitoring shall be performed by moving the probe along the landfill surface (using the mapped route) while observing the instrument readout. If an increased meter reading is observed, the interface should slowly be sampled where the leakage is indicated until the maximum reading is obtained, leaving the probe inlet at this location for approximately two times the instrument response time. If the maximum observed meter reading is greater than 500 ppm, record and report the result. As previously mentioned, monitoring will not be performed during extreme meteorological conditions.

In addition to monitoring the prescribed route, the monitoring will be performed around the perimeter of the area being collected from and where visual observations indicate elevated surface concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover.

If a reading in excess of 500 ppm is recorded, the following actions shall be taken:

1) The location of the monitored exceedance shall be marked and the location recorded.

2) Cover maintenance or adjustments to the vacuum of the adjacent wells will be performed to increase gas collection in the vicinity of each exceedance. The location will then be re-monitored within 10 calendar days of detecting the exceedance.

3) If the re-monitoring of the location shows a second exceedance, additional corrective action will be taken and the location will be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in item (5) to follow will be taken, and no further monitoring of that location is required until the action specified in item (5) is taken.

4) Any location that initially showed an exceedance, but has a methane content less than 500 ppm methane above background at the 10-day re-monitoring will also be monitored 1 month from the initial exceedance. If the 1 month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of the location is required until the next quarterly monitoring period. If the 1 month re-monitoring shows an exceedance, the actions specified in item (5) to follow will be taken.

5) For any location where the monitored methane concentration equals or exceeds 500 parts per million above background three consecutive times in a quarterly period, a new well or other collection device will be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the landfill cover or cap, blower, header pipes, or control device, and a corresponding timeline for installation may be filed.

5.6 Reduced Monitoring Frequency for Closed Landfills

40 CFR §60.756(f) allows for any closed landfill that has no monitored exceedances of the 500 ppm limit above background in three consecutive quarterly monitored periods after landfill closure to reduce the monitoring frequency to annually. Any methane reading of 500 ppm or more above the background detected during an annual monitoring event shall automatically return the frequency back to a quarterly frequency. This provision may be exercised if the surface scans meet these criteria after landfill closure.

5.7 Cover Integrity Monitoring

40 CFR §60.755(b)(5) requires a program to monitor for cover integrity and implement cover repairs

as necessary on a monthly basis. This will be performed during surface scan events quarterly to cover those months. During surface scan events, the monitoring technician will look for signs of compromised cover integrity such as stressed vegetation, cracks, and erosion. The inspection will be documented in the surface scan monitoring form and appropriate facility personnel will be notified so that appropriate actions can be taken.

APPENDIX A
LANDGEM MODEL OUTPUT

Summary Report

Landfill Name or Identifier: Camino Real Landfill (GCCS Design Plan Generation)

Date: Monday, February 20, 2017

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1977**	
Landfill Closure Year (with 80-year limit)	**2038**	
Actual Closure Year (without limit)	***2038***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.020**	*$year^{-1}$*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**595**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Total landfill gas**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1977	3,318	3,650	0	0
1978	3,364	3,700	3,318	3,650
1979	3,409	3,750	6,682	7,350
1980	3,409	3,750	10,091	11,100
1981	3,455	3,800	13,500	14,850
1982	3,500	3,850	16,955	18,650
1983	3,500	3,850	20,455	22,500
1984	3,545	3,900	23,955	26,350
1985	3,591	3,950	27,500	30,250
1986	3,591	3,950	31,091	34,200
1987	84,558	93,014	34,682	38,150
1988	84,558	93,014	119,240	131,164
1989	84,558	93,014	203,798	224,178
1990	211,393	232,532	288,356	317,192
1991	221,518	243,670	499,749	549,724
1992	217,226	238,949	721,267	793,394
1993	246,307	270,938	938,494	1,032,343
1994	197,125	216,837	1,184,801	1,303,281
1995	217,334	239,067	1,381,925	1,520,118
1996	291,388	320,527	1,599,259	1,759,185
1997	410,788	451,867	1,890,647	2,079,712
1998	408,878	449,765	2,301,435	2,531,579
1999	463,854	510,240	2,710,313	2,981,344
2000	473,185	520,504	3,174,167	3,491,584
2001	438,349	482,183	3,647,353	4,012,088
2002	479,132	527,046	4,085,701	4,494,271
2003	485,045	533,550	4,564,834	5,021,317
2004	517,138	568,852	5,049,879	5,554,867
2005	451,086	496,195	5,567,017	6,123,719
2006	551,485	606,634	6,018,104	6,619,914
2007	586,547	645,202	6,569,589	7,226,548
2008	533,701	587,071	7,156,136	7,871,750
2009	476,427	524,070	7,689,837	8,458,821
2010	565,595	622,155	8,166,264	8,982,891
2011	530,591	583,650	8,731,859	9,605,045
2012	463,482	509,830	9,262,450	10,188,695
2013	393,128	432,440	9,725,932	10,698,525
2014	416,466	458,113	10,119,060	11,130,966
2015	449,172	494,089	10,535,526	11,589,079
2016	416,782	458,460	10,984,698	12,083,168

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2017	418,865	460,752	11,401,480	12,541,628
2018	420,960	463,056	11,820,345	13,002,380
2019	423,065	465,371	12,241,305	13,465,436
2020	425,180	467,698	12,664,370	13,930,807
2021	427,306	470,037	13,089,550	14,398,505
2022	429,443	472,387	13,516,856	14,868,542
2023	431,590	474,749	13,946,299	15,340,929
2024	433,748	477,123	14,377,889	15,815,678
2025	435,916	479,508	14,811,637	16,292,801
2026	438,096	481,906	15,247,554	16,772,309
2027	440,286	484,315	15,685,650	17,254,215
2028	442,488	486,737	16,125,936	17,738,530
2029	444,700	489,170	16,568,424	18,225,267
2030	446,924	491,616	17,013,124	18,714,437
2031	449,158	494,074	17,460,048	19,206,053
2032	451,405	496,545	17,909,206	19,700,127
2033	453,662	499,028	18,360,611	20,196,672
2034	455,930	501,523	18,814,273	20,695,700
2035	458,209	504,030	19,270,203	21,197,223
2036	460,500	506,550	19,728,412	21,701,253
2037	462,803	509,083	20,188,912	22,207,803
2038	388,242	427,066	20,651,714	22,716,886
2039	0	0	21,039,956	23,143,952
2040	0	0	21,039,956	23,143,952
2041	0	0	21,039,956	23,143,952
2042	0	0	21,039,956	23,143,952
2043	0	0	21,039,956	23,143,952
2044	0	0	21,039,956	23,143,952
2045	0	0	21,039,956	23,143,952
2046	0	0	21,039,956	23,143,952
2047	0	0	21,039,956	23,143,952
2048	0	0	21,039,956	23,143,952
2049	0	0	21,039,956	23,143,952
2050	0	0	21,039,956	23,143,952
2051	0	0	21,039,956	23,143,952
2052	0	0	21,039,956	23,143,952
2053	0	0	21,039,956	23,143,952
2054	0	0	21,039,956	23,143,952
2055	0	0	21,039,956	23,143,952
2056	0	0	21,039,956	23,143,952

Results (Continued)

Year	Carbon dioxide			Total landfill gas		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
1977	0	0	0	0	0	0
1978	1.204E+01	6.577E+03	4.419E-01	1.643E+01	1.315E+04	8.838E-01
1979	2.400E+01	1.311E+04	8.811E-01	3.275E+01	2.623E+04	1.762E+00
1980	3.590E+01	1.961E+04	1.318E+00	4.898E+01	3.922E+04	2.635E+00
1981	4.756E+01	2.598E+04	1.746E+00	6.489E+01	5.196E+04	3.491E+00
1982	5.915E+01	3.231E+04	2.171E+00	8.071E+01	6.463E+04	4.342E+00
1983	7.068E+01	3.861E+04	2.594E+00	9.644E+01	7.722E+04	5.188E+00
1984	8.198E+01	4.478E+04	3.009E+00	1.119E+02	8.957E+04	6.018E+00
1985	9.322E+01	5.092E+04	3.422E+00	1.272E+02	1.018E+05	6.843E+00
1986	1.044E+02	5.703E+04	3.832E+00	1.424E+02	1.141E+05	7.664E+00
1987	1.154E+02	6.302E+04	4.234E+00	1.574E+02	1.260E+05	8.469E+00
1988	4.199E+02	2.294E+05	1.541E+01	5.729E+02	4.588E+05	3.082E+01
1989	7.184E+02	3.924E+05	2.637E+01	9.802E+02	7.849E+05	5.274E+01
1990	1.011E+03	5.523E+05	3.711E+01	1.379E+03	1.105E+06	7.421E+01
1991	1.758E+03	9.603E+05	6.453E+01	2.399E+03	1.921E+06	1.291E+02
1992	2.527E+03	1.380E+06	9.275E+01	3.448E+03	2.761E+06	1.855E+02
1993	3.265E+03	1.784E+06	1.198E+02	4.455E+03	3.567E+06	2.397E+02
1994	4.094E+03	2.237E+06	1.503E+02	5.586E+03	4.473E+06	3.005E+02
1995	4.728E+03	2.583E+06	1.735E+02	6.451E+03	5.166E+06	3.471E+02
1996	5.423E+03	2.963E+06	1.991E+02	7.400E+03	5.925E+06	3.981E+02
1997	6.373E+03	3.481E+06	2.339E+02	8.696E+03	6.963E+06	4.678E+02
1998	7.737E+03	4.227E+06	2.840E+02	1.056E+04	8.454E+06	5.680E+02
1999	9.067E+03	4.954E+06	3.328E+02	1.237E+04	9.907E+06	6.657E+02
2000	1.057E+04	5.775E+06	3.880E+02	1.442E+04	1.155E+07	7.760E+02
2001	1.208E+04	6.598E+06	4.433E+02	1.648E+04	1.320E+07	8.867E+02
2002	1.343E+04	7.337E+06	4.929E+02	1.832E+04	1.467E+07	9.859E+02
2003	1.490E+04	8.141E+06	5.470E+02	2.033E+04	1.628E+07	1.094E+03
2004	1.637E+04	8.941E+06	6.008E+02	2.233E+04	1.788E+07	1.202E+03
2005	1.792E+04	9.789E+06	6.577E+02	2.445E+04	1.958E+07	1.315E+03
2006	1.920E+04	1.049E+07	7.048E+02	2.620E+04	2.098E+07	1.410E+03
2007	2.082E+04	1.137E+07	7.643E+02	2.841E+04	2.275E+07	1.529E+03
2008	2.254E+04	1.231E+07	8.273E+02	3.075E+04	2.462E+07	1.655E+03
2009	2.403E+04	1.313E+07	8.820E+02	3.278E+04	2.625E+07	1.764E+03
2010	2.528E+04	1.381E+07	9.279E+02	3.449E+04	2.762E+07	1.856E+03
2011	2.683E+04	1.466E+07	9.849E+02	3.661E+04	2.932E+07	1.970E+03
2012	2.823E+04	1.542E+07	1.036E+03	3.851E+04	3.084E+07	2.072E+03
2013	2.935E+04	1.603E+07	1.077E+03	4.005E+04	3.207E+07	2.155E+03
2014	3.019E+04	1.649E+07	1.108E+03	4.120E+04	3.299E+07	2.217E+03
2015	3.111E+04	1.699E+07	1.142E+03	4.244E+04	3.399E+07	2.284E+03
2016	3.212E+04	1.755E+07	1.179E+03	4.383E+04	3.510E+07	2.358E+03
2017	3.300E+04	1.803E+07	1.211E+03	4.502E+04	3.605E+07	2.422E+03
2018	3.386E+04	1.850E+07	1.243E+03	4.621E+04	3.700E+07	2.486E+03
2019	3.472E+04	1.897E+07	1.274E+03	4.737E+04	3.794E+07	2.549E+03
2020	3.557E+04	1.943E+07	1.306E+03	4.853E+04	3.886E+07	2.611E+03
2021	3.641E+04	1.989E+07	1.336E+03	4.967E+04	3.978E+07	2.673E+03
2022	3.724E+04	2.034E+07	1.367E+03	5.081E+04	4.068E+07	2.734E+03
2023	3.806E+04	2.079E+07	1.397E+03	5.193E+04	4.158E+07	2.794E+03
2024	3.887E+04	2.123E+07	1.427E+03	5.303E+04	4.247E+07	2.853E+03
2025	3.967E+04	2.167E+07	1.456E+03	5.413E+04	4.335E+07	2.912E+03
2026	4.047E+04	2.211E+07	1.485E+03	5.522E+04	4.422E+07	2.971E+03

Results (Continued)

Year	Carbon dioxide			Total landfill gas		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2027	4.126E+04	2.254E+07	1.514E+03	5.629E+04	4.508E+07	3.029E+03
2028	4.204E+04	2.297E+07	1.543E+03	5.736E+04	4.593E+07	3.086E+03
2029	4.281E+04	2.339E+07	1.571E+03	5.841E+04	4.677E+07	3.143E+03
2030	4.358E+04	2.381E+07	1.600E+03	5.946E+04	4.761E+07	3.199E+03
2031	4.433E+04	2.422E+07	1.627E+03	6.049E+04	4.844E+07	3.255E+03
2032	4.509E+04	2.463E+07	1.655E+03	6.152E+04	4.926E+07	3.310E+03
2033	4.583E+04	2.504E+07	1.682E+03	6.254E+04	5.008E+07	3.365E+03
2034	4.657E+04	2.544E+07	1.709E+03	6.354E+04	5.088E+07	3.419E+03
2035	4.730E+04	2.584E+07	1.736E+03	6.454E+04	5.168E+07	3.473E+03
2036	4.803E+04	2.624E+07	1.763E+03	6.553E+04	5.248E+07	3.526E+03
2037	4.875E+04	2.663E+07	1.789E+03	6.651E+04	5.326E+07	3.579E+03
2038	4.946E+04	2.702E+07	1.816E+03	6.749E+04	5.404E+07	3.631E+03
2039	4.989E+04	2.726E+07	1.831E+03	6.807E+04	5.451E+07	3.663E+03
2040	4.890E+04	2.672E+07	1.795E+03	6.673E+04	5.343E+07	3.590E+03
2041	4.793E+04	2.619E+07	1.759E+03	6.541E+04	5.237E+07	3.519E+03
2042	4.699E+04	2.567E+07	1.725E+03	6.411E+04	5.134E+07	3.449E+03
2043	4.606E+04	2.516E+07	1.690E+03	6.284E+04	5.032E+07	3.381E+03
2044	4.514E+04	2.466E+07	1.657E+03	6.160E+04	4.932E+07	3.314E+03
2045	4.425E+04	2.417E+07	1.624E+03	6.038E+04	4.835E+07	3.248E+03
2046	4.337E+04	2.369E+07	1.592E+03	5.918E+04	4.739E+07	3.184E+03
2047	4.251E+04	2.323E+07	1.561E+03	5.801E+04	4.645E+07	3.121E+03
2048	4.167E+04	2.277E+07	1.530E+03	5.686E+04	4.553E+07	3.059E+03
2049	4.085E+04	2.231E+07	1.499E+03	5.573E+04	4.463E+07	2.999E+03
2050	4.004E+04	2.187E+07	1.470E+03	5.463E+04	4.375E+07	2.939E+03
2051	3.925E+04	2.144E+07	1.441E+03	5.355E+04	4.288E+07	2.881E+03
2052	3.847E+04	2.102E+07	1.412E+03	5.249E+04	4.203E+07	2.824E+03
2053	3.771E+04	2.060E+07	1.384E+03	5.145E+04	4.120E+07	2.768E+03
2054	3.696E+04	2.019E+07	1.357E+03	5.043E+04	4.038E+07	2.713E+03
2055	3.623E+04	1.979E+07	1.330E+03	4.943E+04	3.958E+07	2.660E+03
2056	3.551E+04	1.940E+07	1.303E+03	4.845E+04	3.880E+07	2.607E+03
2057	3.481E+04	1.902E+07	1.278E+03	4.749E+04	3.803E+07	2.555E+03
2058	3.412E+04	1.864E+07	1.252E+03	4.655E+04	3.728E+07	2.505E+03
2059	3.344E+04	1.827E+07	1.228E+03	4.563E+04	3.654E+07	2.455E+03
2060	3.278E+04	1.791E+07	1.203E+03	4.473E+04	3.582E+07	2.406E+03
2061	3.213E+04	1.755E+07	1.179E+03	4.384E+04	3.511E+07	2.359E+03
2062	3.150E+04	1.721E+07	1.156E+03	4.297E+04	3.441E+07	2.312E+03
2063	3.087E+04	1.687E+07	1.133E+03	4.212E+04	3.373E+07	2.266E+03
2064	3.026E+04	1.653E+07	1.111E+03	4.129E+04	3.306E+07	2.221E+03
2065	2.966E+04	1.620E+07	1.089E+03	4.047E+04	3.241E+07	2.177E+03
2066	2.907E+04	1.588E+07	1.067E+03	3.967E+04	3.177E+07	2.134E+03
2067	2.850E+04	1.557E+07	1.046E+03	3.888E+04	3.114E+07	2.092E+03
2068	2.793E+04	1.526E+07	1.025E+03	3.811E+04	3.052E+07	2.051E+03
2069	2.738E+04	1.496E+07	1.005E+03	3.736E+04	2.992E+07	2.010E+03
2070	2.684E+04	1.466E+07	9.851E+02	3.662E+04	2.932E+07	1.970E+03
2071	2.631E+04	1.437E+07	9.656E+02	3.590E+04	2.874E+07	1.931E+03
2072	2.579E+04	1.409E+07	9.465E+02	3.518E+04	2.817E+07	1.893E+03
2073	2.528E+04	1.381E+07	9.278E+02	3.449E+04	2.762E+07	1.856E+03
2074	2.478E+04	1.353E+07	9.094E+02	3.380E+04	2.707E+07	1.819E+03
2075	2.428E+04	1.327E+07	8.914E+02	3.314E+04	2.653E+07	1.783E+03
2076	2.380E+04	1.300E+07	8.737E+02	3.248E+04	2.601E+07	1.747E+03
2077	2.333E+04	1.275E+07	8.564E+02	3.184E+04	2.549E+07	1.713E+03

APPENDIX B
KYGAS MODEL OUTPUT

```
* * * * * * * * * * * * * K Y G A S * * * * * * * * * * * * *
*                                                             *
*  Gas Network Analysis Software                              *
*                                                             *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)                 *
*  Version: 8.014  01/11/2016                                 *
*  Company:  SCSEnginee    Serial #:  500203                  *
*  Interface:  Classic                                        *
*  Licensed for Pipe2014                                      *
*                                                             *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

 INPUT DATA FILE NAME FOR THIS SIMULATION  = m:\projects\WASTEC~1\CAMINO~1\16216
 1~1.002\TASK4-~1\kygas\CAMINO~1.KYP\camino_r.DAT
 OUTPUT DATA FILE NAME FOR THIS SIMULATION = m:\projects\WASTEC~1\CAMINO~1\16216
 1~1.002\TASK4-~1\kygas\CAMINO~1.KYP\camino_r.OT2

 DATE FOR THIS COMPUTER RUN       :  4-08-2017
 START TIME FOR THIS COMPUTER RUN : 11:27:15:90


 SUMMARY OF DISTRIBUTION SYSTEM CHARACTERISTICS:
 ------------------------------------------------


 NUMBER OF PIPES           =   257
 NUMBER OF JUNCTION NODES  =   251

 UNITS SPECIFIED           = ENGLISH



 PROPERTIES OF THE GAS FOR THIS ANALYSIS ARE:

  OPERATING TEMPERATURE                  =    120.000 DEGREES FAHRENHEIT
  REFERENCE DENSITY (@ STD. PRESSURE)   =    .71E-01 POUNDS/CUBIC FOOT
  GAS MOLECULAR WEIGHT                   =     30.000
  GAS SPECIFIC GRAVITY                   =      1.036
  RATIO OF SPECIFIC HEATS                =      1.300
  GAS CONSTANT                           =     51.512
  ABSOLUTE VISCOSITY                     =   .266E-06 POUND SECONDS/SQUARE FOOT


      USER SPEC. FLOW UNITS (USFU)       = SCF / MIN.
     USER SPEC. PRESSURE UNITS(USPU)    = INCHES OF WATER (GAUGE)


 -------  SUMMARY OF PIPE NETWORK GEOMETRIC AND OPERATING DATA  -------

------------------------------------------------------------------------
    PIPE     NODE     NODE   LENGTH  DIAM.  ROUGHNESS SUM-M PUMP ELEVATION
    NAME      #1       #2    (FT.)  (IN.)  (MILLIFEET) FACT.  ID    CHANGE
------------------------------------------------------------------------
    P-1      R-1      J-28    62.8   21.1       .005      .0    0        .0
```

P-2	J-2	B7	221.0	5.8	.005	.0	0	.0
P-3	J-2	J-10	22.5	3.9	.005	.0	0	.0
P-4	J-3	J-8	42.4	5.8	.005	.0	0	.0
P-5	J-3	J-5	347.8	5.8	.005	.0	0	.0
P-6	J-5	J-27	303.1	5.8	.005	.0	0	.0
P-7	J-5	A3	16.4	3.9	.005	.0	0	.0
P-8	J-8	B9	335.1	5.8	.005	.0	0	.0
P-9	J-8	A5	13.1	3.9	.005	.0	0	.0
P-10	J-10	J-3	196.9	5.8	.005	.0	0	.0
P-11	J-10	B8	20.4	3.9	.005	.0	0	.0
P-12	J-12	J-2	200.4	5.8	.005	.0	0	.0
P-13	J-12	B6	171.5	3.9	.005	.0	0	.0
P-14	J-14	J-12	260.1	5.8	.005	.0	0	.0
P-15	J-14	A4	23.6	3.9	.005	.0	0	.0
P-16	J-16	J-14	291.8	5.8	.005	.0	0	.0
P-17	J-16	B5	9.1	3.9	.005	.0	0	.0
P-18	J-18	J-16	255.0	5.8	.005	.0	0	.0
P-19	J-18	B4	28.5	3.9	.005	.0	0	.0
P-20	J-20	J-18	234.1	5.8	.005	.0	0	.0
P-21	J-20	B3	82.0	3.9	.005	.0	0	.0
P-22	J-22	J-20	267.3	5.8	.005	.0	0	.0
P-23	J-22	B2	89.2	3.9	.005	.0	0	.0
P-24	J-24	J-25	105.9	21.1	.005	.0	0	.0
P-25	J-24	J-34	334.8	7.6	.005	.0	0	.0
P-26	J-25	J-22	444.1	5.8	.005	.0	0	.0
P-27	J-25	J-36	1029.6	5.8	.005	.0	0	.0
P-28	J-28	J-24	100.9	21.1	.005	.0	0	.0
P-29	J-28	J-42	1266.1	21.1	.005	.0	0	.0
P-30	J-26	B12	83.0	3.9	.005	.0	0	.0
P-31	J-26	B10	144.0	3.9	.005	.0	0	.0
P-32	J-32	J-26	233.3	5.8	.005	.0	0	.0
P-33	J-32	B11	64.1	3.9	.005	.0	0	.0
P-34	J-34	J-32	258.0	5.8	.005	.0	0	.0
P-35	J-34	B1	68.1	3.9	.005	.0	0	.0
P-36	J-36	A1	80.3	3.9	.005	.0	0	.0
P-37	J-27	J-36	384.3	5.8	.005	.0	0	.0
P-38	J-27	A2	19.5	3.9	.005	.0	0	.0
P-39	J-30	J-40	231.8	15.8	.005	.0	0	.0
P-40	J-30	C1R	29.1	3.9	.005	.0	0	.0
P-41	J-40	J-38	107.8	15.8	.005	.0	0	.0
P-42	J-40	C2R	124.5	3.9	.005	.0	0	.0
P-43	J-42	J-30	114.4	15.8	.005	.0	0	.0
P-44	J-42	J-51	137.8	15.8	.005	.0	0	.0
P-45	J-43	J-77	27.6	15.8	.005	.0	0	.0
P-46	J-43	J-226	527.3	11.2	.005	.0	0	.0
P-47	HP-7	J-188	18.6	11.2	.005	.0	0	.0
P-48	J-45	J-87	115.4	15.8	.005	.0	0	.0
P-49	J-45	J-79	168.8	11.2	.005	.0	0	.0
P-50	J-46	J-43	171.3	15.8	.005	.0	0	.0
P-51	J-47	J-171	93.8	11.2	.005	.0	0	.0
P-52	J-47	J-158	67.7	11.2	.005	.0	0	.0
P-53	J-49	CS-4	145.2	11.2	.005	.0	0	.0
P-54	J-48	HP-7	728.7	11.2	.005	.0	0	.0
P-55	J-48	J1	211.9	11.2	.005	.0	0	.0
P-56	J-50	J-219	101.2	11.2	.005	.0	0	.0

P-57	J-51	J-62	210.2	15.8	.005	.0	0	.0
P-58	J-51	C6R	135.3	7.6	.005	.0	0	.0
P-59	J-53	J-54	131.2	7.6	.005	.0	0	.0
P-60	J-53	C5R	201.3	5.8	.005	.0	0	.0
P-61	J-54	J-57	163.3	7.6	.005	.0	0	.0
P-62	J-54	C8	71.6	5.8	.005	.0	0	.0
P-63	J-57	J-59	45.0	5.8	.005	.0	0	.0
P-64	J-57	C4R	188.9	3.9	.005	.0	0	.0
P-65	J-59	C9	125.7	5.8	.005	.0	0	.0
P-66	J-59	D5R	342.4	3.9	.005	.0	0	.0
P-67	C9	D6	227.0	3.9	.005	.0	0	.0
P-68	J-62	J-68	210.1	15.8	.005	.0	0	.0
P-69	J-62	F12	48.1	7.6	.005	.0	0	.0
P-70	J-63	F16	288.7	3.9	.005	.0	0	.0
P-71	J-63	F13	179.0	3.9	.005	.0	0	.0
P-72	J-66	J-63	70.2	5.8	.005	.0	0	.0
P-73	J-66	C7R	202.1	3.9	.005	.0	0	.0
P-74	J-68	J-70	357.8	15.8	.005	.0	0	.0
P-75	J-68	F10	55.0	3.9	.005	.0	0	.0
P-76	J-70	HP-1	75.7	15.8	.005	.0	0	.0
P-77	J-70	F11	49.2	3.9	.005	.0	0	.0
P-78	J-72	CS-1	108.6	15.8	.005	.0	0	.0
P-79	J-72	F9	120.3	3.9	.005	.0	0	.0
P-80	J-74	J-45	127.9	15.8	.005	.0	0	.0
P-81	J-74	F14	116.6	3.9	.005	.0	0	.0
P-82	J-76a	HP-2	112.5	15.8	.005	.0	0	.0
P-83	J-76a	D1R	185.5	3.9	.005	.0	0	.0
P-84	J-76	CS-2	102.7	15.8	.005	.0	0	.0
P-85	J-76	D2R	72.4	5.8	.005	.0	0	.0
P-86	D2R	D3R	268.0	3.9	.005	.0	0	.0
P-87	J-77	J-76	261.7	15.8	.005	.0	0	.0
P-88	J-77	D7R	54.2	3.9	.005	.0	0	.0
P-89	J-79	J-81	114.1	11.2	.005	.0	0	.0
P-90	J-79	F15	334.7	3.9	.005	.0	0	.0
P-91	J-81	J-89	151.1	11.2	.005	.0	0	.0
P-92	J-81	F8R	52.3	3.9	.005	.0	0	.0
P-93	J-83	J-91	205.4	11.2	.005	.0	0	.0
P-94	J-83	F17	106.4	3.9	.005	.0	0	.0
P-95	J-85	J-98	65.5	11.2	.005	.0	0	.0
P-96	J-85	D4R	102.0	3.9	.005	.0	0	.0
P-97	J-87	J-103	241.8	15.8	.005	.0	0	.0
P-98	J-87	F7R	78.1	3.9	.005	.0	0	.0
P-99	J-89	J-83	84.8	11.2	.005	.0	0	.0
P-100	J-89	F18	204.5	3.9	.005	.0	0	.0
P-101	J-91	J-93	238.6	11.2	.005	.0	0	.0
P-102	J-91	D9R	143.8	3.9	.005	.0	0	.0
P-103	J-93	J-96	274.3	11.2	.005	.0	0	.0
P-104	J-93	D10	91.9	5.8	.005	.0	0	.0
P-105	D10	E2R	238.6	3.9	.005	.0	0	.0
P-106	J-96	HP-5	45.7	11.2	.005	.0	0	.0
P-107	J-96	D11	33.9	3.9	.005	.0	0	.0
P-108	J-98	J-46	127.8	11.2	.005	.0	0	.0
P-109	J-98	D12	252.0	5.8	.005	.0	0	.0
P-110	D12	G4	297.1	3.9	.005	.0	0	.0
P-111	J-101	J-46	103.1	15.8	.005	.0	0	.0

P-112	J-101	D8R	37.4	3.9	.005	.0	0	.0
P-113	J-103	J-105	57.4	15.8	.005	.0	0	.0
P-114	J-103	F6	18.3	3.9	.005	.0	0	.0
P-115	J-105	J-119	240.3	15.8	.005	.0	0	.0
P-116	J-105	J-106	137.6	7.6	.005	.0	0	.0
P-117	J-106	J-109	38.9	7.6	.005	.0	0	.0
P-118	J-106	F5	228.6	3.9	.005	.0	0	.0
P-119	J-109	J-111	291.9	7.6	.005	.0	0	.0
P-120	J-109	F4R	88.9	5.8	.005	.0	0	.0
P-121	J-111	J-115	119.4	7.6	.005	.0	0	.0
P-122	J-111	F19	36.8	3.9	.005	.0	0	.0
P-123	J-113	E3R	295.9	5.8	.005	.0	0	.0
P-124	J-113	E1R	168.9	3.9	.005	.0	0	.0
P-125	J-115	J-113	26.2	5.8	.005	.0	0	.0
P-126	J-115	E4R	170.6	5.8	.005	.0	0	.0
P-127	E4R	E9R	215.9	3.9	.005	.0	0	.0
P-128	E3R	G10	298.7	3.9	.005	.0	0	.0
P-129	J-119	J-123	360.6	15.8	.005	.0	0	.0
P-130	J-119	F3R	74.5	3.9	.005	.0	0	.0
P-131	F4R	F1	263.4	5.8	.005	.0	0	.0
P-132	F1	E5R	211.3	3.9	.005	.0	0	.0
P-133	J-123	J-125	185.1	15.8	.005	.0	0	.0
P-134	J-123	F2	85.0	3.9	.005	.0	0	.0
P-135	J-125	HP-3	61.6	11.2	.005	.0	0	.0
P-136	J-125	E10	141.3	3.9	.005	.0	0	.0
P-137	HP-3	J-129	278.5	11.2	.005	.0	0	.0
P-138	HP-1	J-72	218.9	15.8	.005	.0	0	.0
P-139	J-129	CS-3	72.6	11.2	.005	.0	0	.0
P-140	J-129	E11	103.2	3.9	.005	.0	0	.0
P-141	J-131	J-139	81.1	11.2	.005	.0	0	.0
P-142	J-131	J-137	234.9	7.6	.005	.0	0	.0
P-143	J-133	G9	297.4	3.9	.005	.0	0	.0
P-144	J-133	E6R	210.4	3.9	.005	.0	0	.0
P-145	J-135	J-133	31.8	5.8	.005	.0	0	.0
P-146	J-135	G8	140.3	3.9	.005	.0	0	.0
P-147	J-137	E12	76.3	7.6	.005	.0	0	.0
P-148	J-137	E7R	248.5	3.9	.005	.0	0	.0
P-149	J-139	J-47	285.2	11.2	.005	.0	0	.0
P-150	J-139	E8R	76.8	3.9	.005	.0	0	.0
P-151	J-141	J-101	252.8	15.8	.005	.0	0	.0
P-152	J-141	G1	82.9	7.6	.005	.0	0	.0
P-153	J-142	G5	305.4	3.9	.005	.0	0	.0
P-154	J-142	G6	328.9	3.9	.005	.0	0	.0
P-155	G1	G2	258.4	5.8	.005	.0	0	.0
P-156	G2	J-142	30.0	3.9	.005	.0	0	.0
P-157	J-147	J-141	261.8	15.8	.005	.0	0	.0
P-158	J-147	G3	138.5	3.9	.005	.0	0	.0
P-159	J-149	HP-4	210.0	11.2	.005	.0	0	.0
P-160	J-149	H1	33.1	3.9	.005	.0	0	.0
P-161	H1	H2	230.5	3.9	.005	.0	0	.0
P-162	J-152	J-49	90.1	11.2	.005	.0	0	.0
P-163	J-152	I14	83.9	3.9	.005	.0	0	.0
P-164	J-154	J-169	20.9	11.2	.005	.0	0	.0
P-165	J-154	H7	229.1	3.9	.005	.0	0	.0
P-166	J-156	J-167	16.2	11.2	.005	.0	0	.0

P-167	J-156	H6	23.1	3.9	.005	.0	0	.0
P-168	J-158	J-164	210.0	11.2	.005	.0	0	.0
P-169	J-158	G7	112.3	3.9	.005	.0	0	.0
P-170	J-160	J-156	386.0	11.2	.005	.0	0	.0
P-171	J-160	H4	85.9	5.8	.005	.0	0	.0
P-172	G11	G12	272.3	3.9	.005	.0	0	.0
P-173	H4	G11	258.5	5.8	.005	.0	0	.0
P-174	J-164	J-160	21.7	7.6	.005	.0	0	.0
P-175	J-164	H5	206.1	5.8	.005	.0	0	.0
P-176	H5	I4	246.2	3.9	.005	.0	0	.0
P-177	J-167	HP-6	275.8	11.2	.005	.0	0	.0
P-178	J-167	I5	260.9	3.9	.005	.0	0	.0
P-179	J-169	J-152	177.8	11.2	.005	.0	0	.0
P-180	J-169	I15	203.5	3.9	.005	.0	0	.0
P-181	J-171	J-173	194.4	11.2	.005	.0	0	.0
P-182	J-171	H3	116.4	3.9	.005	.0	0	.0
P-183	J-173	J-174	400.5	11.2	.005	.0	0	.0
P-184	J-173	I1	170.4	5.8	.005	.0	0	.0
P-185	J-174	J-177	336.3	11.2	.005	.0	0	.0
P-186	J-174	I2	24.0	3.9	.005	.0	0	.0
P-187	J-177	J-179	280.3	11.2	.005	.0	0	.0
P-188	J-177	I6	49.1	3.9	.005	.0	0	.0
P-189	J-179	J-183	251.0	11.2	.005	.0	0	.0
P-190	J-179	I7	22.3	5.8	.005	.0	0	.0
P-191	I7	I8	186.1	3.9	.005	.0	0	.0
P-192	I1	I3	238.8	3.9	.005	.0	0	.0
P-193	J-183	J-186	260.2	11.2	.005	.0	0	.0
P-194	J-183	I9	66.6	5.8	.005	.0	0	.0
P-195	I9	I10	212.8	3.9	.005	.0	0	.0
P-196	J-186	HP-7	303.6	11.2	.005	.0	0	.0
P-197	J-186	I11	87.2	3.9	.005	.0	0	.0
P-198	J-188	J-190	274.3	11.2	.005	.0	0	.0
P-199	J-188	I12	57.9	3.9	.005	.0	0	.0
P-200	J-190	J-49	144.2	11.2	.005	.0	0	.0
P-201	J-190	I13	105.8	3.9	.005	.0	0	.0
P-202	J1	J20	250.9	11.2	.005	.0	0	.0
P-203	J20	J-221	426.7	11.2	.005	.0	0	.0
P-204	J17	J-50	270.3	11.2	.005	.0	0	.0
P-205	J-195	J-48	206.5	11.2	.005	.0	0	.0
P-206	J-195	J3	130.0	3.9	.005	.0	0	.0
P-207	J-197	J-195	174.1	11.2	.005	.0	0	.0
P-208	J-197	J2	36.4	3.9	.005	.0	0	.0
P-209	J-199	CS-6	141.4	11.2	.005	.0	0	.0
P-210	J-199	J4	31.9	5.8	.005	.0	0	.0
P-211	J4	J5	230.6	3.9	.005	.0	0	.0
P-212	J-202	HP-8	78.9	11.2	.005	.0	0	.0
P-213	J-202	J6	24.7	3.9	.005	.0	0	.0
P-214	J-204	J-202	282.8	11.2	.005	.0	0	.0
P-215	J-204	J8	21.4	3.9	.005	.0	0	.0
P-216	J-206	J-204	284.2	11.2	.005	.0	0	.0
P-217	J-206	J9	19.7	3.9	.005	.0	0	.0
P-218	J-208	J-206	402.9	11.2	.005	.0	0	.0
P-219	J-208	J10	25.1	3.9	.005	.0	0	.0
P-220	J-210	J-208	328.7	11.2	.005	.0	0	.0
P-221	J-210	J11	24.0	5.8	.005	.0	0	.0

P-222	J11	J12	192.4	3.9	.005	.0	0	.0
P-223	J-213	CS-7	20.0	11.2	.005	.0	0	.0
P-224	J-213	J13	58.7	5.8	.005	.0	0	.0
P-225	J13	J14	213.4	3.9	.005	.0	0	.0
P-226	J-216	J-213	246.8	11.2	.005	.0	0	.0
P-227	J-216	J15	69.1	5.8	.005	.0	0	.0
P-228	J15	J7	245.6	3.9	.005	.0	0	.0
P-229	J-219	J-216	232.9	11.2	.005	.0	0	.0
P-230	J-219	J16	110.2	3.9	.005	.0	0	.0
P-231	J-221	J-223	46.4	11.2	.005	.0	0	.0
P-232	J-221	J19	140.2	3.9	.005	.0	0	.0
P-233	J-223	J17	91.1	11.2	.005	.0	0	.0
P-234	J-223	J18	212.6	3.9	.005	.0	0	.0
P-235	J-225	J-50	98.0	11.2	.005	.0	0	.0
P-236	J-225	K1	39.7	5.8	.005	.0	0	.0
P-237	J-226	J-225	283.3	11.2	.005	.0	0	.0
P-238	J-226	K2	49.6	3.9	.005	.0	0	.0
P-239	F12	J-66	92.0	5.8	.005	.0	0	.0
P-240	C6R	J-53	107.1	7.6	.005	.0	0	.0
P-241	C5R	C3R	270.4	3.9	.005	.0	0	.0
P-242	C8	C10	244.8	5.8	.005	.0	0	.0
P-243	C10	C11	234.3	3.9	.005	.0	0	.0
P-244	CS-2	J-76a	111.8	15.8	.005	.0	0	.0
P-245	HP-2	J-38	478.4	15.8	.005	.0	0	.0
P-246	CS-1	J-74	142.8	15.8	.005	.0	0	.0
P-247	HP-5	J-85	307.1	11.2	.005	.0	0	.0
P-248	E12	J-135	84.3	5.8	.005	.0	0	.0
P-249	CS-3	J-131	88.9	11.2	.005	.0	0	.0
P-250	HP-4	J-147	54.7	15.8	.005	.0	0	.0
P-251	CS-4	J-149	139.7	11.2	.005	.0	0	.0
P-252	HP-6	J-154	247.2	11.2	.005	.0	0	.0
P-253	CS-6	J-197	190.4	11.2	.005	.0	0	.0
P-254	HP-8	J-199	188.3	11.2	.005	.0	0	.0
P-255	CS-7	J-210	238.2	11.2	.005	.0	0	.0
P-256	K1	K3	238.9	3.9	.005	.0	0	.0

JUNCTION NAME	NODE TITLE	ELEV	DEMAND (USFU)	FPN PRESSURE
A1		.00	-15.67	
A2		.00	-15.67	
A3		.00	-18.33	
A4		.00	-9.03	
A5		.00	-9.30	
B1		.00	-5.84	
B10		.00	-11.69	
B11		.00	-6.11	
B12		.00	-6.11	
B2		.00	-5.84	
B3		.00	-7.70	
B4		.00	-6.37	
B5		.00	-7.70	
B6		.00	-6.11	
B7		.00	-6.64	

B8	.00	-9.03
B9	.00	-8.23
C10	.00	-31.61
C11	.00	-37.19
C1R	.00	-14.87
C2R	.00	-28.69
C3R	.00	-29.75
C4R	.00	-31.08
C5R	.00	-24.97
C6R	.00	-14.61
C7R	.00	-18.59
C8	.00	-27.36
C9	.00	-32.94
D10	.00	-37.19
D11	.00	-36.65
D12	.00	-29.22
D1R	.00	-28.69
D2R	.00	-9.03
D3R	.00	-28.69
D4R	.00	-26.56
D5R	.00	-35.06
D6	.00	-35.06
D7R	.00	-7.97
D8R	.00	-10.89
D9R	.00	-37.19
E10	.00	-30.55
E11	.00	-19.39
E12	.00	-29.22
E1R	.00	-37.19
E2R	.00	-37.19
E3R	.00	-37.19
E4R	.00	-37.19
E5R	.00	-37.19
E6R	.00	-37.19
E7R	.00	-37.19
E8R	.00	-17.00
E9R	.00	-37.19
F1	.00	-37.19
F10	.00	-13.02
F11	.00	-9.56
F12	.00	-11.95
F13	.00	-27.09
F14	.00	-12.48
F15	.00	-31.08
F16	.00	-31.34
F17	.00	-37.19
F18	.00	-37.19
F19	.00	-37.19
F2	.00	-19.12
F3R	.00	-18.06
F4R	.00	-27.36
F5	.00	-30.55
F6	.00	-22.84
F7R	.00	-12.22
F8R	.00	-29.75

F9	.00	-11.95
G1	.00	-17.00
G10	.00	-37.19
G11	.00	-37.19
G12	.00	-37.19
G2	.00	-32.94
G3	.00	-24.70
G4	.00	-37.19
G5	.00	-37.19
G6	.00	-37.19
G7	.00	-15.94
G8	.00	-31.08
G9	.00	-37.19
H1	.00	-15.41
H2	.00	-30.55
H3	.00	-16.20
H4	.00	-27.62
H5	.00	-28.95
H6	.00	-37.19
H7	.00	-37.19
I1	.00	-17.27
I10	.00	-35.59
I11	.00	-24.17
I12	.00	-22.31
I13	.00	-22.84
I14	.00	-22.58
I15	.00	-37.19
I2	.00	-17.53
I3	.00	-34.00
I4	.00	-37.19
I5	.00	-37.19
I6	.00	-23.64
I7	.00	-12.22
I8	.00	-33.73
I9	.00	-16.73
J1	.00	-11.95
J10	.00	-36.65
J11	.00	-27.09
J12	.00	-37.19
J13	.00	-20.19
J14	.00	-37.19
J15	.00	-16.47
J16	.00	-19.66
J17	.00	-19.66
J18	.00	-16.20
J19	.00	-24.44
J2	.00	-14.34
J20	.00	-11.42
J3	.00	-17.53
J4	.00	-22.84
J5	.00	-30.55
J6	.00	-34.00
J7	.00	-35.59
J8	.00	-26.56
J9	.00	-22.84

K1	.00	-12.48
K2	.00	-10.36
K3	.00	-19.12
CS-1	.00	.00
CS-2	.00	.00
CS-3	.00	.00
CS-4	.00	.00
CS-6	.00	.00
CS-7	.00	.00
HP-1	.00	.00
HP-2	.00	.00
HP-3	.00	.00
HP-4	.00	.00
HP-5	.00	.00
HP-6	.00	.00
HP-7	.00	.00
HP-8	.00	.00
J-2	.00	.00
J-3	.00	.00
J-5	.00	.00
J-8	.00	.00
J-10	.00	.00
J-12	.00	.00
J-14	.00	.00
J-16	.00	.00
J-18	.00	.00
J-20	.00	.00
J-22	.00	.00
J-24	.00	.00
J-25	.00	.00
J-26	.00	.00
J-27	.00	.00
J-28	.00	.00
J-30	.00	.00
J-32	.00	.00
J-34	.00	.00
J-36	.00	.00
J-38	.00	.00
J-40	.00	.00
J-42	.00	.00
J-43	.00	.00
J-45	.00	.00
J-46	.00	.00
J-47	.00	.00
J-48	.00	.00
J-49	.00	.00
J-50	.00	.00
J-51	.00	.00
J-53	.00	.00
J-54	.00	.00
J-57	.00	.00
J-59	.00	.00
J-62	.00	.00
J-63	.00	.00
J-66	.00	.00

J-68	.00	.00
J-70	.00	.00
J-72	.00	.00
J-74	.00	.00
J-76	.00	.00
J-77	.00	.00
J-79	.00	.00
J-81	.00	.00
J-83	.00	.00
J-85	.00	.00
J-87	.00	.00
J-89	.00	.00
J-91	.00	.00
J-93	.00	.00
J-96	.00	.00
J-98	.00	.00
J-101	.00	.00
J-103	.00	.00
J-105	.00	.00
J-106	.00	.00
J-109	.00	.00
J-111	.00	.00
J-113	.00	.00
J-115	.00	.00
J-119	.00	.00
J-123	.00	.00
J-125	.00	.00
J-129	.00	.00
J-131	.00	.00
J-133	.00	.00
J-135	.00	.00
J-137	.00	.00
J-139	.00	.00
J-141	.00	.00
J-142	.00	.00
J-147	.00	.00
J-149	.00	.00
J-152	.00	.00
J-154	.00	.00
J-156	.00	.00
J-158	.00	.00
J-160	.00	.00
J-164	.00	.00
J-167	.00	.00
J-169	.00	.00
J-171	.00	.00
J-173	.00	.00
J-174	.00	.00
J-177	.00	.00
J-179	.00	.00
J-183	.00	.00
J-186	.00	.00
J-188	.00	.00
J-190	.00	.00
J-195	.00	.00

J-197	.00	.00	
J-199	.00	.00	
J-202	.00	.00	
J-204	.00	.00	
J-206	.00	.00	
J-208	.00	.00	
J-210	.00	.00	
J-213	.00	.00	
J-216	.00	.00	
J-219	.00	.00	
J-221	.00	.00	
J-223	.00	.00	
J-225	.00	.00	
J-226	.00	.00	
J-76a	.00	.00	
R-1	.00	.00	-40.00

==
Set = 0

==================== RESULTS FOR THIS SIMULATION FOLLOW =================

Solution was obtained in 14 trials
Flow Accuracy = .6343E-04[< .500E-02]
RV Accuracy = .0000E+00[< .100E-02]

PIPE NO.	NODE #1	NODE #2	FLOW (USFU)	LOSS (USPU)	VELOCITY (FT/S)	DENSITY (#/CF)	FRICTION FACTOR	AREA RATIO
P-1	R-1	J-28	-3113.640	.07	26.58	.064	.0140	.041
P-2	J-2	B7	-6.640	.00	.74	.064	.0461	.001
P-3	J-2	J-10	-15.902	.01	3.85	.064	.0314	.006
P-4	J-3	J-8	-17.530	.00	1.96	.064	.0341	.003
P-5	J-3	J-5	10.658	.01	1.19	.064	.0396	.002
P-6	J-5	J-27	28.988	.04	3.24	.064	.0297	.005
P-7	J-5	A3	-18.330	.01	4.44	.064	.0302	.007
P-8	J-8	B9	-8.230	.00	.92	.064	.0430	.001
P-9	J-8	A5	-9.300	.00	2.25	.064	.0367	.003
P-10	J-10	J-3	-6.872	.00	.77	.064	.0456	.001
P-11	J-10	B8	-9.030	.00	2.19	.064	.0370	.003
P-12	J-12	J-2	-22.542	.02	2.52	.064	.0318	.004
P-13	J-12	B6	-6.110	.01	1.48	.064	.0418	.002
P-14	J-14	J-12	-28.652	.03	3.20	.064	.0298	.005
P-15	J-14	A4	-9.030	.00	2.19	.064	.0370	.003
P-16	J-16	J-14	-37.682	.06	4.21	.064	.0277	.006
P-17	J-16	B5	-7.700	.00	1.87	.064	.0389	.003
P-18	J-18	J-16	-45.382	.07	5.08	.064	.0264	.008

P-19	J-18	B4	-6.370	.00	1.54	.064	.0412	.002
P-20	J-20	J-18	-51.752	.08	5.79	.064	.0255	.009
P-21	J-20	B3	-7.700	.01	1.87	.064	.0389	.003
P-22	J-22	J-20	-59.452	.12	6.65	.064	.0247	.010
P-23	J-22	B2	-5.840	.00	1.42	.064	.0424	.002
P-24	J-24	J-25	-125.620	.00	1.07	.064	.0283	.002
P-25	J-24	J-34	-29.750	.01	1.97	.064	.0316	.003
P-26	J-25	J-22	-65.292	.23	7.31	.064	.0241	.011
P-27	J-25	J-36	-60.328	.46	6.75	.064	.0246	.010
P-28	J-28	J-24	-155.370	.00	1.33	.064	.0268	.002
P-29	J-28	J-42	-2958.270	1.24	25.21	.064	.0141	.038
P-30	J-26	B12	-6.110	.00	1.48	.064	.0418	.002
P-31	J-26	B10	-11.690	.02	2.84	.064	.0343	.004
P-32	J-32	J-26	-17.800	.01	1.99	.064	.0340	.003
P-33	J-32	B11	-6.110	.00	1.48	.064	.0418	.002
P-34	J-34	J-32	-23.910	.02	2.68	.064	.0313	.004
P-35	J-34	B1	-5.840	.00	1.42	.064	.0424	.002
P-36	J-36	A1	-15.670	.02	3.80	.064	.0316	.006
P-37	J-27	J-36	44.658	.10	4.99	.064	.0265	.008
P-38	J-27	A2	-15.670	.01	3.80	.064	.0316	.006
P-39	J-30	J-40	-1337.240	.21	20.21	.064	.0156	.031
P-40	J-30	C1R	-14.870	.01	3.60	.064	.0320	.005
P-41	J-40	J-38	-1308.550	.10	19.77	.064	.0156	.030
P-42	J-40	C2R	-28.690	.09	6.93	.064	.0269	.011
P-43	J-42	J-30	-1352.110	.11	20.44	.064	.0155	.031
P-44	J-42	J-51	-1606.160	.18	24.28	.064	.0150	.037
P-45	J-43	J-77	1234.170	.02	18.59	.064	.0158	.028
P-46	J-43	J-226	-453.568	.36	13.61	.064	.0181	.021
P-47	HP-7	J-188	183.904	.00	5.51	.064	.0220	.008
P-48	J-45	J-87	-908.142	.05	13.68	.064	.0168	.021
P-49	J-45	J-79	-262.408	.04	7.88	.064	.0203	.012
P-50	J-46	J-43	780.602	.06	11.76	.064	.0173	.018
P-51	J-47	J-171	-117.928	.01	3.53	.064	.0245	.005
P-52	J-47	J-158	-123.734	.00	3.71	.064	.0242	.006
P-53	J-49	CS-4	460.740	.10	13.81	.064	.0180	.021
P-54	J-48	HP-7	70.752	.02	2.12	.064	.0278	.003
P-55	J-48	J1	74.974	.01	2.25	.064	.0274	.003
P-56	J-50	J-219	-252.964	.02	7.58	.064	.0205	.012
P-57	J-51	J-62	-1306.530	.19	19.74	.064	.0156	.030
P-58	J-51	C6R	-299.630	.29	19.71	.064	.0182	.030
P-59	J-53	J-54	-230.300	.18	15.13	.064	.0192	.023
P-60	J-53	C5R	-54.720	.07	6.10	.064	.0252	.009
P-61	J-54	J-57	-134.140	.08	8.81	.064	.0217	.013
P-62	J-54	C8	-96.160	.07	10.71	.064	.0220	.016
P-63	J-57	J-59	-103.060	.05	11.47	.064	.0217	.017
P-64	J-57	C4R	-31.080	.16	7.50	.064	.0263	.011
P-65	J-59	C9	-68.000	.07	7.57	.064	.0239	.012
P-66	J-59	D5R	-35.060	.37	8.46	.064	.0256	.013
P-67	C9	D6	-35.060	.24	8.46	.064	.0256	.013
P-68	J-62	J-68	-1217.560	.16	18.39	.064	.0159	.028
P-69	J-62	F12	-88.970	.01	5.85	.064	.0238	.009
P-70	J-63	F16	-31.340	.25	7.57	.064	.0263	.012
P-71	J-63	F13	-27.090	.12	6.54	.064	.0273	.010
P-72	J-66	J-63	-58.430	.03	6.51	.064	.0248	.010
P-73	J-66	C7R	-18.590	.07	4.49	.064	.0301	.007

P-74	J-68	J-70	-1204.540	.27	18.18	.064	.0159	.028
P-75	J-68	F10	-13.020	.01	3.15	.064	.0333	.005
P-76	J-70	HP-1	-1194.980	.06	18.03	.064	.0159	.027
P-77	J-70	F11	-9.560	.01	2.31	.064	.0364	.004
P-78	J-72	CS-1	-1183.030	.08	17.84	.064	.0159	.027
P-79	J-72	F9	-11.950	.02	2.88	.064	.0341	.004
P-80	J-74	J-45	-1170.550	.09	17.64	.064	.0160	.027
P-81	J-74	F14	-12.480	.02	3.01	.064	.0337	.005
P-82	J-76a	HP-2	1308.550	.10	19.74	.064	.0156	.030
P-83	J-76a	D1R	-28.690	.14	6.92	.064	.0269	.011
P-84	J-76	CS-2	1279.860	.09	19.30	.064	.0157	.029
P-85	J-76	D2R	-37.720	.01	4.20	.064	.0277	.006
P-86	D2R	D3R	-28.690	.20	6.92	.064	.0269	.011
P-87	J-77	J-76	1242.140	.21	18.72	.064	.0158	.029
P-88	J-77	D7R	-7.970	.00	1.92	.064	.0384	.003
P-89	J-79	J-81	-231.328	.02	6.94	.064	.0209	.011
P-90	J-79	F15	-31.080	.29	7.49	.064	.0263	.011
P-91	J-81	J-89	-201.578	.02	6.05	.064	.0216	.009
P-92	J-81	F8R	-29.750	.04	7.17	.064	.0266	.011
P-93	J-83	J-91	-127.198	.01	3.82	.064	.0240	.006
P-94	J-83	F17	-37.190	.13	8.96	.064	.0252	.014
P-95	J-85	J-98	47.582	.00	1.43	.064	.0310	.002
P-96	J-85	D4R	-26.560	.07	6.40	.064	.0274	.010
P-97	J-87	J-103	-895.922	.11	13.49	.064	.0169	.021
P-98	J-87	F7R	-12.220	.01	2.95	.064	.0339	.004
P-99	J-89	J-83	-164.388	.01	4.93	.064	.0226	.008
P-100	J-89	F18	-37.190	.24	8.96	.064	.0252	.014
P-101	J-91	J-93	-90.008	.01	2.70	.064	.0262	.004
P-102	J-91	D9R	-37.190	.17	8.96	.064	.0252	.014
P-103	J-93	J-96	-15.628	.00	.47	.064	.0432	.001
P-104	J-93	D10	-74.380	.06	8.27	.064	.0234	.013
P-105	D10	E2R	-37.190	.28	8.96	.064	.0252	.014
P-106	J-96	HP-5	21.022	.00	.63	.064	.0393	.001
P-107	J-96	D11	-36.650	.04	8.83	.064	.0253	.013
P-108	J-98	J-46	113.992	.01	3.42	.064	.0247	.005
P-109	J-98	D12	-66.410	.13	7.38	.064	.0240	.011
P-110	D12	G4	-37.190	.35	8.96	.064	.0252	.014
P-111	J-101	J-46	666.611	.03	10.04	.064	.0179	.015
P-112	J-101	D8R	-10.890	.01	2.62	.064	.0350	.004
P-113	J-103	J-105	-873.082	.02	13.15	.064	.0169	.020
P-114	J-103	F6	-22.840	.01	5.50	.064	.0285	.008
P-115	J-105	J-119	-517.652	.04	7.79	.064	.0189	.012
P-116	J-105	J-106	-355.430	.40	23.30	.064	.0175	.036
P-117	J-106	J-109	-324.880	.10	21.28	.064	.0179	.032
P-118	J-106	F5	-30.550	.19	7.35	.064	.0265	.011
P-119	J-109	J-111	-223.140	.37	14.61	.065	.0193	.022
P-120	J-109	F4R	-101.740	.10	11.29	.064	.0217	.017
P-121	J-111	J-115	-185.950	.11	12.16	.065	.0201	.019
P-122	J-111	F19	-37.190	.04	8.94	.065	.0252	.014
P-123	J-113	E3R	-74.380	.19	8.24	.065	.0234	.013
P-124	J-113	E1R	-37.190	.20	8.93	.065	.0252	.014
P-125	J-115	J-113	-111.570	.03	12.37	.065	.0213	.019
P-126	J-115	E4R	-74.380	.11	8.25	.065	.0234	.013
P-127	E4R	E9R	-37.190	.25	8.93	.065	.0252	.014
P-128	E3R	G10	-37.190	.35	8.93	.065	.0252	.014

P-129	J-119	J-123	-499.592	.06	7.52	.064	.0190	.011
P-130	J-119	F3R	-18.060	.03	4.35	.064	.0304	.007
P-131	F4R	F1	-74.380	.17	8.25	.065	.0234	.013
P-132	F1	E5R	-37.190	.25	8.94	.065	.0252	.014
P-133	J-123	J-125	-480.472	.03	7.23	.064	.0192	.011
P-134	J-123	F2	-19.120	.03	4.61	.064	.0299	.007
P-135	J-125	HP-3	-449.922	.04	13.50	.064	.0181	.021
P-136	J-125	E10	-30.550	.12	7.36	.064	.0265	.011
P-137	HP-3	J-129	-449.922	.19	13.49	.064	.0181	.021
P-138	HP-1	J-72	-1194.980	.17	18.02	.064	.0159	.027
P-139	J-129	CS-3	-430.532	.05	12.91	.064	.0183	.020
P-140	J-129	E11	-19.390	.04	4.67	.064	.0298	.007
P-141	J-131	J-139	-258.662	.02	7.75	.064	.0204	.012
P-142	J-131	J-137	-171.870	.19	11.25	.064	.0205	.017
P-143	J-133	G9	-37.190	.35	8.94	.065	.0252	.014
P-144	J-133	E6R	-37.190	.25	8.94	.065	.0252	.014
P-145	J-135	J-133	-74.380	.02	8.25	.065	.0234	.013
P-146	J-135	G8	-31.080	.12	7.47	.065	.0263	.011
P-147	J-137	E12	-134.680	.04	8.82	.065	.0216	.013
P-148	J-137	E7R	-37.190	.29	8.94	.065	.0252	.014
P-149	J-139	J-47	-241.662	.06	7.24	.064	.0207	.011
P-150	J-139	E8R	-17.000	.02	4.09	.064	.0309	.006
P-151	J-141	J-101	655.721	.06	9.87	.064	.0180	.015
P-152	J-141	G1	-124.320	.04	8.15	.064	.0220	.012
P-153	J-142	G5	-37.190	.36	8.95	.065	.0252	.014
P-154	J-142	G6	-37.190	.39	8.94	.065	.0252	.014
P-155	G1	G2	-107.320	.31	11.92	.064	.0215	.018
P-156	G2	J-142	-74.380	.12	17.90	.064	.0214	.027
P-157	J-147	J-141	531.401	.05	8.00	.064	.0188	.012
P-158	J-147	G3	-24.700	.08	5.95	.064	.0279	.009
P-159	J-149	HP-4	506.701	.18	15.20	.064	.0177	.023
P-160	J-149	H1	-45.960	.06	11.07	.064	.0239	.017
P-161	H1	H2	-30.550	.19	7.35	.064	.0265	.011
P-162	J-152	J-49	231.686	.02	6.94	.064	.0209	.011
P-163	J-152	I14	-22.580	.04	5.43	.064	.0286	.008
P-164	J-154	J-169	171.916	.00	5.15	.064	.0224	.008
P-165	J-154	H7	-37.190	.27	8.95	.065	.0252	.014
P-166	J-156	J-167	97.536	.00	2.92	.064	.0257	.004
P-167	J-156	H6	-37.190	.03	8.95	.064	.0252	.014
P-168	J-158	J-164	-107.794	.01	3.23	.064	.0250	.005
P-169	J-158	G7	-15.940	.03	3.84	.064	.0314	.006
P-170	J-160	J-156	60.346	.01	1.81	.064	.0290	.003
P-171	J-160	H4	-102.000	.10	11.32	.065	.0217	.017
P-172	G11	G12	-37.190	.32	8.94	.065	.0252	.014
P-173	H4	G11	-74.380	.16	8.25	.065	.0234	.013
P-174	J-164	J-160	-41.654	.00	2.73	.064	.0289	.004
P-175	J-164	H5	-66.140	.11	7.34	.065	.0240	.011
P-176	H5	I4	-37.190	.29	8.94	.065	.0252	.014
P-177	J-167	HP-6	134.726	.02	4.04	.064	.0237	.006
P-178	J-167	I5	-37.190	.31	8.94	.065	.0252	.014
P-179	J-169	J-152	209.106	.03	6.27	.064	.0214	.010
P-180	J-169	I15	-37.190	.24	8.95	.065	.0252	.014
P-181	J-171	J-173	-101.728	.01	3.05	.064	.0254	.005
P-182	J-171	H3	-16.200	.03	3.90	.064	.0313	.006
P-183	J-173	J-174	-50.458	.01	1.51	.064	.0305	.002

P-184	J-173	I1	-51.270	.06	5.69	.065	.0256	.009
P-185	J-174	J-177	-32.928	.00	.99	.064	.0344	.002
P-186	J-174	I2	-17.530	.01	4.22	.064	.0306	.006
P-187	J-177	J-179	-9.288	.00	.28	.064	.0074	.000
P-188	J-177	I6	-23.640	.03	5.69	.064	.0283	.009
P-189	J-179	J-183	36.662	.00	1.10	.064	.0333	.002
P-190	J-179	I7	-45.950	.01	5.10	.064	.0263	.008
P-191	I7	I8	-33.730	.19	8.11	.065	.0258	.012
P-192	I1	I3	-34.000	.24	8.18	.065	.0258	.012
P-193	J-183	J-186	88.982	.01	2.67	.064	.0263	.004
P-194	J-183	I9	-52.320	.02	5.81	.064	.0255	.009
P-195	I9	I10	-35.590	.23	8.56	.065	.0255	.013
P-196	J-186	HP-7	113.152	.02	3.39	.064	.0247	.005
P-197	J-186	I11	-24.170	.05	5.81	.064	.0281	.009
P-198	J-188	J-190	206.214	.05	6.18	.064	.0215	.009
P-199	J-188	I12	-22.310	.03	5.37	.064	.0287	.008
P-200	J-190	J-49	229.054	.03	6.87	.064	.0210	.010
P-201	J-190	I13	-22.840	.05	5.50	.064	.0285	.008
P-202	J1	J20	86.924	.01	2.60	.064	.0264	.004
P-203	J20	J-221	98.344	.02	2.95	.064	.0256	.004
P-204	J17	J-50	158.644	.03	4.75	.064	.0228	.007
P-205	J-195	J-48	145.726	.02	4.37	.064	.0233	.007
P-206	J-195	J3	-17.530	.04	4.22	.065	.0306	.006
P-207	J-197	J-195	128.196	.01	3.84	.065	.0240	.006
P-208	J-197	J2	-14.340	.01	3.45	.065	.0324	.005
P-209	J-199	CS-6	113.856	.01	3.41	.065	.0247	.005
P-210	J-199	J4	-53.390	.01	5.93	.065	.0253	.009
P-211	J4	J5	-30.550	.19	7.35	.065	.0265	.011
P-212	J-202	HP-8	60.466	.00	1.81	.065	.0290	.003
P-213	J-202	J6	-34.000	.02	8.18	.065	.0258	.012
P-214	J-204	J-202	26.466	.00	.79	.065	.0366	.001
P-215	J-204	J8	-26.560	.01	6.39	.065	.0274	.010
P-216	J-206	J-204	-.094	.00	.00	.065	.0059	.000
P-217	J-206	J9	-22.840	.01	5.49	.065	.0285	.008
P-218	J-208	J-206	-22.934	.00	.69	.065	.0382	.001
P-219	J-208	J10	-36.650	.03	8.82	.065	.0253	.013
P-220	J-210	J-208	-59.584	.01	1.79	.065	.0291	.003
P-221	J-210	J11	-64.280	.01	7.13	.065	.0242	.011
P-222	J11	J12	-37.190	.23	8.94	.065	.0252	.014
P-223	J-213	CS-7	-123.864	.00	3.71	.065	.0242	.006
P-224	J-213	J13	-57.380	.02	6.37	.065	.0249	.010
P-225	J13	J14	-37.190	.25	8.94	.065	.0252	.014
P-226	J-216	J-213	-181.244	.03	5.43	.064	.0221	.008
P-227	J-216	J15	-52.060	.02	5.78	.064	.0255	.009
P-228	J15	J7	-35.590	.27	8.56	.065	.0255	.013
P-229	J-219	J-216	-233.304	.05	6.99	.064	.0209	.011
P-230	J-219	J16	-19.660	.04	4.73	.064	.0297	.007
P-231	J-221	J-223	122.784	.00	3.68	.064	.0242	.006
P-232	J-221	J19	-24.440	.08	5.88	.064	.0280	.009
P-233	J-223	J17	138.984	.01	4.17	.064	.0235	.006
P-234	J-223	J18	-16.200	.06	3.90	.064	.0313	.006
P-235	J-225	J-50	-411.608	.06	12.34	.064	.0184	.019
P-236	J-225	K1	-31.600	.01	3.51	.064	.0290	.005
P-237	J-226	J-225	-443.208	.19	13.29	.064	.0182	.020
P-238	J-226	K2	-10.360	.01	2.49	.064	.0355	.004

P-239	F12	J-66	-77.020	.06	8.59	.064	.0232	.013
P-240	C6R	J-53	-285.020	.21	18.74	.064	.0184	.029
P-241	C5R	C3R	-29.750	.22	7.18	.064	.0266	.011
P-242	C8	C10	-68.800	.14	7.66	.064	.0238	.012
P-243	C10	C11	-37.190	.28	8.97	.064	.0252	.014
P-244	CS-2	J-76a	1279.860	.10	19.30	.064	.0157	.029
P-245	HP-2	J-38	1308.550	.43	19.75	.064	.0156	.030
P-246	CS-1	J-74	-1183.030	.11	17.83	.064	.0159	.027
P-247	HP-5	J-85	21.022	.00	.63	.064	.0393	.001
P-248	E12	J-135	-105.460	.10	11.70	.065	.0216	.018
P-249	CS-3	J-131	-430.532	.06	12.91	.064	.0183	.020
P-250	HP-4	J-147	506.701	.01	7.63	.064	.0190	.012
P-251	CS-4	J-149	460.740	.10	13.82	.064	.0180	.021
P-252	HP-6	J-154	134.726	.02	4.04	.064	.0237	.006
P-253	CS-6	J-197	113.856	.01	3.41	.065	.0247	.005
P-254	HP-8	J-199	60.466	.00	1.81	.065	.0290	.003
P-255	CS-7	J-210	-123.864	.02	3.71	.065	.0242	.006
P-256	K1	K3	-19.120	.09	4.60	.064	.0299	.007
R-1	R-1	R-1	-3113.640	.00	.01	.064	.0338	.000

JUNCTION NAME	NODE TITLE	DEMAND (USFU)	PRESSURE (USPU)	PRESSURE (PSIA)	PRESSURE (PSIG)	DENSITY #/CF
A1		-15.67	-39.45	13.27	-1.42	.064
A2		-15.67	-39.37	13.28	-1.42	.064
A3		-18.33	-39.33	13.28	-1.42	.064
A4		-9.03	-39.38	13.28	-1.42	.064
A5		-9.30	-39.33	13.28	-1.42	.064
B1		-5.84	-39.92	13.26	-1.44	.064
B10		-11.69	-39.86	13.26	-1.44	.064
B11		-6.11	-39.89	13.26	-1.44	.064
B12		-6.11	-39.88	13.26	-1.44	.064
B2		-5.84	-39.70	13.26	-1.43	.064
B3		-7.70	-39.58	13.27	-1.43	.064
B4		-6.37	-39.51	13.27	-1.43	.064
B5		-7.70	-39.44	13.27	-1.42	.064
B6		-6.11	-39.35	13.28	-1.42	.064
B7		-6.64	-39.34	13.28	-1.42	.064
B8		-9.03	-39.33	13.28	-1.42	.064
B9		-8.23	-39.32	13.28	-1.42	.064
C10		-31.61	-37.63	13.34	-1.36	.064
C11		-37.19	-37.35	13.35	-1.35	.064
C1R		-14.87	-38.58	13.30	-1.39	.064
C2R		-28.69	-38.27	13.32	-1.38	.064
C3R		-29.75	-37.72	13.34	-1.36	.064
C4R		-31.08	-37.59	13.34	-1.36	.064
C5R		-24.97	-37.94	13.33	-1.37	.064
C6R		-14.61	-38.22	13.32	-1.38	.064
C7R		-18.59	-38.18	13.32	-1.38	.064
C8		-27.36	-37.76	13.33	-1.36	.064
C9		-32.94	-37.63	13.34	-1.36	.064
D10		-37.19	-37.20	13.35	-1.34	.064

D11	-36.65	-37.22	13.35	-1.34	.064
D12	-29.22	-37.13	13.36	-1.34	.064
D1R	-28.69	-37.61	13.34	-1.36	.064
D2R	-9.03	-37.55	13.34	-1.35	.064
D3R	-28.69	-37.35	13.35	-1.35	.064
D4R	-26.56	-37.19	13.35	-1.34	.064
D5R	-35.06	-37.34	13.35	-1.35	.064
D6	-35.06	-37.39	13.35	-1.35	.064
D7R	-7.97	-37.35	13.35	-1.35	.064
D8R	-10.89	-37.24	13.35	-1.34	.064
D9R	-37.19	-37.10	13.36	-1.34	.064
E10	-30.55	-36.96	13.36	-1.33	.064
E11	-19.39	-36.80	13.37	-1.33	.064
E12	-29.22	-36.52	13.38	-1.32	.065
E1R	-37.19	-35.99	13.40	-1.30	.065
E2R	-37.19	-36.92	13.36	-1.33	.064
E3R	-37.19	-36.01	13.40	-1.30	.065
E4R	-37.19	-36.12	13.39	-1.30	.065
E5R	-37.19	-36.19	13.39	-1.31	.065
E6R	-37.19	-36.15	13.39	-1.30	.065
E7R	-37.19	-36.26	13.39	-1.31	.065
E8R	-17.00	-36.70	13.37	-1.32	.064
E9R	-37.19	-35.86	13.40	-1.29	.065
F1	-37.19	-36.44	13.38	-1.31	.065
F10	-13.02	-38.15	13.32	-1.38	.064
F11	-9.56	-37.88	13.33	-1.37	.064
F12	-11.95	-38.31	13.31	-1.38	.064
F13	-27.09	-38.10	13.32	-1.37	.064
F14	-12.48	-37.46	13.34	-1.35	.064
F15	-31.08	-37.05	13.36	-1.34	.064
F16	-31.34	-37.97	13.33	-1.37	.064
F17	-37.19	-37.16	13.36	-1.34	.064
F18	-37.19	-37.05	13.36	-1.34	.064
F19	-37.19	-36.29	13.39	-1.31	.065
F2	-19.12	-37.07	13.36	-1.34	.064
F3R	-18.06	-37.13	13.36	-1.34	.064
F4R	-27.36	-36.61	13.38	-1.32	.065
F5	-30.55	-36.61	13.38	-1.32	.065
F6	-22.84	-37.22	13.35	-1.34	.064
F7R	-12.22	-37.32	13.35	-1.35	.064
F8R	-29.75	-37.28	13.35	-1.34	.064
F9	-11.95	-37.65	13.34	-1.36	.064
G1	-17.00	-37.14	13.36	-1.34	.064
G10	-37.19	-35.65	13.41	-1.29	.065
G11	-37.19	-36.38	13.38	-1.31	.065
G12	-37.19	-36.06	13.40	-1.30	.065
G2	-32.94	-36.83	13.37	-1.33	.064
G3	-24.70	-37.05	13.36	-1.34	.064
G4	-37.19	-36.78	13.37	-1.33	.064
G5	-37.19	-36.35	13.38	-1.31	.065
G6	-37.19	-36.32	13.39	-1.31	.065
G7	-15.94	-36.62	13.37	-1.32	.065
G8	-31.08	-36.30	13.39	-1.31	.065
G9	-37.19	-36.05	13.40	-1.30	.065
H1	-15.41	-36.89	13.37	-1.33	.064

H2	-30.55	-36.70	13.37	-1.32	.064
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H4	-27.62	-36.55	13.38	-1.32	.065
H5	-28.95	-36.54	13.38	-1.32	.065
H6	-37.19	-36.62	13.37	-1.32	.065
H7	-37.19	-36.42	13.38	-1.31	.065
I1	-17.27	-36.59	13.38	-1.32	.065
I10	-35.59	-36.38	13.38	-1.31	.065
I11	-24.17	-36.60	13.38	-1.32	.065
I12	-22.31	-36.64	13.37	-1.32	.064
I13	-22.84	-36.66	13.37	-1.32	.064
I14	-22.58	-36.68	13.37	-1.32	.064
I15	-37.19	-36.45	13.38	-1.32	.065
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J16	-19.66	-36.65	13.37	-1.32	.064
J17	-19.66	-36.69	13.37	-1.32	.064
J18	-16.20	-36.62	13.37	-1.32	.064
J19	-24.44	-36.60	13.38	-1.32	.065
J2	-14.34	-36.61	13.38	-1.32	.065
J20	-11.42	-36.66	13.37	-1.32	.064
J3	-17.53	-36.58	13.38	-1.32	.065
J4	-22.84	-36.58	13.38	-1.32	.065
J5	-30.55	-36.39	13.38	-1.31	.065
J6	-34.00	-36.56	13.38	-1.32	.065
J7	-35.59	-36.35	13.38	-1.31	.065
J8	-26.56	-36.57	13.38	-1.32	.065
J9	-22.84	-36.58	13.38	-1.32	.065
K1	-12.48	-36.77	13.37	-1.33	.064
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K3	-19.12	-36.68	13.37	-1.32	.064
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CS-2	.00	-37.65	13.34	-1.36	.064
CS-3	.00	-36.80	13.37	-1.33	.064
CS-4	.00	-36.85	13.37	-1.33	.064
CS-6	.00	-36.60	13.38	-1.32	.065
CS-7	.00	-36.61	13.38	-1.32	.065
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HP-2	.00	-37.85	13.33	-1.37	.064
HP-3	.00	-37.03	13.36	-1.34	.064
HP-4	.00	-37.12	13.36	-1.34	.064
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HP-7	.00	-36.66	13.37	-1.32	.064
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J-27	.00	-39.38	13.28	-1.42	.064
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J-30	.00	-38.58	13.30	-1.39	.064
J-32	.00	-39.90	13.26	-1.44	.064
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J-36	.00	-39.48	13.27	-1.42	.064
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J-54	.00	-37.84	13.33	-1.37	.064
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J-62	.00	-38.33	13.31	-1.38	.064
J-63	.00	-38.22	13.32	-1.38	.064
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J-119	.00	-37.16	13.36	-1.34	.064
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J-210	.00	-36.60	13.38	-1.32	.065
J-213	.00	-36.61	13.38	-1.32	.065
J-216	.00	-36.65	13.37	-1.32	.064
J-219	.00	-36.70	13.37	-1.32	.064
J-221	.00	-36.68	13.37	-1.32	.064
J-223	.00	-36.68	13.37	-1.32	.064
J-225	.00	-36.78	13.37	-1.33	.064
J-226	.00	-36.96	13.36	-1.33	.064

J-76a	.00	-37.75	13.33	-1.36	.064
R-1	.00	-40.00	13.25	-1.44	.064

* This designates the use of default density in a low pressure region

THE NET SYSTEM DEMAND (USFU) = -3113.639

SUMMARY OF INFLOWS(+).AND.OUTFLOWS(-) :

NAME	FLOW (USFU)	FPN TITLE
R-1	-3113.6	R-1

MAXIMUM MACH NUMBER = .03 IN LINE NO. P-1

SUMMARY OF MINIMUM.AND.MAXIMUM VELOCITIES (FT/S)

MINIMUM		MAXIMUM	
P-216	.00	P-1	26.58
R-1	.01	P-29	25.21
P-187	.28	P-44	24.28
P-103	.47	P-116	23.30
P-106	.63	P-117	21.28

SUMMARY OF MINIMUM.AND.MAXIMUM LOSS/1000. (PSI)

MINIMUM		MAXIMUM	
P-216	.00	P-156	.14
R-1	.00	P-116	.11
P-187	.00	P-117	.09
P-103	.00	P-58	.08
P-106	.00	P-240	.07

SUMMARY OF MINIMUM.AND.MAXIMUM PRESSURES (USPU)

MINIMUM		MAXIMUM	
R-1	-40.00	G10	-35.65
J-28	-39.93	E9R	-35.86
J-24	-39.93	E1R	-35.99
J-25	-39.93	E3R	-36.01
J-34	-39.92	G9	-36.05

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************************    END OF KYGAS SIMULATION    ***********************


DATE FOR THIS COMPUTER RUN       :  4-08-2017
START TIME FOR THIS COMPUTER RUN : 11:27:15:93
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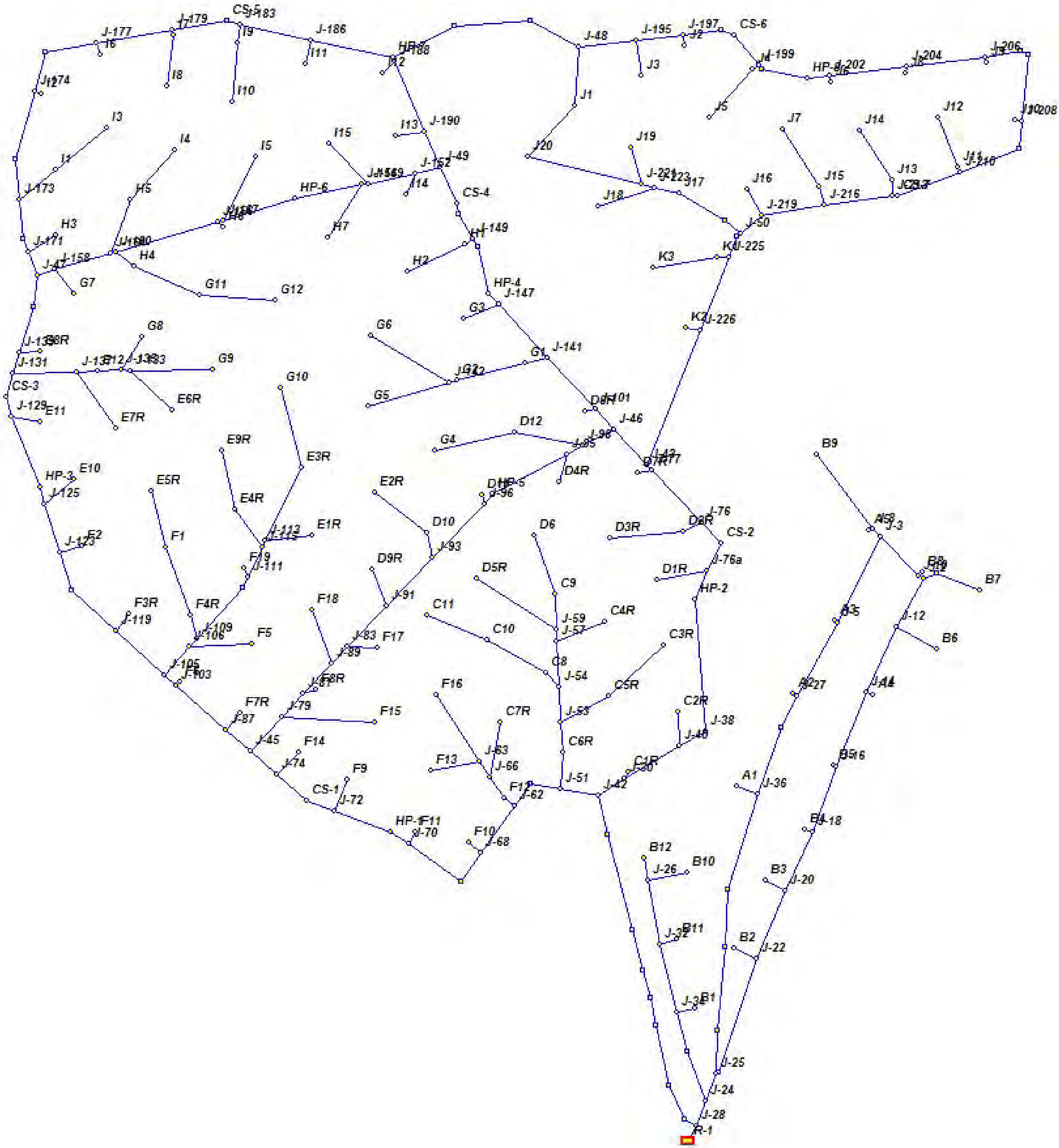
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I1
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H7
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J-171
J-158
H4
H2
J-149
J-147
HP-4
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G7
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G12
G3
K2
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G8
G6
G9
J-131
CS-3
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E11
E6R
E7R
G10
G5
G1
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D12
G4
J-46
D4R
E9R
E3R
HP-3
E10
J-125
E5R
E2R
E4R
E1R
F1
D10
J-93
J-76
CS-2
D3R
D6
B9
J-3
J-123
J-111
F19
D9R
D1R
J-76a
HP-2
B7
D5R
C9
J-91
F18
C11
F3R
J-119
F4R
J-109
F5
J-106
J-83
F17
J-89
C10
J-59
C4R
J-57
C3R
B6
J-12
C8
J-54
J-105
J-103
F8R
C5R
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F7R
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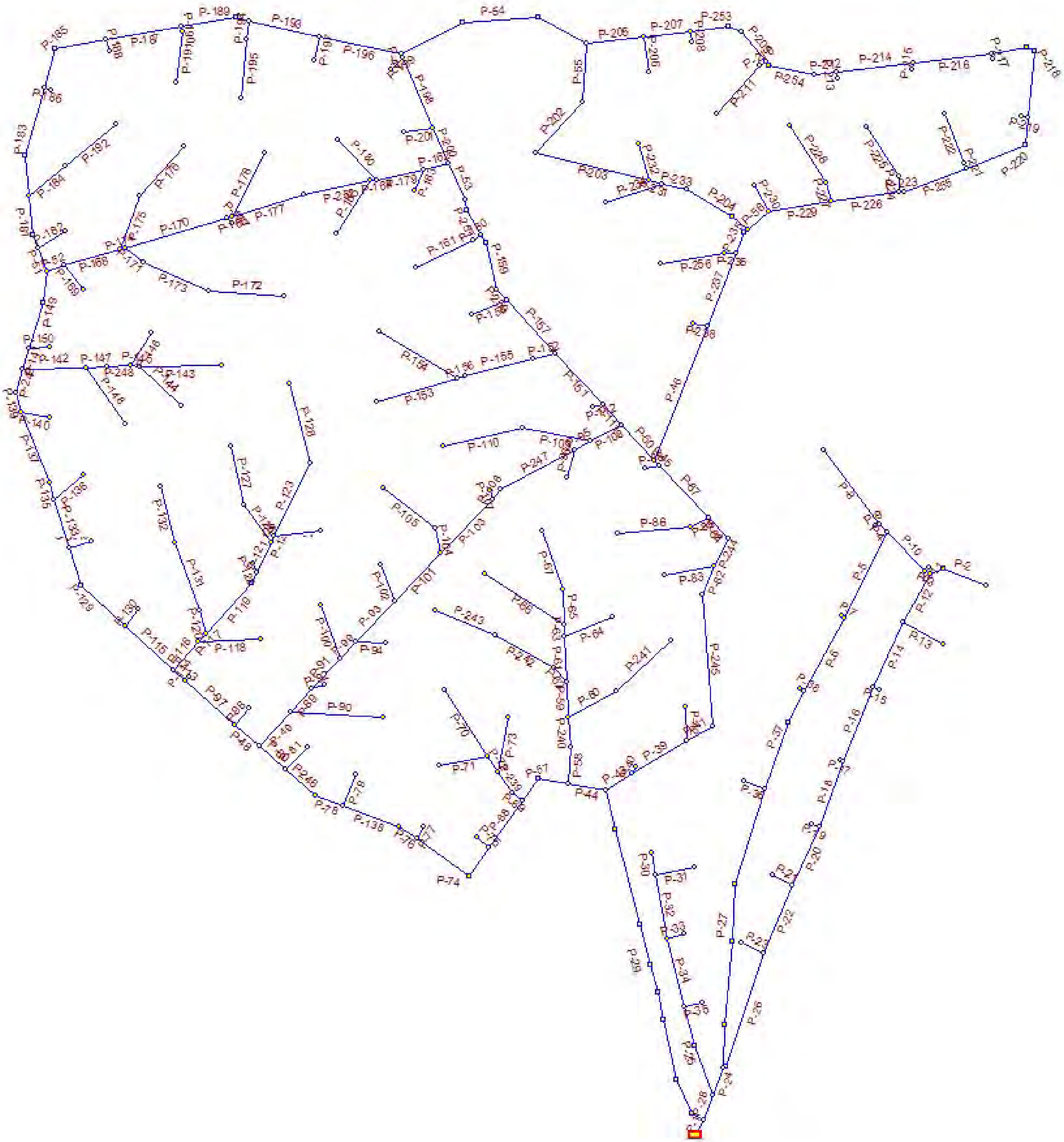
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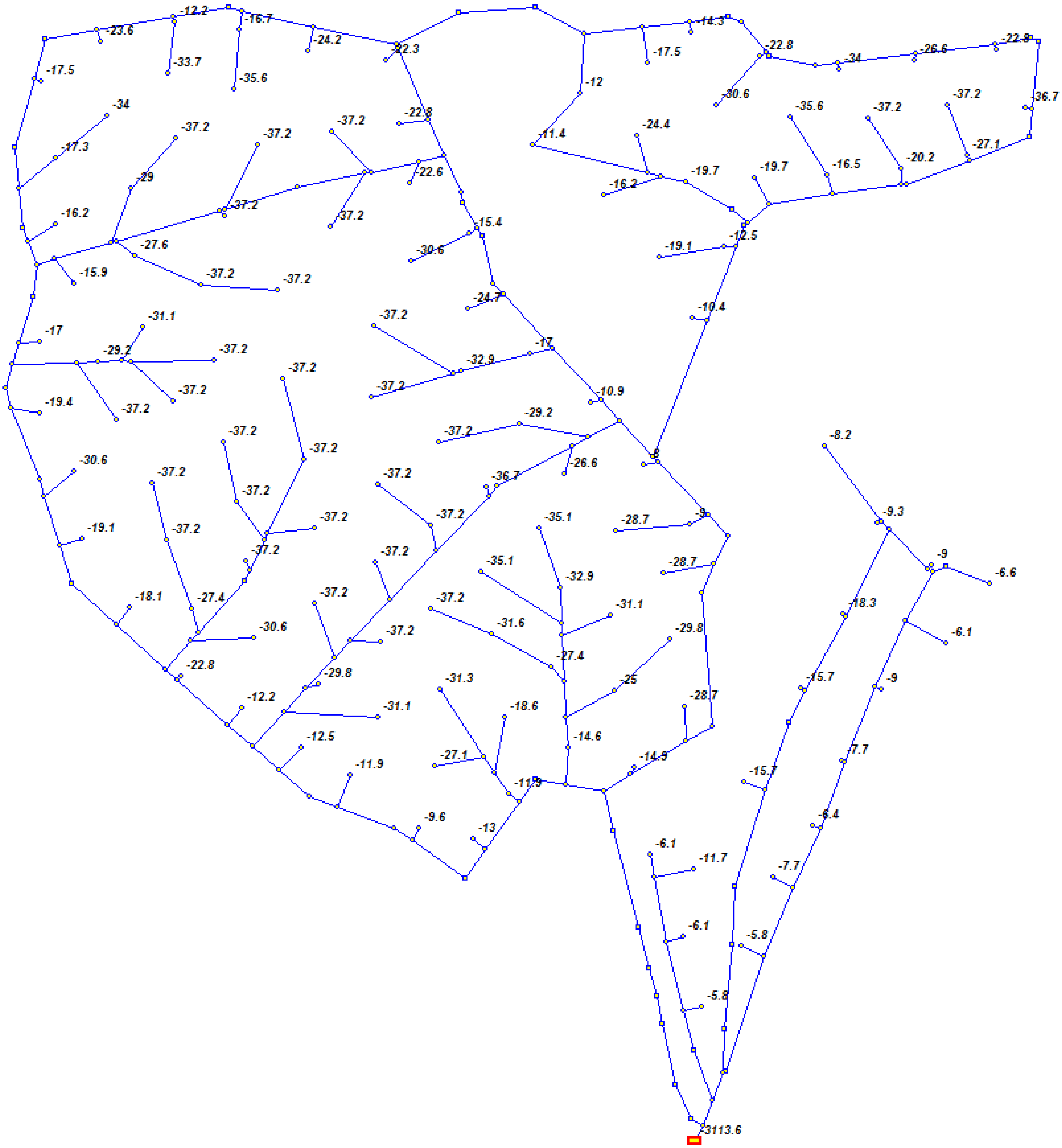
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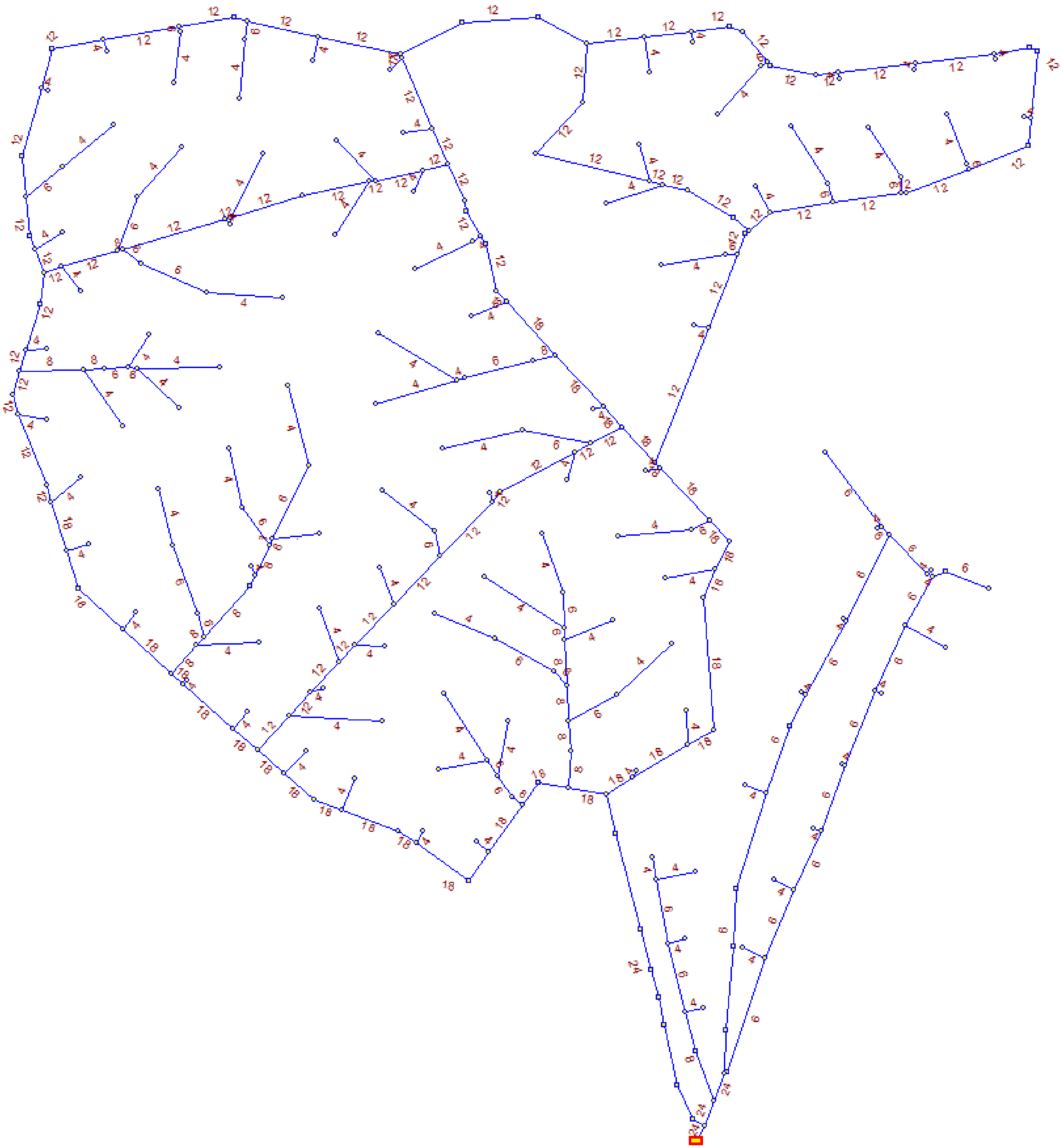
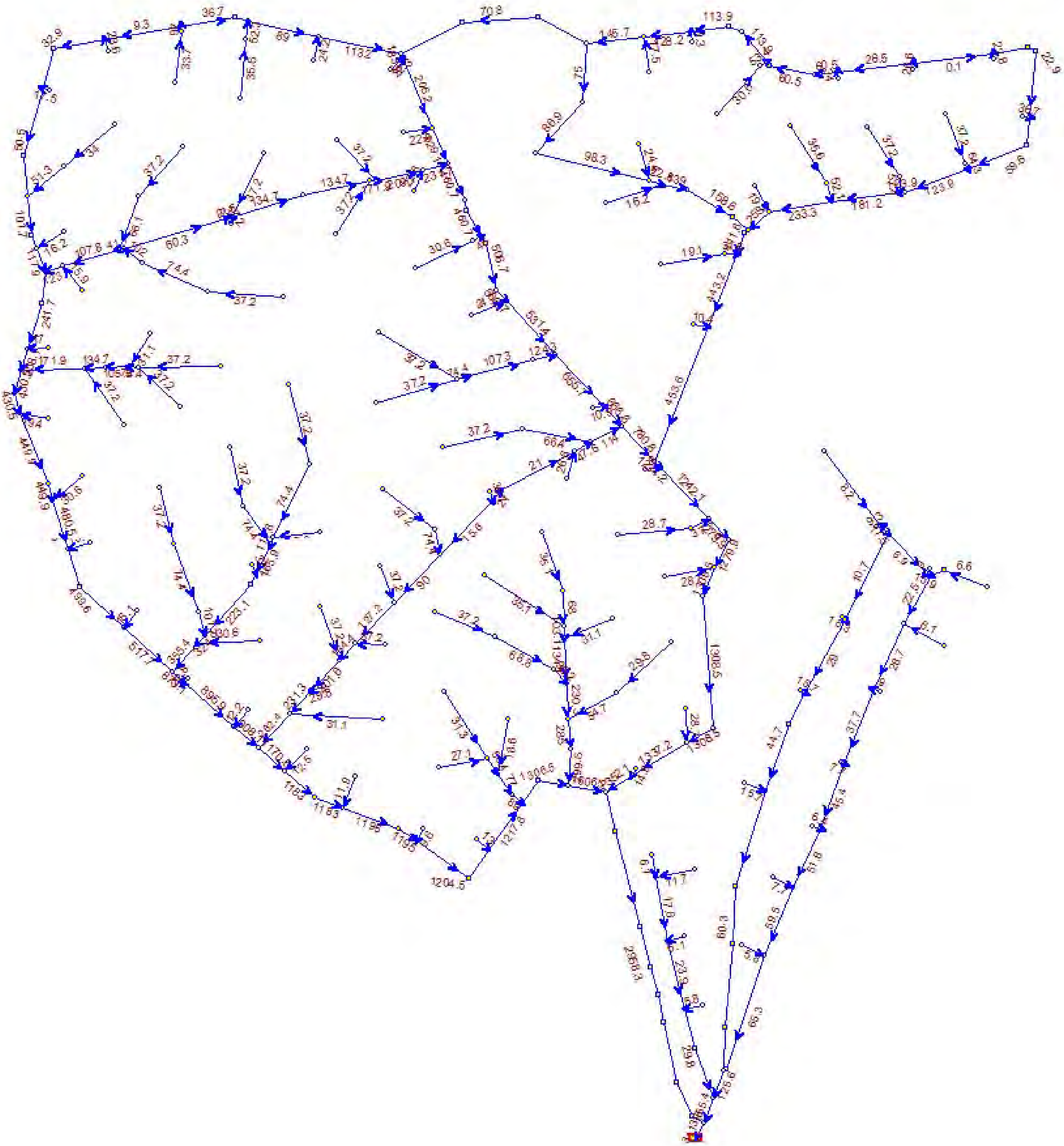
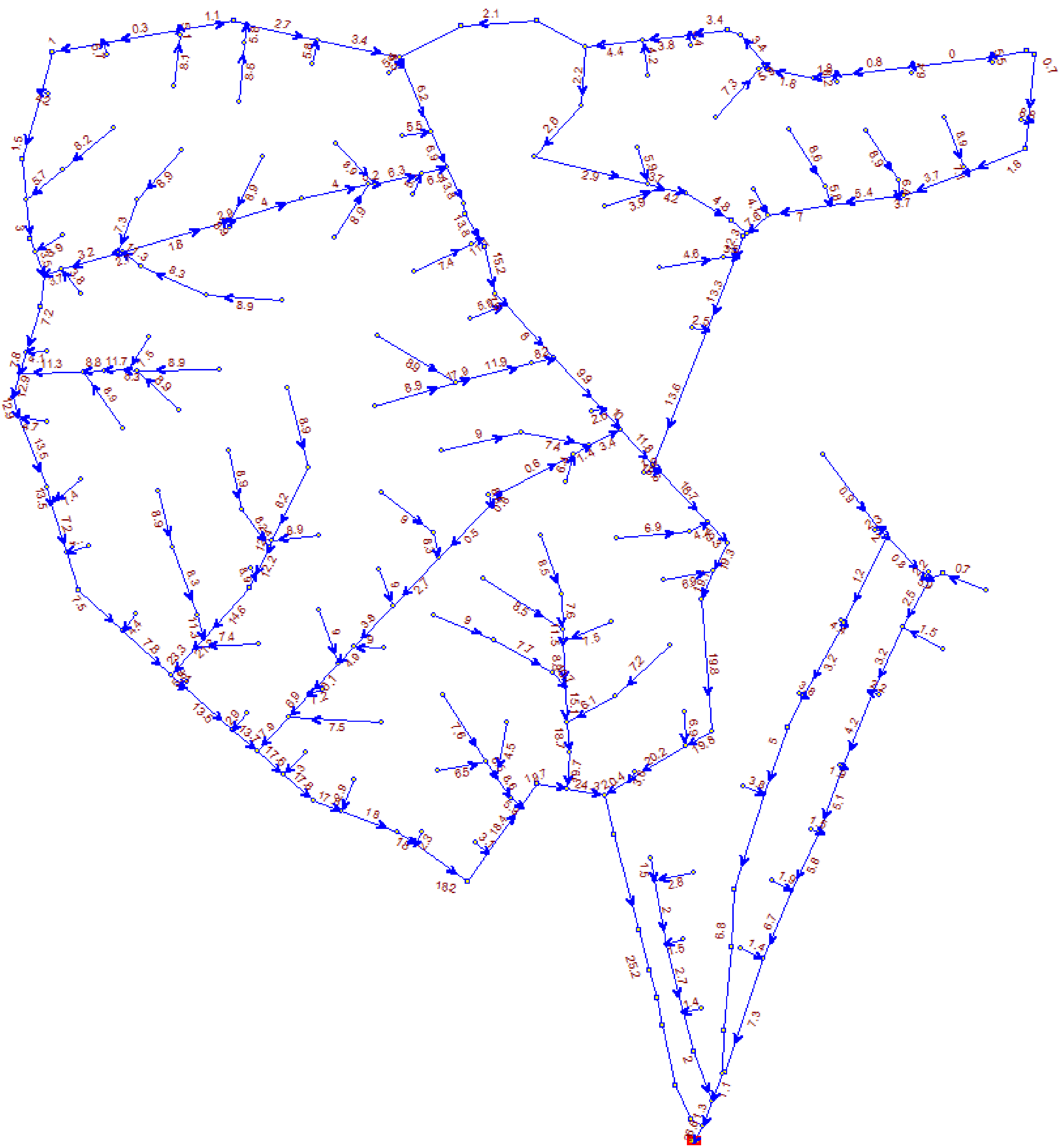
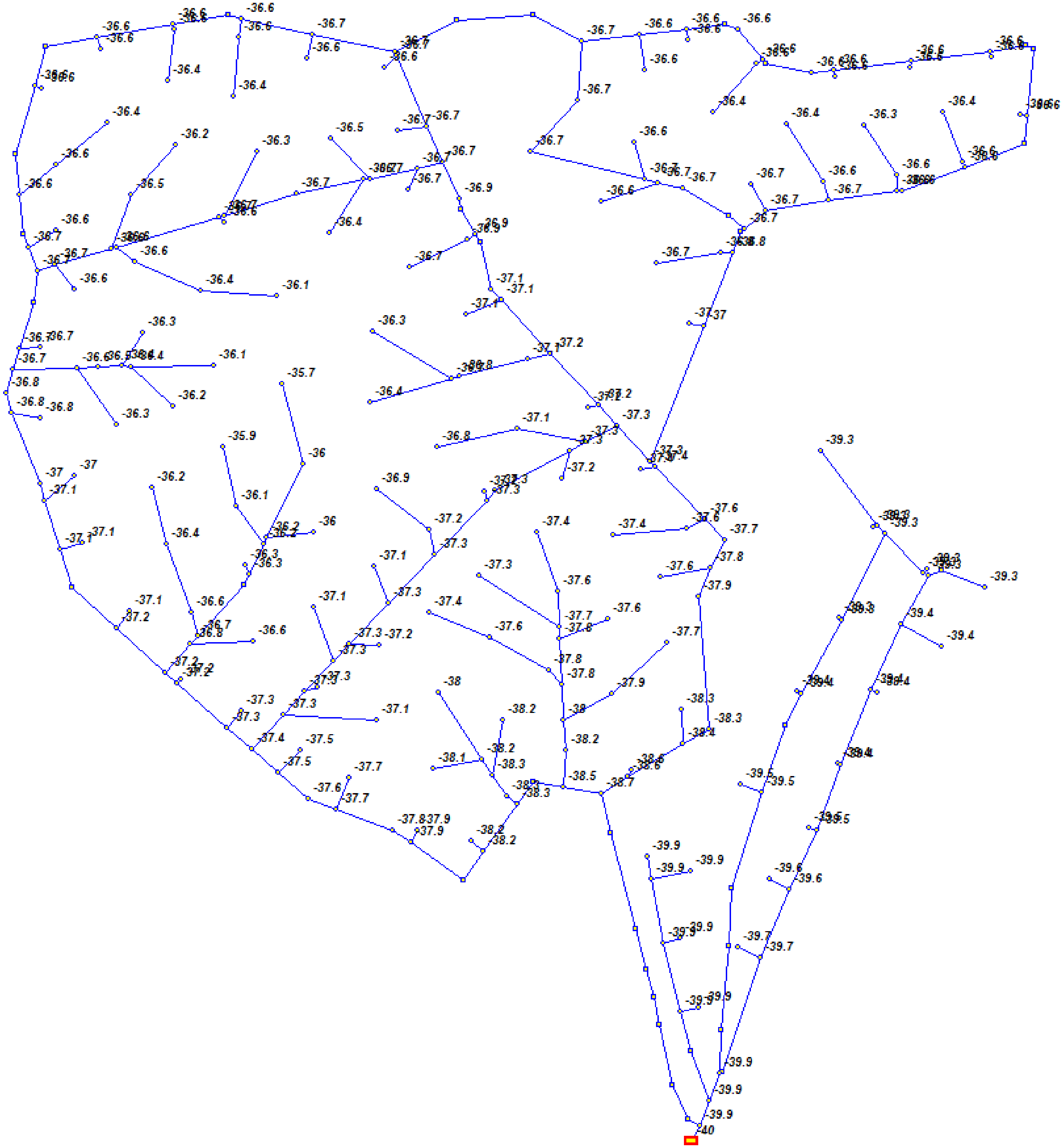
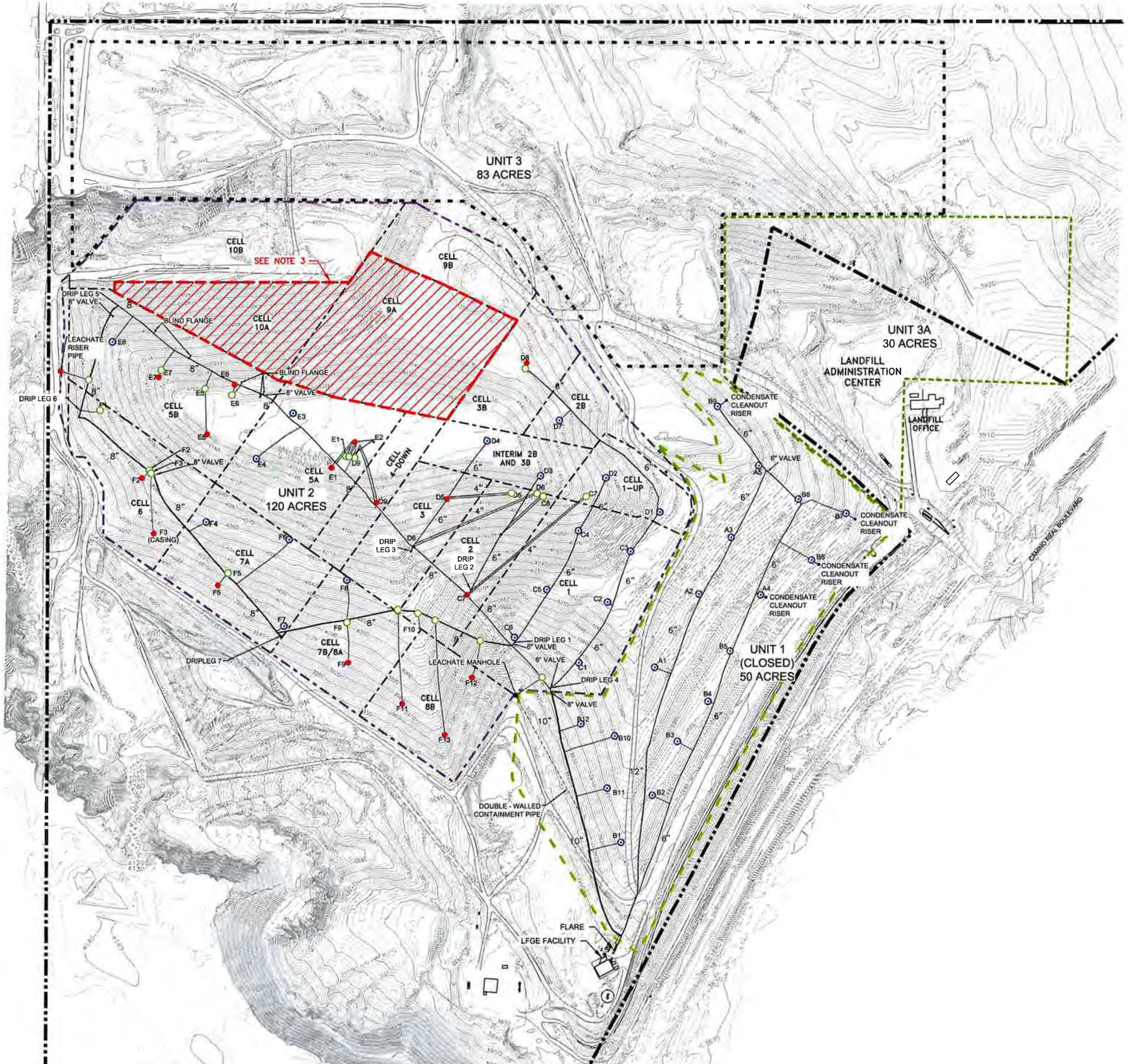








APPENDIX C
DRAWINGS



0 250 500
SCALE IN FEET

LEGEND

- EXISTING CONTOUR (SEE NOTE 1)
- SOLID WASTE FACILITY BOUNDARY
- PERMITTED LIMIT OF WASTE FOR UNIT 1 (CLOSED)
- PERMITTED LIMIT OF WASTE FOR UNIT 2
- CONCEPTUAL LIMIT OF WASTE FOR UNIT 3
- CONCEPTUAL LIMIT OF WASTE FOR UNIT 3A
- CELL BOUNDARY
- EXISTING PIPING
- B4 — EXISTING GCCS WELL AND WELLHEAD
- C7 — EXISTING GCCS WELLHEAD
- E1 — EXISTING GCCS WELL (CASING ONLY)

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NEW MEXICO
15236
PROFESSIONAL ENGINEER
5/10/17
Exp. 12/31/18

NOTES

1. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2016 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2016 TOPOGRAPHIC SURVEY FROM AN AERIAL SURVEY FLOWN IN 2016.

2. THE EXISTING GCCS LAYOUT IS FROM A DRAWING TITLED GCCS SITE PLAN, DATED NOVEMBER 1, 2010, PROVIDED BY GORDON ENVIRONMENTAL, INC.

3. AREA HIGHLIGHTED ON THIS DRAWING SHOWS THE AREA OUTSIDE OF THE GAS SYSTEM, THAT WILL HAVE WASTE-IN-PLACE FOR 5 YEARS BY THE NSPS CONTROL DATE FOR THIS SITE OF NOVEMBER 16, 2018.

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: EXISTING SITE LAYOUT

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-8060 FAX NO. (505) 349-8061

PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: BRK
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 01 - EXISTING GCCS

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO 1

4/10/2017 3:58 PM G:\Camino Real\16216119.00 GCCS Design Plan\01 - EXISTING GCCS

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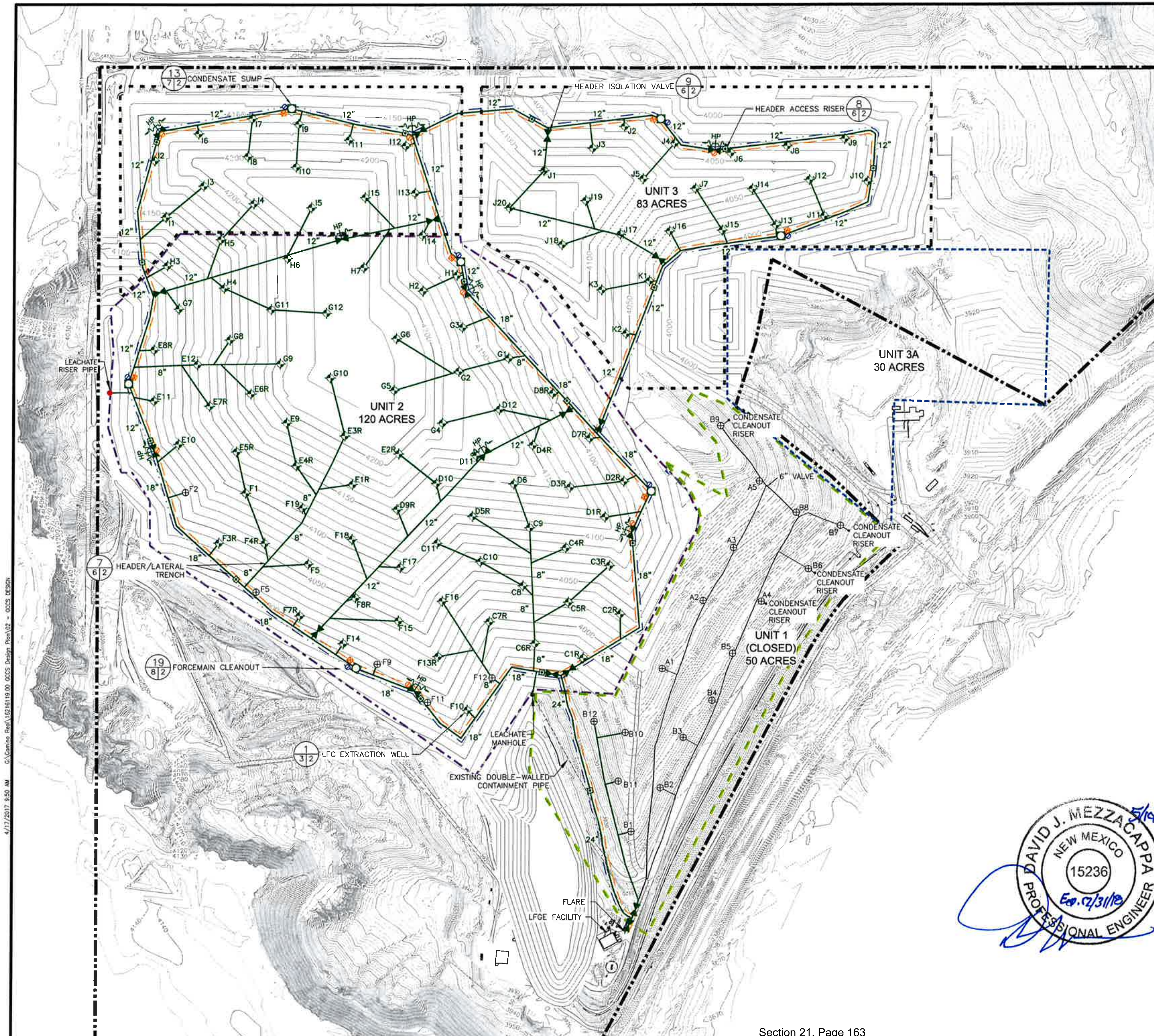

0 250 500
SCALE IN FEET

LEGEND

	EXISTING CONTOURS (SEE NOTE 1)
—4050—	PERMITTED FINAL COVER CONTOUR (SEE NOTE 2)
	SOLID WASTE FACILITY BOUNDARY
	PERMITTED LIMIT OF WASTE FOR UNIT 1 (CLOSED)
	PERMITTED LIMIT OF WASTE FOR UNIT 2
	CONCEPTUAL LIMIT OF WASTE FOR UNIT 3
	CONCEPTUAL LIMIT OF WASTE FOR UNIT 3A
	EXISTING HEADER/LATERAL PIPING
E1	EXISTING GCCS WELL
	PROPOSED HEADER/LATERAL PIPING
	PROPOSED AIR SUPPLY LINE
	PROPOSED CONDENSATE FORCEMAIN
F10	PROPOSED LFG EXTRACTION WELL
	PROPOSED CONDENSATE SUMP
	PROPOSED HEADER ISOLATION VALVE
	PROPOSED FORCEMAIN ISOLATION VALVE (OPTIONAL)
	PROPOSED AIR SUPPLY LINE ISOLATION VALVE (OPTIONAL)
	PROPOSED HEADER ACCESS RISER (OPTIONAL)
	PROPOSED FORCEMAIN CLEANOUT (OPTIONAL)
HP	PROPOSED HIGH POINT

NOTES

1. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2016 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2016 TOPOGRAPHIC SURVEY FROM AN AERIAL SURVEY FLOWN IN 2016.

2. THE PERMITTED FINAL GRADES ARE BASED ON SITE DEVELOPMENT SEQUENCING INFORMATION PREPARED BY GORDON ENVIRONMENTAL, INC., DATED 05-23-07.

3. THE NSPS REQUIRED COLLECTION AND CONTROL SYSTEM DESIGN PLAN IS BASED ON THE FINAL GRADES CURRENTLY PERMITTED. THE FACILITY IS CURRENTLY AT INTERIM GRADES. THE EVOLUTION OF THE COLLECTION AND CONTROL SYSTEM AS THE LANDFILL IS FILLED WILL ULTIMATELY PRODUCE A DESIGN CONSISTENT WITH THIS PLAN. UNTIL THE LANDFILL HAS REACHED FINAL GRADES, THE COLLECTION AND CONTROL OF LANDFILL GAS PURSUANT TO THE NSPS MAY BE ACCOMPLISHED USING VARIOUS METHODS NOT SPECIFICALLY INCLUDED AS PART OF THE FINAL DESIGN. HOWEVER, ONCE THE FACILITY HAS REACHED THE FINAL GRADES, THE COLLECTION AND CONTROL SYSTEM WILL MEET THE CRITERIA SPECIFIED WITHIN THIS DESIGN PLAN.

4. LOCATION AND INSTALLATION OF THE PROPOSED GAS EXTRACTION WELLS, HEADER AND LATERAL ALIGNMENT, CONDENSATE MANAGEMENT FACILITIES, AND CONTROL DEVICE MAY VARY TO ACCOMMODATE FINAL CONSTRUCTED LANDFILL SLOPE OR SITE OPERATIONS. WELL LOCATIONS MAY CHANGE IF OBSTRUCTIONS ARE ENCOUNTERED DURING DRILLING.

5. REFER TO TABLE 3.2 IN THE LANDFILL GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN FOR A PLANNING-LEVEL WELL SCHEDULE.

6. ROAD CROSSINGS ON LANDFILL TO BE ADDED AS NEEDED WHEN FINAL ACCESS ROADS ARE DESIGNED.

7. PIPE SLOPE OF 5% WITHIN THE WASTE FOOTPRINT IS PREFERRED. IN NO CASES SHALL BELOW-GROUND HEADER PIPE WITHIN THE FOOTPRINT OF WASTE BE DESIGNED OR INSTALLED WITH LESS THAN 3% SLOPE. OUTSIDE OF THE WASTE FOOTPRINT A MINIMUM SLOPE OF 1% IS PREFERRED.

8. ALL PIPE SIZES SHOWN ON THIS DRAWING ARE MINIMUM SIZES. LATERALS FOR ONE WELL ARE SIZED AT NO LESS THAN 4 INCHES, WHILE LATERALS SERVING TWO OR MORE WELLS ARE A MINIMUM OF 6 INCHES IN DIAMETER ALONG THE ENTIRE LENGTH.

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NEW MEXICO
15236
PROFESSIONAL ENGINEER
5/10/17
Exp. 12/31/18

DRAWING TITLE
GCCS LAYOUT PLAN

PROJECT TITLE
CAMINO REAL LANDFILL
LANDFILL GAS COLLECTION AND
CONTROL SYSTEM DEISGN PLAN

CLIENT
CAMINO REAL ENVIRONMENTAL
CENTER, INC.
1000 CAMINO REAL BLVD.
SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-6060 FAX NO. (505) 349-6061

PROJ. NO. 16216119.00 | DSN. BY: DJM | CHK. BY: AGA | DWN. BY: AGA | APP. BY: DJM | Q/A RVW BY: BRK

CADD FILE: 02 – GCCS DESIGN

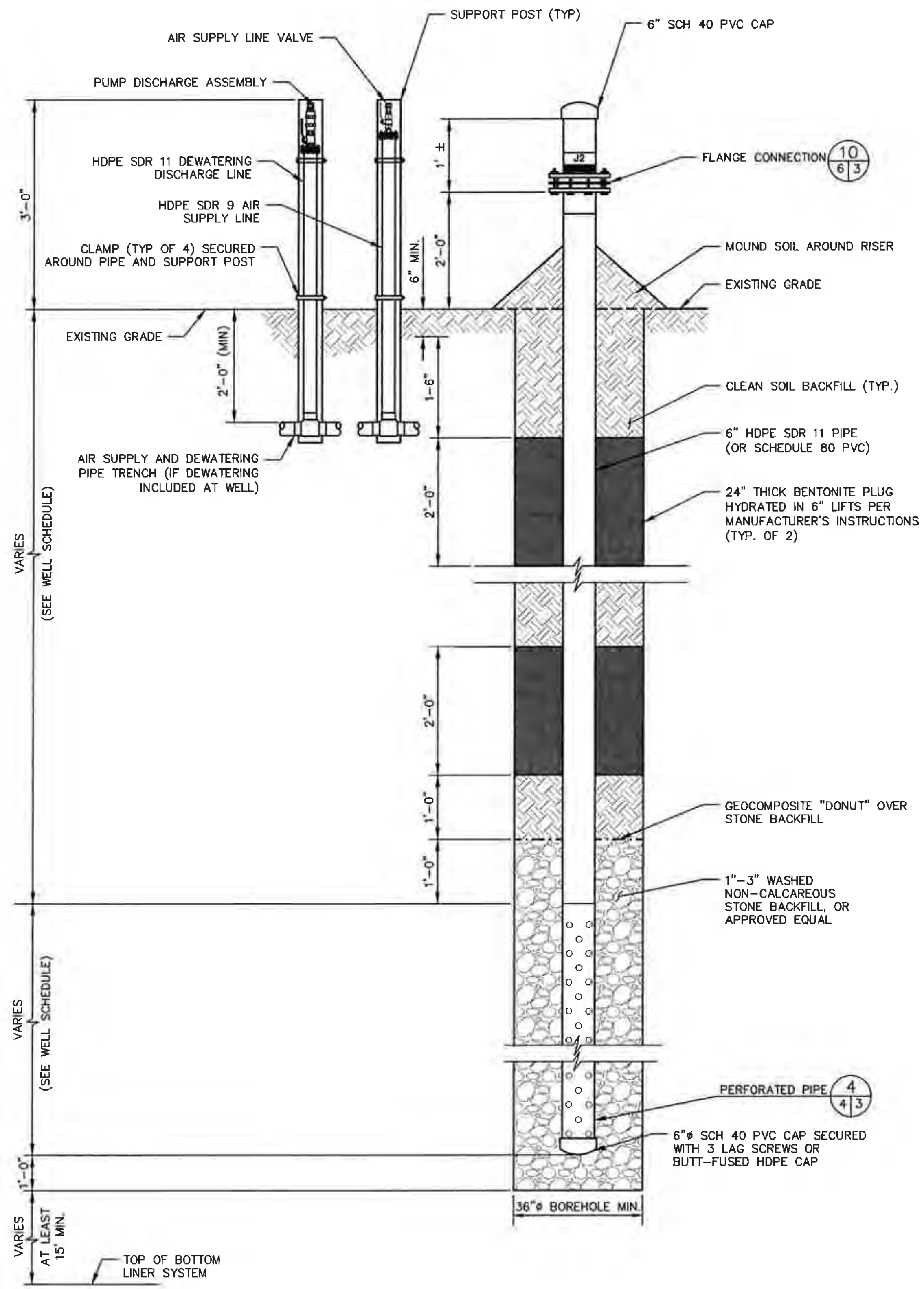
DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 2

4/17/2017 9:50 AM G:\Camino Real\16216119.00 GCCS Design Plan\02 - GCCS DESIGN

FOR COMPLIANCE PURPOSES ONLY



LFG EXTRACTION WELL 1 / 3 2
NTS

DETAIL DESIGNATION
DRAWING DETAIL REFERENCES
DRAWING DETAIL SHOWN ON

DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER
5/19/17
Exp. 12/31/18

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: VERTICAL EXTRACTION WELL DETAILS - 1

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-8060 FAX NO. (505) 349-8061

PROJ. NO. 16216119.00 | DSN. BY: DJM | DWN. BY: AGA | CHK. BY: AGA | Q/A RVW BY: BRK | APP. BY: DJM

CADD FILE: 03 – 05 GCCS DETAILS

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 3

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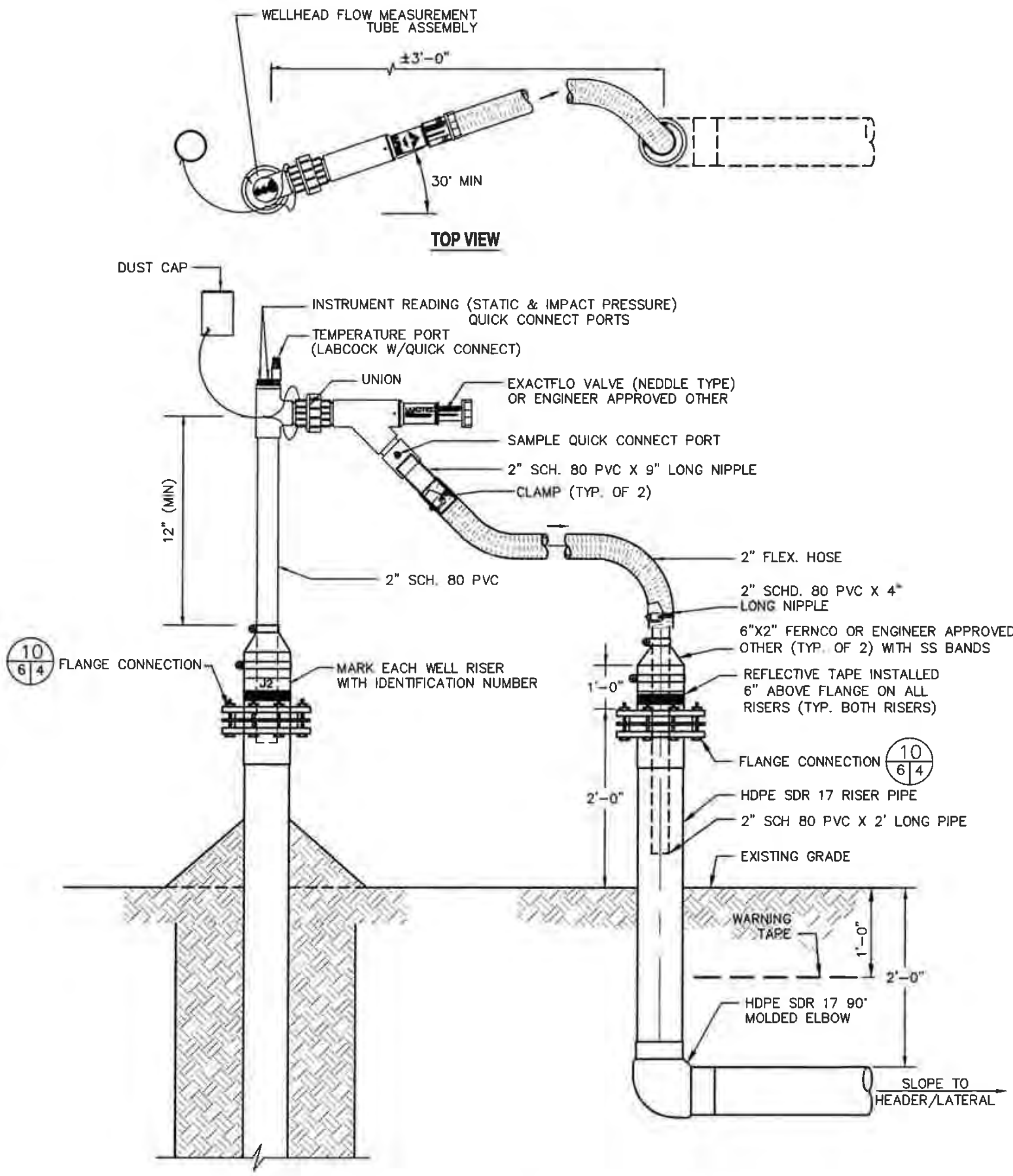
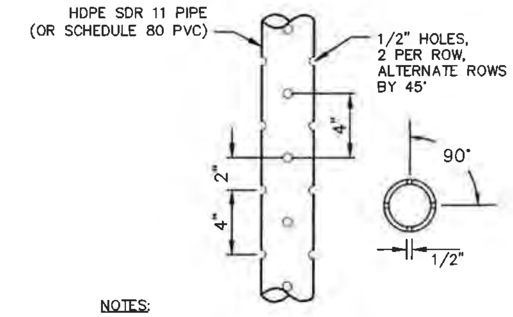


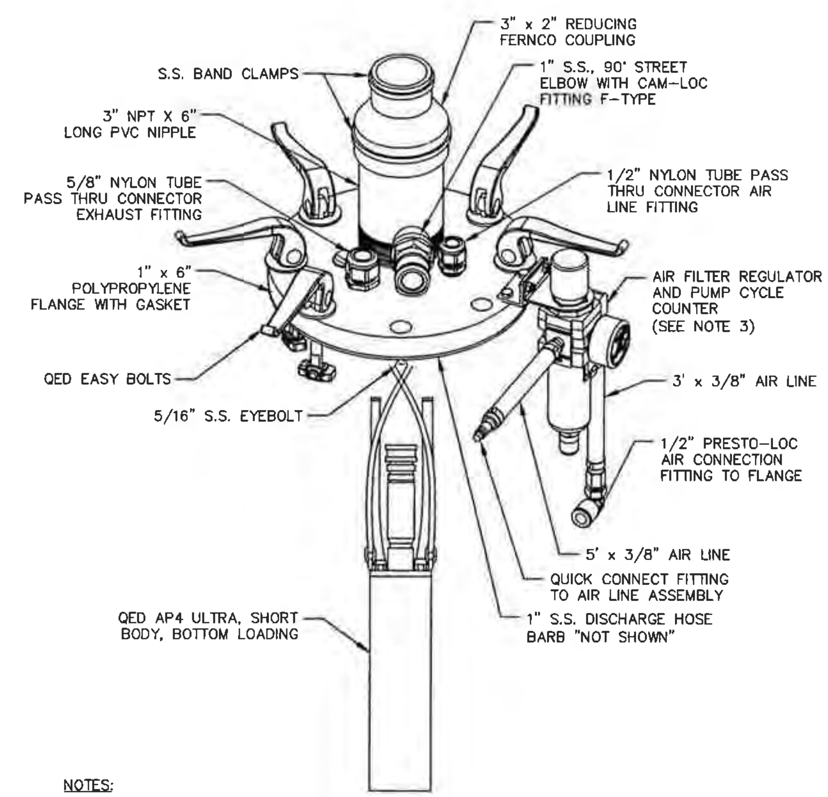
LFG EXTRACTION WELLHEAD 3 / 4 | –
NTS



NOTES:

1. PERFORATIONS SPACED 90° APART HORIZONTALLY.
2. PERFORATIONS SPACED 4" APART VERTICALLY.
3. 90° AND 270° ROWS STAGGERED 2" BELOW 0° AND 180° ROWS.

PERFORATED PIPE 4 / 4 | 3,7
NTS



NOTES:

1. ANY PROPOSED NEW WELL IDENTIFIED FOR DUAL-EXTRACTION SHALL RECEIVE DUAL-EXTRACTION WELL FLANGE CAP AND BOTTOM LOADING PNEUMATIC PUMP. TUBING SHALL BE CONNECTED TO PUMP WITH EASY FITTINGS. PUMP EXHAUST LINES SHALL BE VENTED TO THE ATMOSPHERE; NOT WITHIN THE WELL CASING.
2. AIR REGULATORS SHALL BE INSTALLED WITH QED HIGH FLOW SHUTOFF VALVE, IF AVAILABLE. VALVE SHALL BE INSTALLED ON AIR SUPPLY LINE BETWEEN THE AIR REGULATOR AND PUMP ON THE OUTSIDE OF WELL CASING.

DUAL-EXTRACTION WELL FLANGE CAP 5 / 4 | –
NTS

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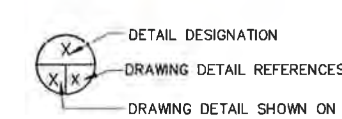
5/10/17
Exp. 12/31/18



REV | DATE | DESCRIPTION | BY

DRAWING TITLE: VERTICAL EXTRACTION WELL DETAILS - 2

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-6060 FAX NO. (505) 349-6061

PROJ. NO. 16216119.00 | DSN. BY: DJM | DWN. BY: AGA | CHK. BY: AGA | Q/A RVW BY: RRK | APP. BY: DJM

CADD FILE: 03 - 05 GCCS DETAILS

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 4

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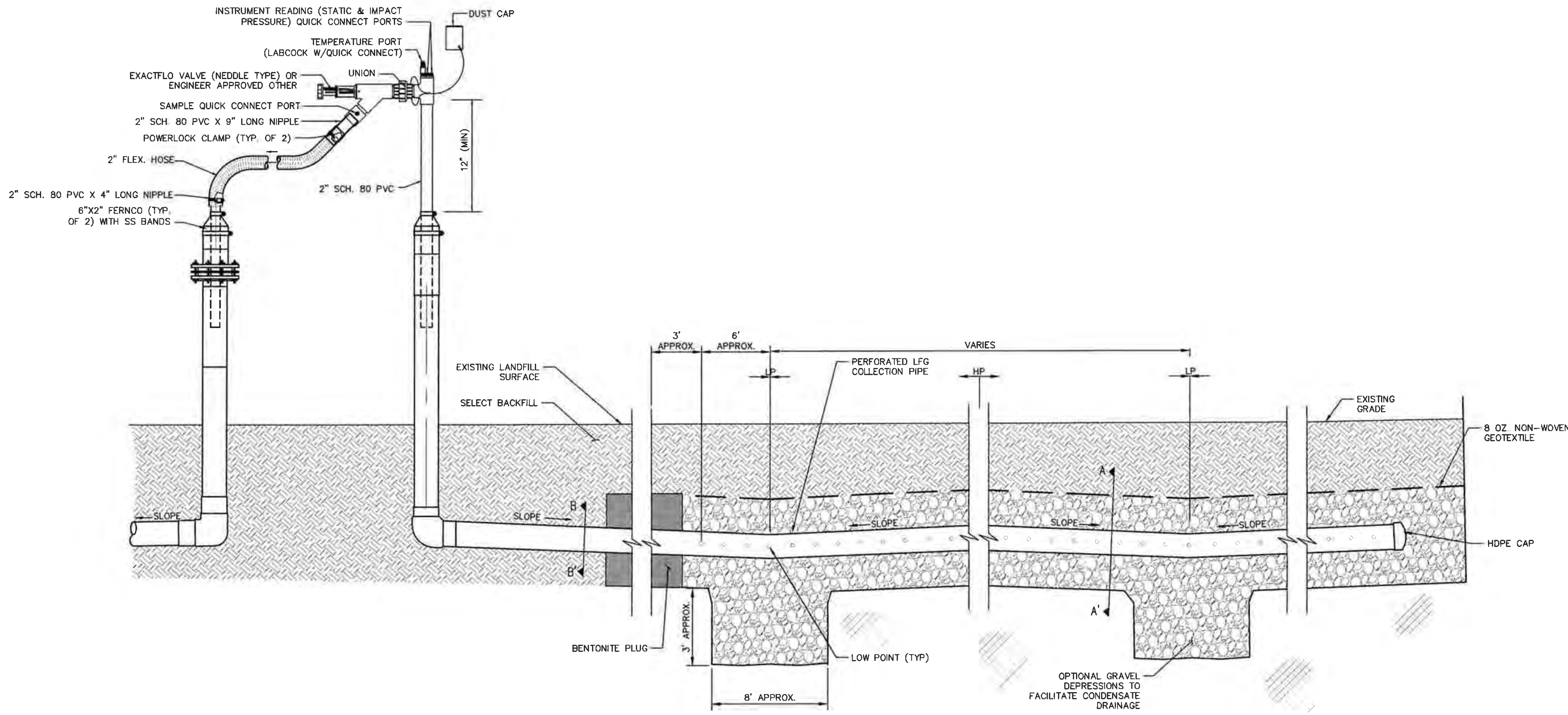
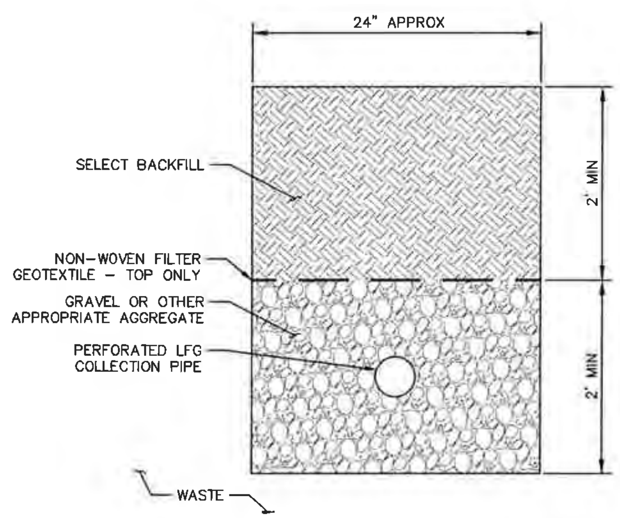


NOTE: CONFIGURATION OF HORIZONTAL MAY BE VARIED BY ELIMINATING OPERATIONAL DEPRESSIONS OR ENHANCING THEM WITH VERTICAL CHIMNEY WELLS, DEPENDING ON THE DESIGN ENGINEER, WASTE CONFIGURATION, AND FUTURE POSSIBLE LANDFILL GAS-TO-ENERGY NEEDS.

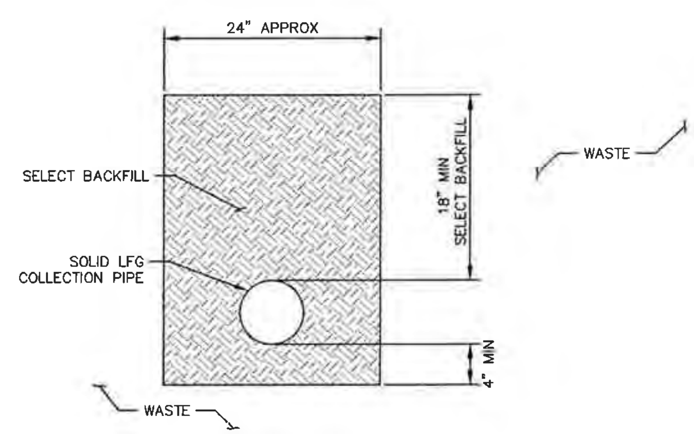
TYPICAL HORIZONTAL LFG COLLECTOR 6/5

NTS



SECTION A-A'

NTS



SECTION B-B'

NTS

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15236
PROFESSIONAL ENGINEER
5/14/17
Exp. 12/31/18

X — DETAIL DESIGNATION
X — DRAWING DETAIL REFERENCES
X — DRAWING DETAIL SHOWN ON

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: HORIZONTAL EXTRACTION WELL DETAIL

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC.
1000 CAMINO REAL BLVD.
SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
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PH (505) 349-8080 FAX NO. (505) 349-8081

PROJ. NO. 16216119.00 | DSN. BY: DJM | CHK. BY: AGA | DWN. BY: AGA | APP. BY: DJM | Q/A RVW BY: BRK

CADD FILE: 03 - 05 GCCS DETAILS

DATE: 5/2017

SCALE: AS SHOWN

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FOR COMPLIANCE PURPOSES ONLY

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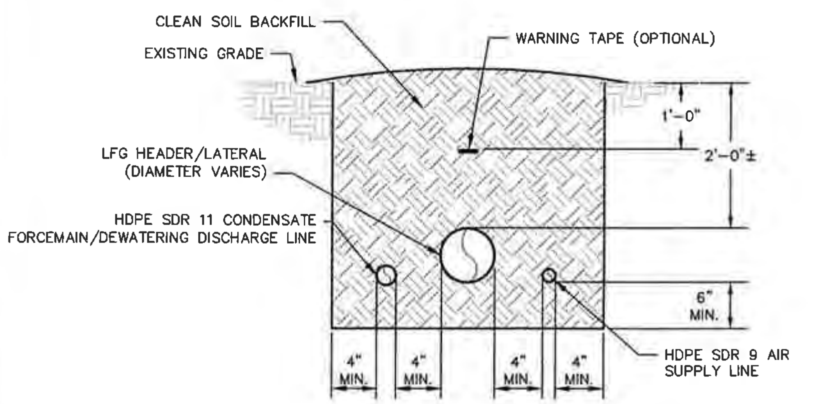
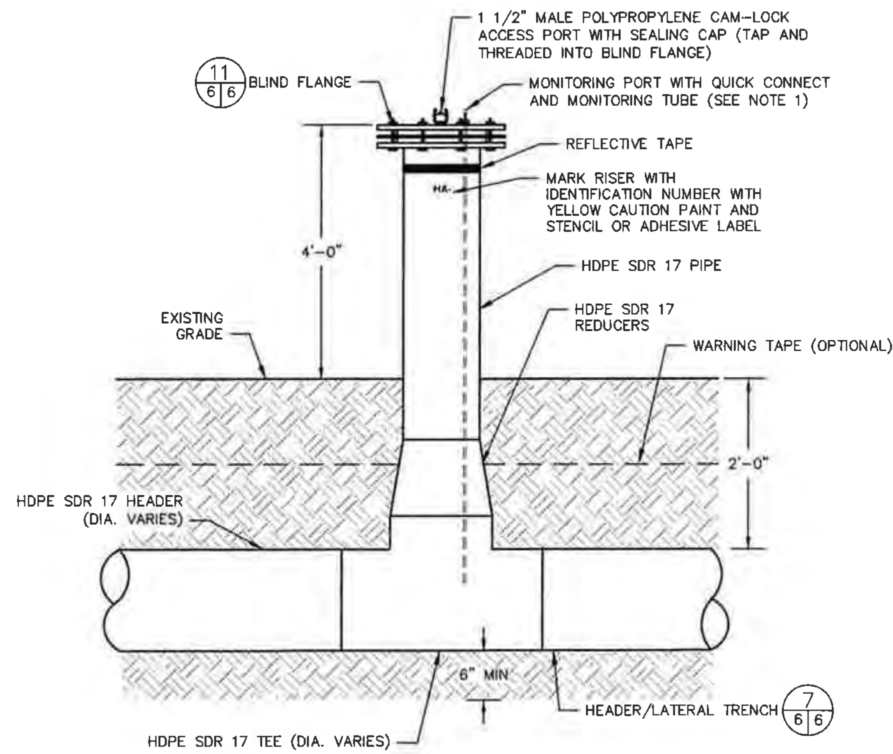


NOTES:

1. WARNING TAPE SHALL BE MIN. 3" WIDE AND IMPRINTED WITH "GAS LINE BURIED BELOW."
2. THE NUMBER AND TYPES OF PIPES INSTALLED IN THE TRENCH MAY VARY.
3. CONDENSATE/AIR LINES ARE NOT NECESSARILY INCLUDED ALONG LATERAL/HEADER PIPING.

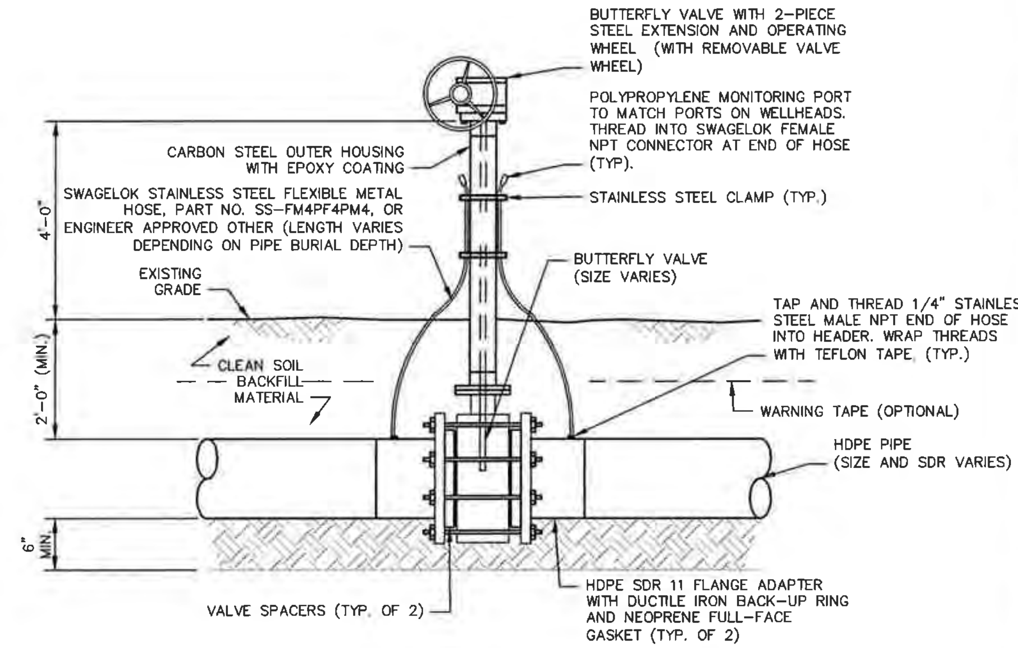
HEADER/LATERAL TRENCH 7 / 6 | 2
NTS



NOTE:

1. TUBING SHALL BE 3/8" STAINLESS STEEL PIPE AND EXTEND TO CENTERLINE OF HEADER

HEADER ACCESS RISER 8 / 6 | 2
NTS



HEADER/LATERAL ISOLATION VALVE 9 / 6 | 2
NTS

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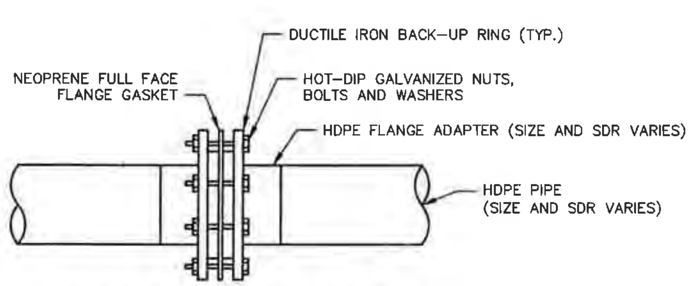
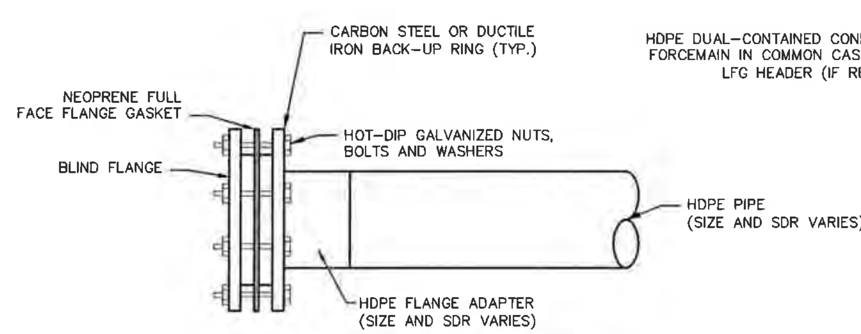
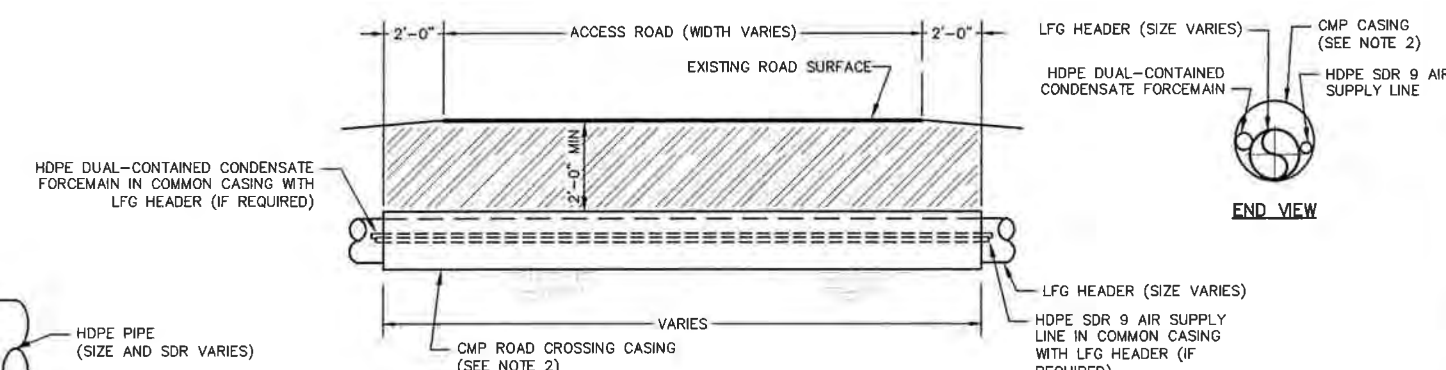
NEW MEXICO
15236
PROFESSIONAL ENGINEER
5/10/17
Exp. 12/31/18



FLANGE CONNECTION 10 / 6 | 3,4,7,8
NTS



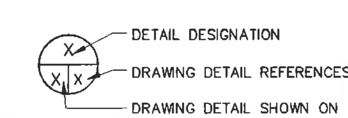
BLIND FLANGE 11 / 6 | 6,7,8
NTS



NOTES:

1. ROAD SHALL BE RESTORED TO MATCH ORIGINAL CONDITIONS.

ROAD CROSSING 12 / 6 | –
NOT TO SCALE



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REV	DATE	DESCRIPTION	BY

DRAWING TITLE: PIPE DETAILS

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D ALBUQUERQUE, NM 87107
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PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: BRK
CHK. BY: DJM | APP. BY: AGA | DJM

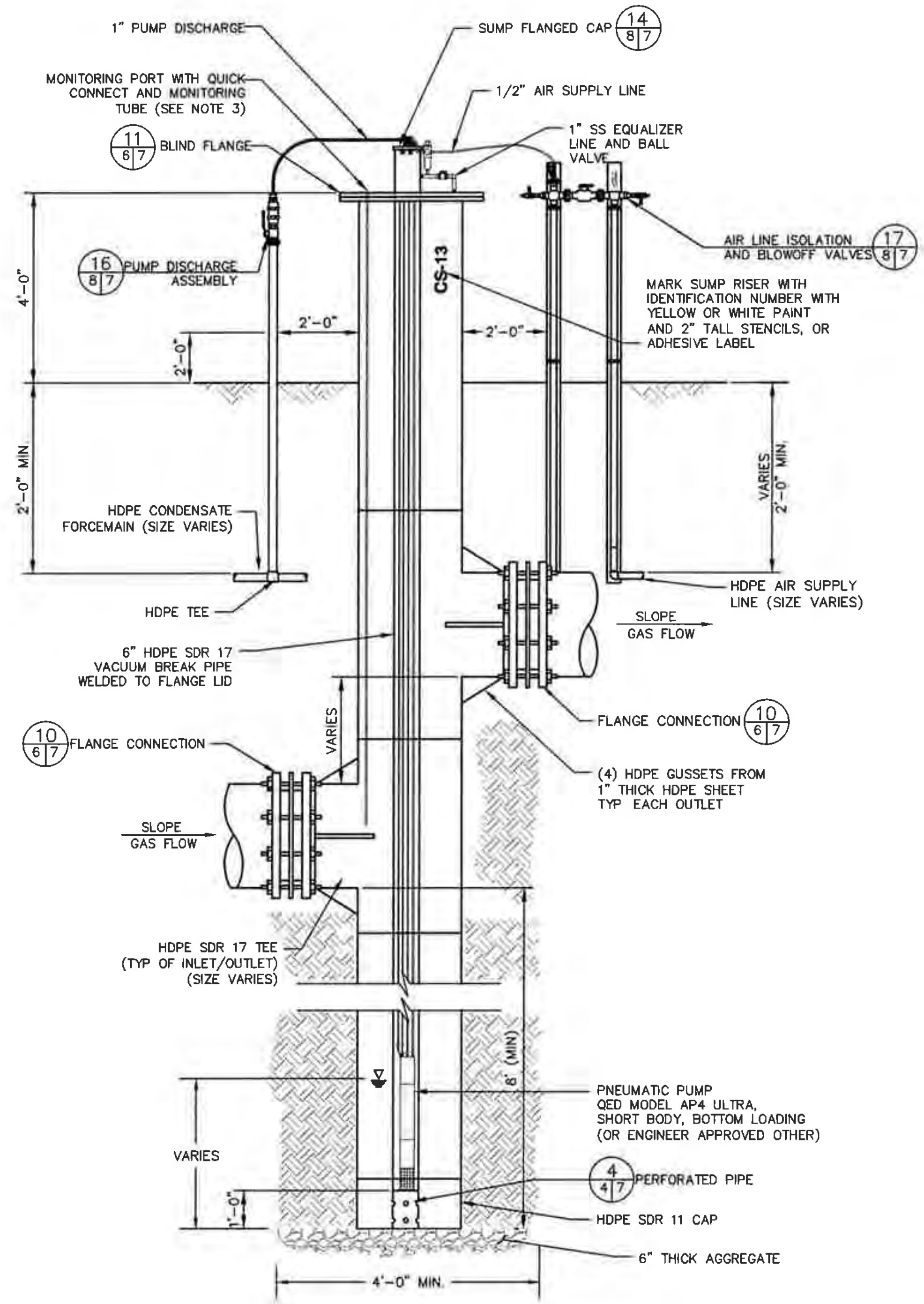
CADD FILE: 06 – 08 CONDENSATE MGMT DETAILS

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 6

FOR COMPLIANCE PURPOSES ONLY



NOTES:

1. SUMP SHALL BE FABRICATED FROM HDPE SDR 17 PIPE AND FITTINGS (SIZE VARIES), CORRESPONDING TO ADJOINING HEADER. CONTRACTOR SHALL CONFIRM ORIENTATION OF TEES PRIOR TO SUMP FABRICATION.
2. 6"ø HDPE SDR 17 VACUUM BREAK PIPE EXTRUSION WELDED TO FLANGE LID. 1'-0" OF PIPE TO PROTRUDE THROUGH TOP OF FLANGE. CENTER OF PIPE LOCATED 2" OFF CENTER OF BLIND FLANGE.
3. TUBING SHALL BE 3/8" STAINLESS STEEL PIPE EXTENDED TO CENTERLINE OF INLET PIPE.
4. PUMP SHALL BE CONNECTED TO PUMP WITH QED EASY FITTINGS OR ENGINEER APPROVED OTHER.
5. IF SUMP IS IN WASTE, DESIGN ENGINEER/CQA SHALL CONFIRM THAT BOTTOM OF SUMP HAS SUFFICIENT SEPARATION FROM THE LANDFILL LINER.

CONDENSATE SUMP 13 7|2
NTS

DAVID J. MEZZACAPPA NEW MEXICO 15236 PROFESSIONAL ENGINEER 5/10/17 Exp. 12/31/18

DETAIL DESIGNATION
DRAWING DETAIL REFERENCES
DRAWING DETAIL SHOWN ON

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: CONDENSATE MANAGEMENT DETAILS - 1
PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN
CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D ALBUQUERQUE, NM 87107
PH (505) 349-6000 FAX NO. (505) 349-6001
PROJ. NO. 16216119.00 DSN. BY: DJM DWN. BY: AGA CHK. BY: AGA Q/A RVW BY: RRK APP BY: DJM

CADD FILE: 06 - 08 CONDENSATE MGMT DETAILS
DATE: 5/2017
SCALE: AS SHOWN
DRAWING NO 7

FOR COMPLIANCE PURPOSES ONLY

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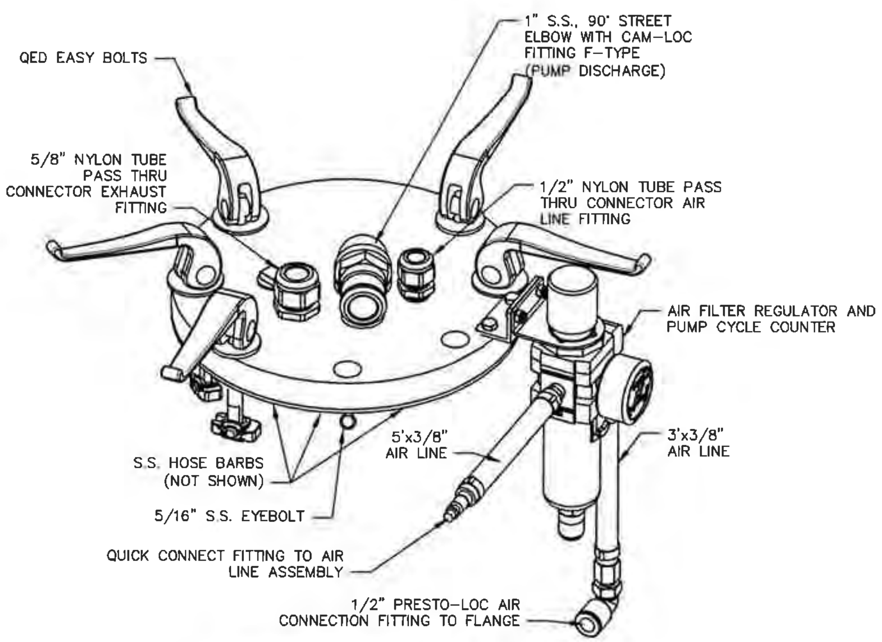
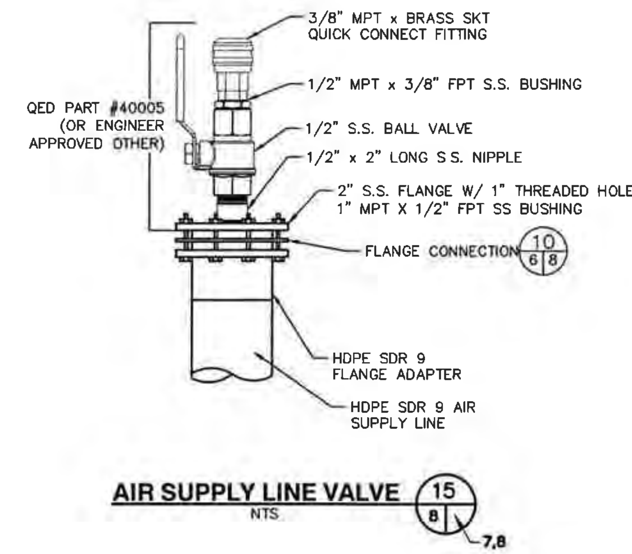


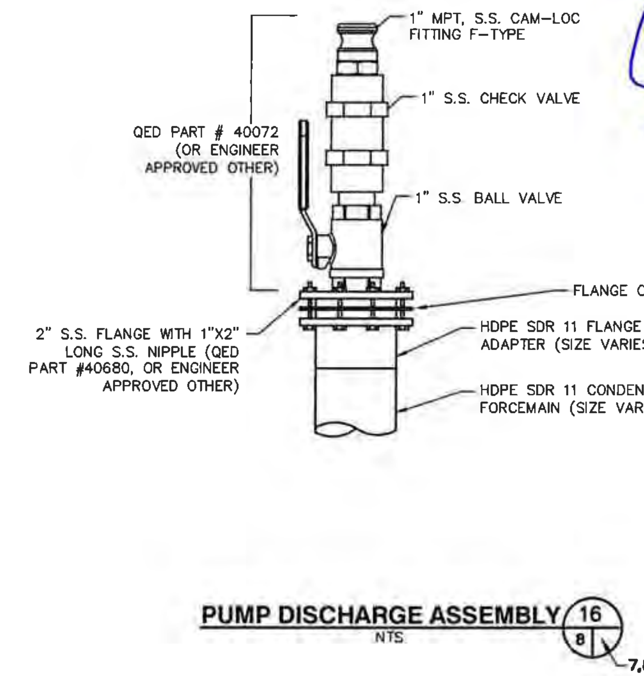
SUMP FLANGE CAP 14 / 8 7

NTS



AIR SUPPLY LINE VALVE 15 / 8 7,8

NTS



PUMP DISCHARGE ASSEMBLY 16 / 8 7,8

NTS

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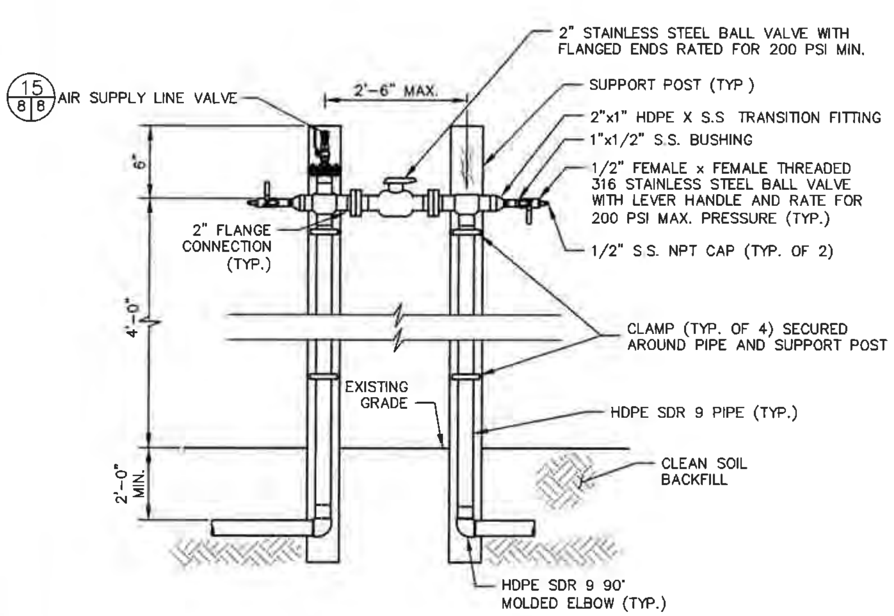
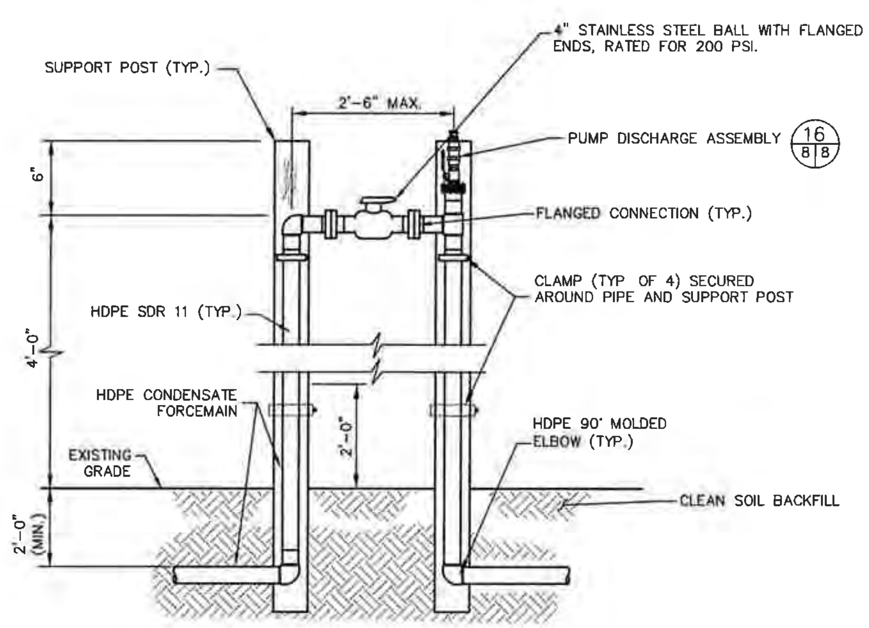


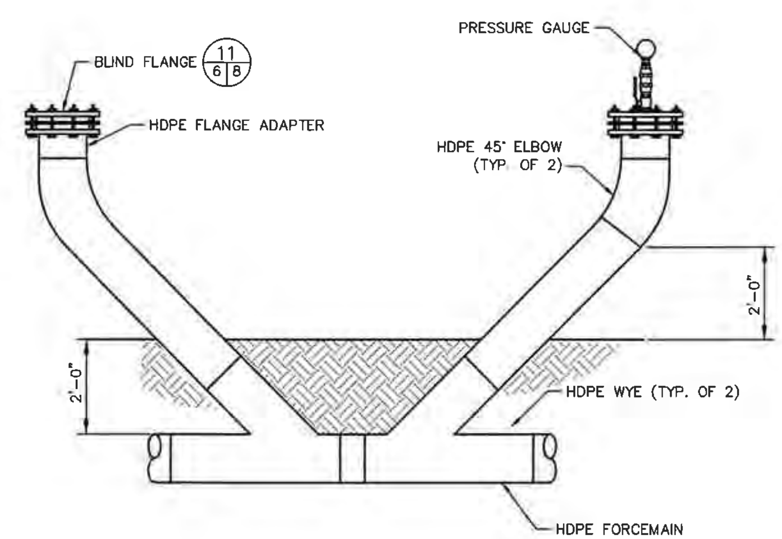
AIR LINE ISOLATION AND BLOWOFF VALVES 17 / 9 2

NTS



CONDENSATE FORCEMAIN ISOLATION VALVE 18 / 8 2

NTS



FORCEMAIN CLEANOUT 19 / 8 2

NTS

X — DETAIL DESIGNATION
X — DRAWING DETAIL REFERENCES
X — DRAWING DETAIL SHOWN ON

4/10/2017 5:48 PM G:\Camino Real\16216119.00 GCCS Design Plan\06 - 08 CONDENSATE MGMT DETAILS

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: CONDENSATE MANAGEMENT DETAILS - 2

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D ALBUQUERQUE, NM 87107
PH (505) 349-6060 FAX NO. (505) 349-6061

PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: RBK
CHK. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 06 - 08 CONDENSATE MGMT DETAILS

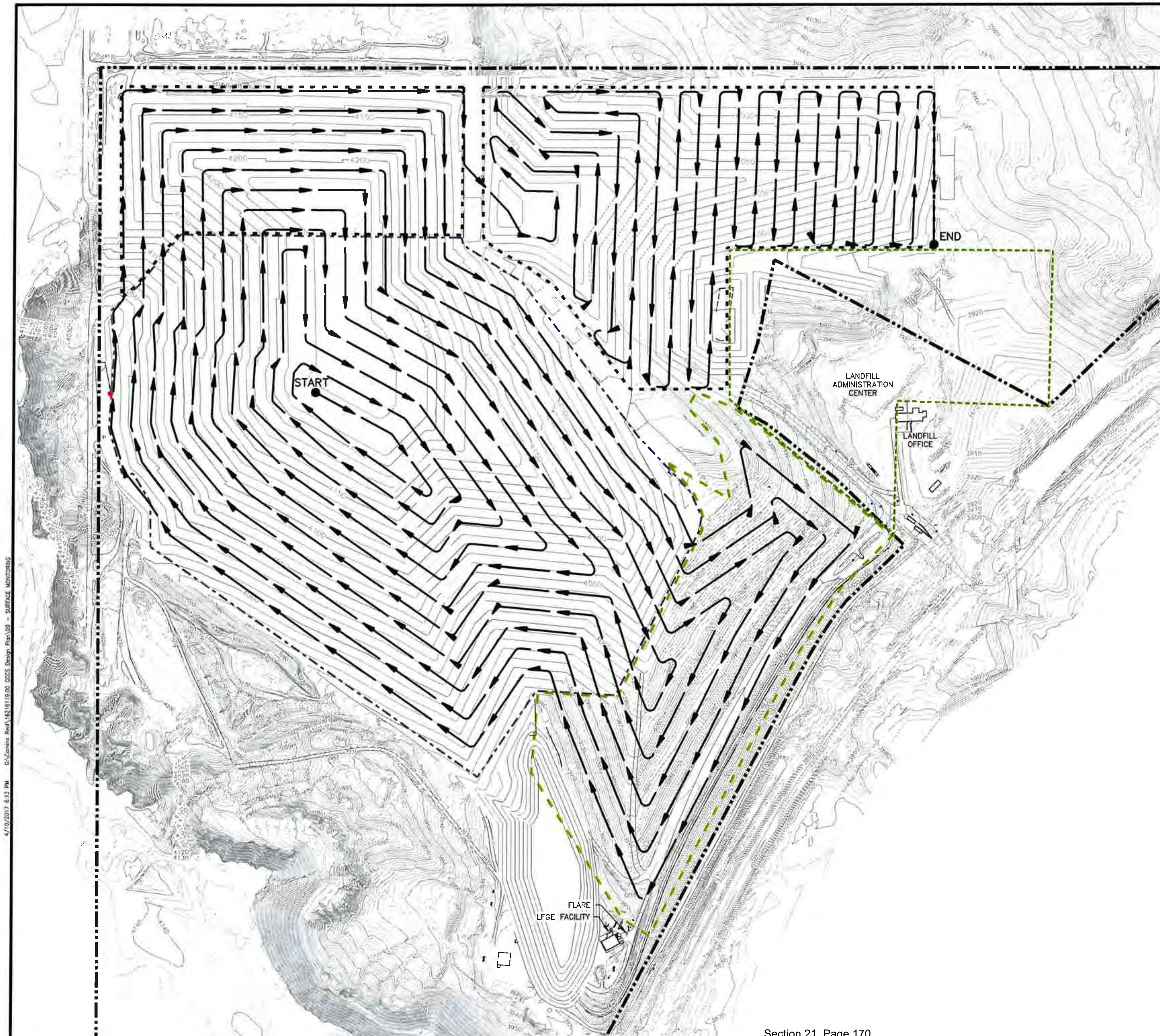
DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 8

FOR COMPLIANCE PURPOSES ONLY

4/10/2017 6:13 PM G:\Camino Real\16216119.00 GCCS Design Plan\09 - SURFACE MONITORING



0 250 500
SCALE IN FEET

LEGEND

4050	PERMITTED FINAL COVER CONTOUR (SEE NOTE 1)
	SOLID WASTE FACILITY BOUNDARY
	PERMITTED LIMIT OF WASTE FOR UNIT 1 (CLOSED)
	PERMITTED LIMIT OF WASTE FOR UNIT 2
	CONCEPTUAL LIMIT OF WASTE FOR UNIT 3
	CONCEPTUAL LIMIT OF WASTE FOR UNIT 3A
	CELL BOUNDARY
	MONITORING ROUTE

NOTES

1. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2016 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2016 TOPOGRAPHIC SURVEY FROM AN AERIAL SURVEY FLOWN IN 2016.

2. THE SURFACE SCAN SHOWN HERE IS AN EXAMPLE. AS LONG AS THE ROUTE MEETS THE REQUIREMENTS SET FORTH IN THE GCCS DEISGN PLAN AND NSPS RULES, IT MAY VARY FROM THE EXACT ROUTE SHOWN HERE..

REV. DATE DESCRIPTION BY

DRAWING TITLE
SURFACE MONITORING ROUTE

PROJECT TITLE
CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT
CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-8060 FAX NO. (505) 349-8061

PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: RRK
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER
5/1/17
EXP. 12/31/18

CADD FILE: 09 - SURFACE MONITORING
DATE: 5/2017
SCALE: AS SHOWN
DRAWING NO. 9

FOR COMPLIANCE PURPOSES ONLY

APPENDIX D
SURFACE MONITORING SAMPLE FORM

Surface Monitoring Log Form

40 CFR §60.755(d)(3) requires performance evaluation of response factor, response time, and calibration precision according to the Section 4.4 of 40 CFR 60 Appendix A, Method 21. The locations to record the evaluations are presented below.

General Information:

Date: ______________________________

Operator Name: ______________________________

Facility: ______________________________

Instrument ID: ______________________________

Wind Direction: N NE E SE S SW W NW (circle one)

Approximate Wind Speed: ________________mph

General Weather: _____________°F,

clear, partly cloudy, overcast, __________________(circle one or write in)

no precip., drizzle, rain, snow, _________________(circle one or write in)

Response Factor:

Since the monitoring instrument is being used to detect methane and the calibration reference compound is methane, the response factor, by definition is one. No further evaluation is required.

Response Time:

Date: ________________________

Operator Name: ________________________

Facility: ________________________

Instrument ID: ________________________

Calibration Gas Concentration: ____________

90% of Calibration Gas Concentration: ____________

Trial No.	Time to reach 90% gas value
1	__________________seconds
2	__________________seconds
3	__________________seconds
Average	__________________seconds

Surface Monitoring Log Form (continued)

Calibration Precision:

Date: ______________________________

Operator Name: ______________________________

Facility: ______________________________

Instrument ID: ______________________________

Calibration Gas Concentration: ______________________

Trial No.	Meter Reading After Zero Gas	Difference Between Calibration Gas and Meter Reading
1	__________________ppm	________________________ppm
2	__________________ppm	________________________ppm
3	__________________ppm	________________________ppm
	Average Difference:	________________________ppm

Calibration Precision = Average Difference/Calibration Gas Conc. X 100%

=__________/__________X 100% = _________%

Calibration Information:
Calibration Gas Concentration: __________________ppm
Conduct internal zero calibration? Yes No (circle one)
Instrument reading after calibration: ____________ppm (should be same as above)
Time of Calibration: ______:______ am pm (fill in and pick one)

Background Concentration Information:
Background concentration upwind of site: _______________ppm

Location of background reading: ____
(Description, for example: North end of Area 1, 100 feet north of gas well No, 1)

Quarterly Cover Integrity Inspection

Quarter	Inspection Date	Inspector's Initials	Cover Integrity Problems Found During Inspection
1st Quarter	___/___/____		
2nd Quarter	___/___/____		
3rd Quarter	___/___/____		
4th Quarter	___/___/____		

Surface Monitoring Log Form (continued)

Use this area to record an individual monitoring exceedance and follow-up monitoring activities. This form is only used when a reading of 500 ppm above background is encountered during the surface monitoring. Use a separate form for each initial exceedance.

Initial Monitoring Exceedance:
Date:__________ Time:_________________am pm Monitoring Technician Initials:___________
Instrument reading - Background reading: ______________ppm - _________ppm = ________ppm

Location of monitored exceedance (include description of field marker used):__________________________
____

Describe cover maintenance or adjustments to the vacuum of adjacent wells to increase gas collection in vicinity of measured exceedance before re-monitoring in 10 days:____
____

Re-monitor location within 10 calendar days of initial exceedance:
Date:__________ Time:_________________am pm Monitoring Technician Initials:___________
Instrument reading - Background reading: ______________ppm - _________ppm = ________ppm

If 10 day re-monitoring shows an exceedance, describe additional corrective action taken before re-monitoring again within 10 days:____
____

If the 10 day re-monitoring is <500 ppm, re-monitor 1 month from initial exceedance:
Date:__________ Time:_________________am pm Monitoring Technician Initials:___________
Instrument reading - Background reading: ______________ppm - _________ppm = ________ppm

If the 1 month re-monitoring is <500 ppm, resume normal quarterly monitoring.
If the 1 month re-monitoring shows an exceedance, describe additional corrective action taken before Re-monitoring again within 10 days:____
____

Re-monitor location within 10 calendar days of 2nd exceedance:
Date:__________ Time:_________________am pm Monitoring Technician Initials:___________
Instrument reading - Background reading: ______________ppm - _________ppm = ________ppm

If the 10 day re-monitoring is <500 ppm, re-monitor 1 month from initial exceedance:
Date:__________ Time:_________________am pm Monitoring Technician Initials:___________
Instrument reading - Background reading: ______________ppm - _________ppm = ________ppm

If the 1 month re-monitoring is <500 ppm, resume normal quarterly monitoring.
If the 1 month re-monitoring shows an exceedance, describe additional corrective action taken before Re-monitoring again within 10 days: ____
____
(use additional forms if necessary)*

*If re-monitoring shows 3 consecutive exceedances within a quarterly period a new well or other collection device must be installed within 120 days of initial exceedance or alternative remedies/timelines may be submitted to the Administrator for approval. Further monitoring is not necessary until the remedy is completed.

ATTACHMENT 21.5

40 CFR 60, SUBPART XXX (AND 20.2.64 NMAC)

INITIAL DESIGN CAPACITY REPORT AND NMOC EMISSION RATE CALCULATIONS
(JANUARY 2020)

New Mexico Environment Department
Air Quality Bureau
Compliance and Enforcement Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505
Phone (505) 476-4300

Version 07.20.18

NMED USE ONLY	
TEMPO	

REPORTING SUBMITTAL FORM

NMED USE ONLY	
Staff	
Admin	

PLEASE NOTE: ® - Indicates required field

SECTION I - GENERAL COMPANY AND FACILITY INFORMATION

A. ® Company Name: Camino Real Environmental Center, Inc.			**D. ® Facility Name:** Camino Real Landfill			
B.1 ® Company Address: 1000 Camino Real Blvd			**E.1 ® Facility Address:** 1000 Camino Real Blvd			
B.2 ® City: Sunland Park	**B.3 ® State:** NM	**B.4 ® Zip:** 8 8 0 6 3	**E.2 ® City:** Sunland Park		**E.3 ® State:** NM	**E.4 ® Zip:** 88063
C.1 ® Company Environmental Contact: Dr. Juan Carlos Tomas	**C.2 ® Title:** Landfill Manager		**F.1 ® Facility Contact:** Dr. Juan Carlos Tomas		**F.2 ® Title:** Landfill Manager	
C.3 ® Phone Number: (575) 589-9440	**C.4 ® Fax Number:** (575) 589-2427		**F.3 ® Phone Number:** (575) 589-9440		**F.4 ® Fax Number:** (575) 589-2427	
C.5 ® Email Address: JuanT@wasteconnections.com			**F.5 ® Email Address:** JuanT@wasteconnections.com			
G. Responsible Official: (Title V only):	**H. Title:**		**I. Phone Number:**		**J. Fax Number:**	

K. ® AI Number:	**L. Title V Permit Number:**	**M. Title V Permit Issue Date:**	**N. NSR Permit Number:**	**O. NSR Permit Issue Date:**

P. Reporting Period:
From: To:

Do NOT submit NSPS OOOO or OOOOa well completion or flowback notifications to the Air Quality Bureau. See https://www.env.nm.gov/air-quality/notices-and-faqs-for-compliance-and-enforcement/ for explanation.

SECTION II – TYPE OF SUBMITTAL (check one that applies)

A. ☐	**Title V Annual Compliance Certification**	**Permit Condition(s):**	**Description:**	
B. ☐	**Title V Semi-Annual Monitoring Report**	**Permit Condition(s):**	**Description:**	
C. ☒	**NSPS Requirement (40CFR60)**	**Regulation:** 40 CFR 60, Subpart XXX	**Section(s):** §60.767(a)&(b)	**Description:** Initial Design Capacity Report and NMOC Emission Rate Report
D. ☐	**MACT Requirement (40CFR63)**	**Regulation:**	**Section(s):**	**Description:**
E. ☐	**NMAC Requirement (20.2.xx) or NESHAP Requirement (40CFR61)**	**Regulation:**	**Section(s):**	**Description:**
F. ☐	**Permit or Notice of Intent (NOI) Requirement**	**Permit No.☐: or NOI No.☐:**	**Condition(s):**	**Description:**
G. ☐	**Requirement of an Enforcement Action**	**NOV No. ☐: or SFO No. ☐: or CD No. ☐: or Other ☐:**	**Section(s):**	**Description:**

SECTION III - CERTIFICATION

After reasonable inquiry, I Dr. Juan Carlos Tomas **certify that the information in this submittal is true, accurate and complete.**
(Name of Certifier)

® Signature of Certifier:	**® Title:**	**® Date**	**® Responsible Official for Title V?**
Dr. Juan Carlos Tomas	**Landfill Manager**	**01/09/2020**	☒ Yes ☐ No

Reviewed By: ____________________ Date Reviewed: ____________________

January 9, 2020
SCS Project No. 16219099.00

Mr. Eddie O'Brien
Compliance and Enforcement Section
New Mexico Environment Department
Air Quality Bureau
525 Camino de los Marquez
Santa Fe, New Mexico 87505-1816

Subject: Initial Design Capacity Report and Non-Methane Organic Compound Emission Rate Report
20.2.64 NMAC Municipal Solid Waste Landfill Emission Guidelines
Operating Permit No. P186LR3
Camino Real Landfill
Sunland Park, New Mexico

Dear Mr. O'Brien:

The State of New Mexico's new Emissions Guideline (EG) rule for Municipal Solid Waste Landfills (20.2.64 NMAC) was approved by EPA on September 11, 2019 and became effective on October 11, 2019. The Camino Real Landfill is subject to this EG rule. Two submittals are required by this rule for the landfill by January 9, 2020 (90 days after the rule's effective date): an Initial Design Capacity Report (DCR) and a Non-Methane Organic Compound (NMOC) Emission Rate Report. On behalf of Camino Real Environmental Center, Inc., SCS Engineers is pleased to submit the Initial DCR and NMOC Emission Rate Report for the Camino Real Landfill.

Regarding the DCR, the landfill's capacity is over the capacity threshold of 2.5 million megagrams or cubic meters, with a design capacity of 26,600,000 cubic yards (20,337,159 cubic meters). If Unit 4 projections are included (Unit 4 does not yet have approved grades, but is approved for waste disposal, then the design capacity approaches 60 million cubic yards (or 45,873,291 cubic meters). An excerpt of information prepared for the landfill's 2013 interim review is included in Appendix B showing the capacity estimated for Units 1-3.

Regarding the landfill's NMOC Emissions Rate Report, the landfill's uncontrolled NMOC emissions were calculated to be 83.45 Mg/year (over the 34/ Mg/yr limit requiring landfill gas collection and control). Both the Tier 2 site-specific NMOC concentration of 998.72 ppmv and Tier 3 site-specific methane generation rate of 0.007 $year^{-1}$ were utilized in the calculations. Also, as allowed by the NSPS rules, inert materials were deducted from the incoming waste totals in the same proportions as in the prior Tier 2 report for the landfill. For the 2019 waste intake the 2018 totals were increased at 5 percent. A copy of the Tier 2 or Tier 3 reports previously submitted to the Air Quality Bureau can be provided upon request, although in any event, the landfill is still well over the 34 Mg/yr emissions threshold requiring further action.

The following attachments are included to satisfy the requirements of the Initial DCR and NMOC Emissions Rate Report:

- Attachment A – Maps from the landfill's 2018 New Source Review Permit Application that show the landfill's size and location, as well as the areas where solid waste may be deposited;
- Attachment B – An excerpt prepared for the landfill's 2013 interim review for the Solid Waste Bureau that shows that the landfill is over the capacity that requires emissions reporting; and
- Attachment C – The Landfill Gas Emissions Model (LandGEM) Model Output showing the uncontrolled NMOC emissions rate.

In closing, as set forth in the EG rule requirements, in the absence of further refinement of the landfill's NMOC emissions rate (not planned at this time), or performance of Tier 4 surface emissions monitoring, the landfill will be fully subject to landfill gas collection and control requirements within 30 months of the date of this submittal. Please do not hesitate to contact David Mezzacappa, P.E., at (817) 358-6108 with any questions.

Sincerely,

Joey Krasner

Joseph D. Krasner, P.E.
Project Engineer
SCS Engineers

David J. Mezzacappa 1/9/2020

DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER
Exp. 12/31/2020

David J. Mezzacappa, P.E.
Vice President
SCS Engineers

Attachments

cc: Dr. Juan Carlos Tomas, Camino Real Environmental Center, Inc.
Mr. Brady Stewart, WCI (e-copy)

FedEx®

January 13,2020

Dear Customer:

The following is the proof-of-delivery for tracking number **777435919053**.

Delivery Information:

Status:	Delivered	**Delivered to:**	Residence
Signed for by:	J.LOPEZ	**Delivery location:**	525 CAMINO DE LOS MARQUEZ 1 SANTA FE, NM 87505
Service type:	FedEx Standard Overnight	**Delivery date:**	Jan 10, 2020 09:25
Special Handling:	Deliver Weekday Residential Delivery		

Shipping Information:

Tracking number:	777435919053	**Ship date:**	Jan 9, 2020
		Weight:	0.5 lbs/0.2 kg

Recipient:
Mr. Eddie OBrien
NMED, AQB Compliance&Enforcement
525 Camino de los Marquez, Ste 1
SANTA FE, NM 87505 US

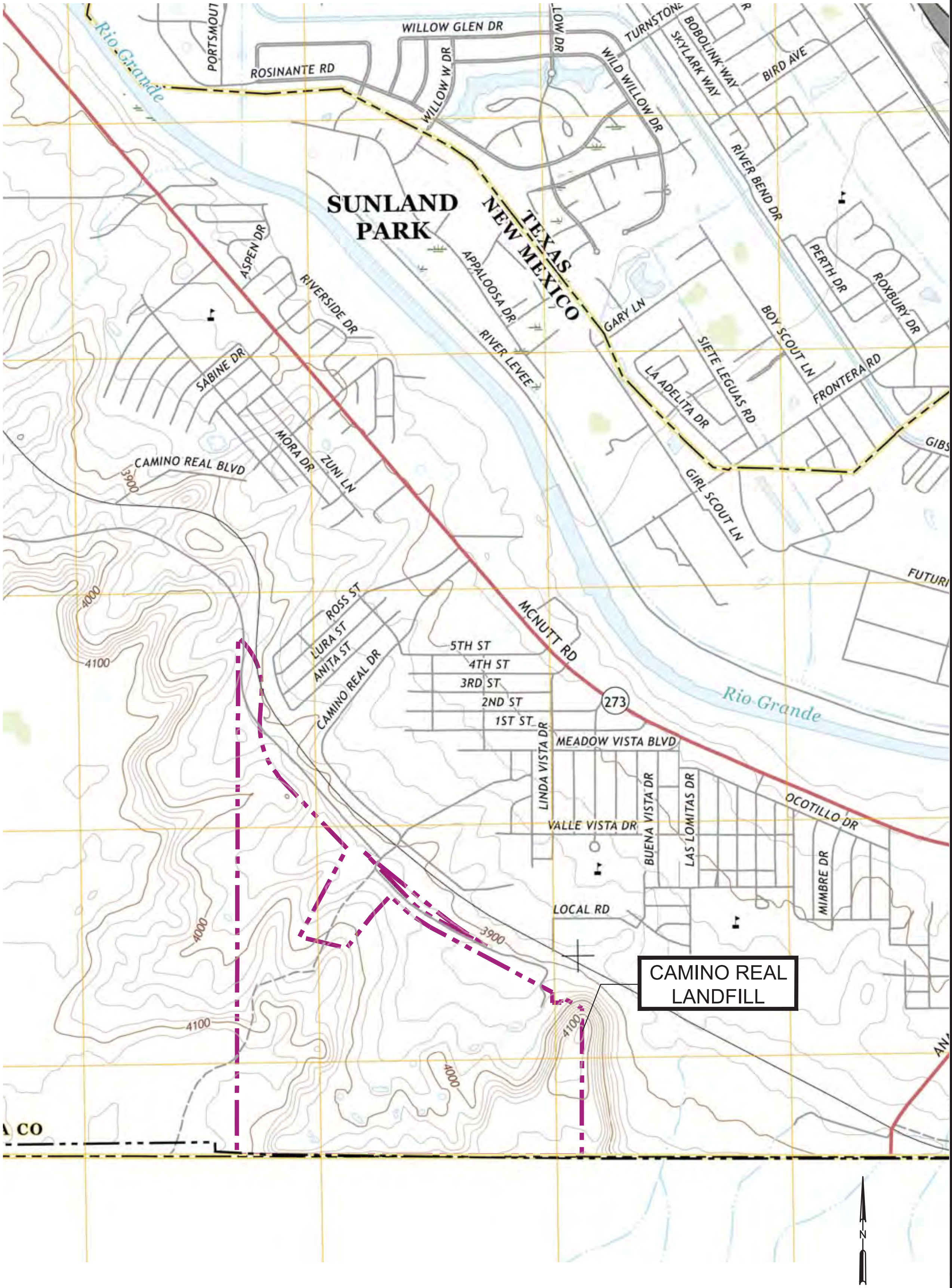
Shipper:
Joey Krasner, P.E.
SCS Engineers
1901 CENTRAL DR
STE 550
BEDFORD, TX 76021 US

Reference	16219099.00 NT JDK
Purchase order number:	Camino EG

Thank you for choosing FedEx.

Attachment A

Maps Showing Landfill Size, Location, and where Waste can be Deposited



NOTE

1. BASED ON SMELTERTOWN, TX–NM–CHH, REVISED 2016 QUADRANGLE, USGS 7.5' SERIES (1:24,000 SCALE).

FOR COMPLIANCE PURPOSES ONLY

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: **SITE LOCATION MAP**

PROJECT TITLE: **NSR PERMIT APPLICATION**

CLIENT: **CAMINO REAL ENVIRONMENTAL CENTER, INC. SUNLAND PARK, NEW MEXICO**

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
1901 CENTRAL DRIVE SUITE 550
BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188

PROJ. NO. 16217091.00 | DSN. BY: JK | DWN. BY: AGA | CHK. BY: JK | Q/A RVW BY: DJM | APP. BY: DJM

CADD FILE: SITE LOCATION MAP (NSR)

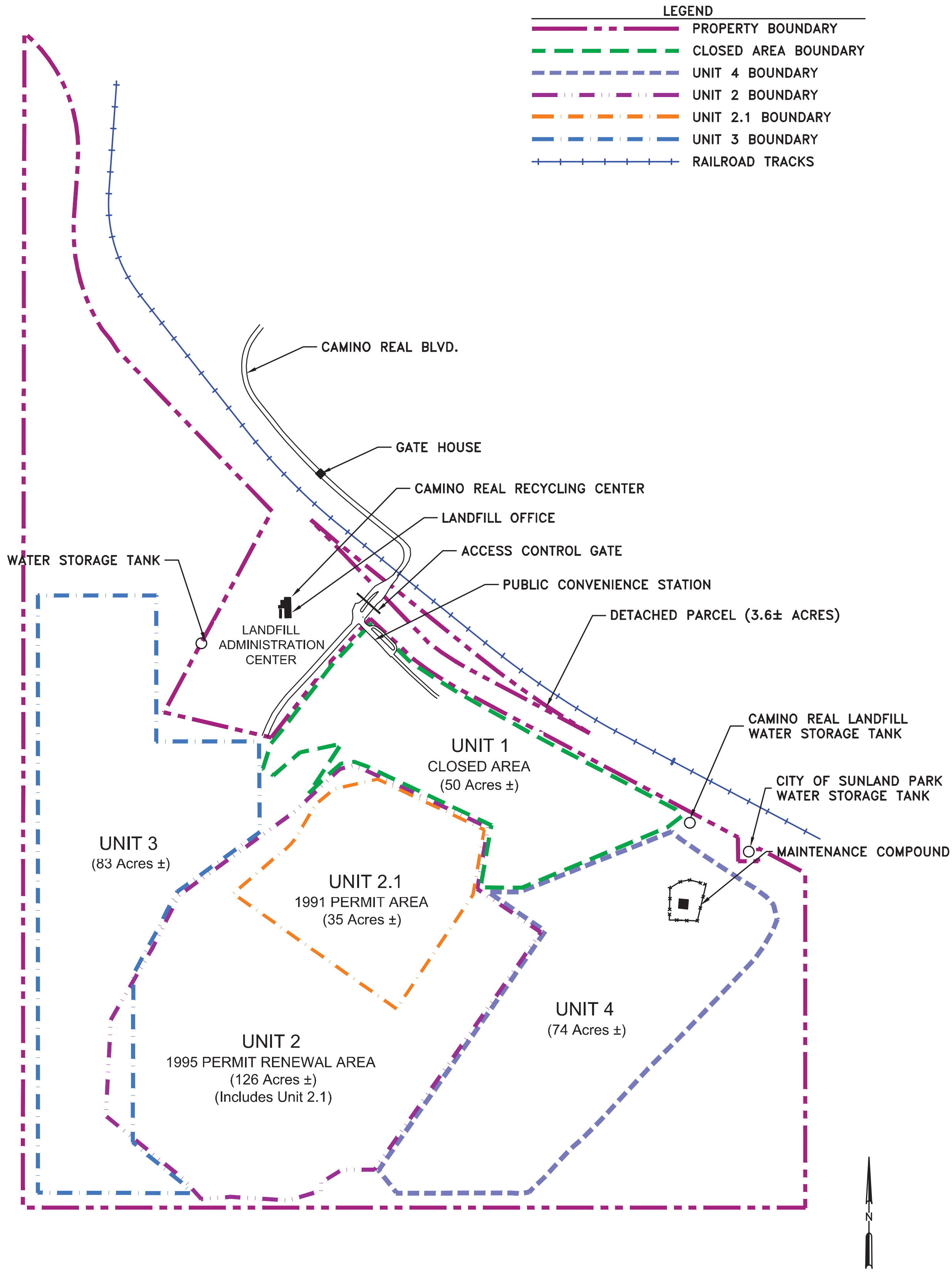
DATE: 12/2018

SCALE: AS SHOWN

DRAWING NO. **8.1**

G:\Camino Real\16217091.00 – NSR PERMIT APPLICATION\UPDATE 2018\SITE LOCATION MAP (NSR)

11/30/2018 9:19 AM



0 500 1000
SCALE IN FEET

G:\Camino Real\16217091.00 – NSR PERMIT APPLICATION\UPDATE 2018\SITE PLAN (NSR)
11/30/2018 9:22 AM

NOTE

1. THE INFORMATION FOR THIS DRAWING WAS ACQUIRED FROM A FIGURE ENTITLED "SPECIAL WASTE MANAGEMENT AREAS," PREPARED BY GORDON ENVIRONMENTAL, INC., DATED SEPTEMBER 02, 2010.

FOR COMPLIANCE PURPOSES ONLY

REV	DATE	DESCRIPTION	BY

DRAWING TITLE
OVERALL LANDFILL SITE PLAN

PROJECT TITLE
NSR PERMIT APPLICATION

CLIENT
CAMINO REAL ENVIRONMENTAL CENTER, INC.
SUNLAND PARK, NEW MEXICO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
1901 CENTRAL DRIVE SUITE 550
BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188

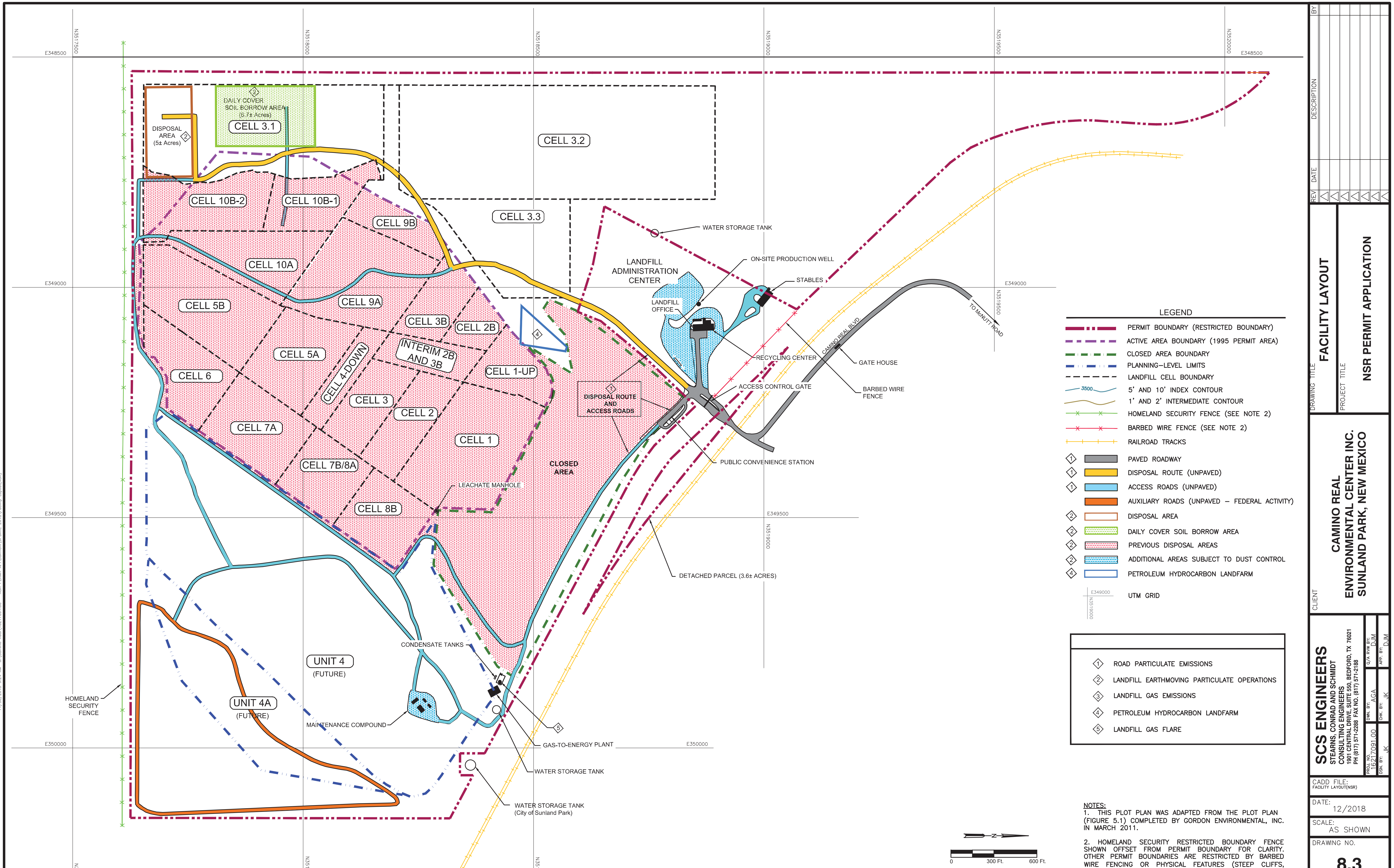
PROJ. NO. 16217091.00
DSN. BY: JK
DWN. BY: AGA
CHK. BY: JK
Q/A RVW BY: DJM
APP. BY: DJM

CADD FILE: SITE PLAN (NSR)

DATE: 12/2018

SCALE: AS SHOWN

DRAWING NO. **8.2**


CELL 3.1
CELL 3.2
CELL 3.3
DAILY COVER SOIL BORROW AREA (6.7± Acres)
DISPOSAL AREA (5± Acres)
CELL 10B-2
CELL 10B-1
CELL 9B
CELL 10A
CELL 5B
CELL 9A
CELL 3B
CELL 2B
CELL 5A
INTERIM 2B AND 3B
CELL 4-DOWN
CELL 1-UP
CELL 6
CELL 3
CELL 2
CELL 7A
CELL 1
CELL 7B/8A
CELL 8B
CLOSED AREA
LEACHATE MANHOLE
DISPOSAL ROUTE AND ACCESS ROADS
LANDFILL ADMINISTRATION CENTER
LANDFILL OFFICE
WATER STORAGE TANK
ON-SITE PRODUCTION WELL
STABLES
RECYCLING CENTER
GATE HOUSE
ACCESS CONTROL GATE
BARBED WIRE FENCE
PUBLIC CONVENIENCE STATION
DETACHED PARCEL (3.6± ACRES)
CAMINO REAL BLVD.
TO McNUTT ROAD
UNIT 4 (FUTURE)
UNIT 4A (FUTURE)
CONDENSATE TANKS
MAINTENANCE COMPOUND
HOMELAND SECURITY FENCE
GAS-TO-ENERGY PLANT
WATER STORAGE TANK
WATER STORAGE TANK (City of Sunland Park)
E348500
E349000
E349500
E350000
N3517500
N3518000
N3518500
N3519000
N3519500
N3520000
LEGEND
PERMIT BOUNDARY (RESTRICTED BOUNDARY)
ACTIVE AREA BOUNDARY (1995 PERMIT AREA)
CLOSED AREA BOUNDARY
PLANNING-LEVEL LIMITS
LANDFILL CELL BOUNDARY
5' AND 10' INDEX CONTOUR
1' AND 2' INTERMEDIATE CONTOUR
HOMELAND SECURITY FENCE (SEE NOTE 2)
BARBED WIRE FENCE (SEE NOTE 2)
RAILROAD TRACKS
PAVED ROADWAY
DISPOSAL ROUTE (UNPAVED)
ACCESS ROADS (UNPAVED)
AUXILIARY ROADS (UNPAVED – FEDERAL ACTIVITY)
DISPOSAL AREA
DAILY COVER SOIL BORROW AREA
PREVIOUS DISPOSAL AREAS
ADDITIONAL AREAS SUBJECT TO DUST CONTROL
PETROLEUM HYDROCARBON LANDFARM
UTM GRID
1 ROAD PARTICULATE EMISSIONS
2 LANDFILL EARTHMOVING PARTICULATE OPERATIONS
3 LANDFILL GAS EMISSIONS
4 PETROLEUM HYDROCARBON LANDFARM
5 LANDFILL GAS FLARE
0 300 Ft. 600 Ft.
NOTES:
1. THIS PLOT PLAN WAS ADAPTED FROM THE PLOT PLAN (FIGURE 5.1) COMPLETED BY GORDON ENVIRONMENTAL, INC. IN MARCH 2011.
2. HOMELAND SECURITY RESTRICTED BOUNDARY FENCE SHOWN OFFSET FROM PERMIT BOUNDARY FOR CLARITY. OTHER PERMIT BOUNDARIES ARE RESTRICTED BY BARBED WIRE FENCING OR PHYSICAL FEATURES (STEEP CLIFFS, ETC.).
REV DATE DESCRIPTION BY
DRAWING TITLE
FACILITY LAYOUT
PROJECT TITLE
NSR PERMIT APPLICATION
CLIENT
CAMINO REAL ENVIRONMENTAL CENTER INC.
SUNLAND PARK, NEW MEXICO
SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
1901 CENTRAL DRIVE, SUITE 550, BEDFORD, TX 76021
PH (817) 571-2288 FAX NO. (817) 571-2188
PROJ. NO. 16217091.00
DSN. BY: JK
CHK. BY: JK
DWN. BY: AGA
APP. BY: DJM
Q/A RVW BY: DJM
CADD FILE: FACILITY LAYOUT(NSR)
DATE: 12/2018
SCALE: AS SHOWN
DRAWING NO.
8.3

Attachment B

Landfill Capacity (Excerpt Prepared for SWB Interim Review)

SOLID WASTE FACILITY PERMIT
INTERIM REVIEW REPORT

CAMINO REAL LANDFILL

MAY 28, 2013

Prepared For:

Camino Real Environmental Center, Inc.
1000 Camino Real Blvd
Sunland Park, New Mexico 88063

Submitted To:

New Mexico Environment Department – Solid Waste Bureau
Harold Runnels Building – Room N2150
P.O. Box 5469 - 1190 St. Francis Drive
Santa Fe, NM 87502-5469

Prepared By:

Gordon Environmental, Inc.
213 South Camino del Pueblo
Bernalillo, New Mexico 87004
(505) 867-6990

Gordon Environmental, Inc.
Consulting Engineers

2.2 Notification

According to 20.9.6 NMAC, a Solid Waste Landfill is required to notify the NMED Solid Waste Bureau (SWB) when it intends to close any part of or the entire Landfill; and when those closure activities are complete. Accordingly, CRLF will notify NMED of its intent to close any portion of the Landfill at least 90 days before closure activities are scheduled to commence. In addition, prior to initiating the closure of each Landfill section, CRLF will notify NMED that a Notice of Intent (NOI) to close the section has been placed in the Facility Operating Record.

Table II.5.1
Capacity Analysis

Unit	Acres	Estimated Waste Volume (yd^3)	Active Operations (projected)
1	50±	2,600,000	Closed 1991/1992
2	126±	12,500,000	1992-2016
3	83±	11,500,000	2016-2037
Total	**259±**	**26,600,000**	

For the purpose of this Plan, "section" means any part of the Landfill that has reached a final elevation suitable for cap installation and the commencement of closure activities. Following closure of sections of the Landfill, or ultimately the entire site, CRLF will notify NMED that closure has been completed in accordance with this Closure Plan, as required by 20.9.6 NMAC. Upon final site closure, CRLF will also record a land use notation on the deed to the solid waste facility property, or a comparable instrument that is normally examined during title search. The notation will serve to notify any potential purchaser of the property that the parcel has been used as a landfill, and that its use is restricted under post-closure care requirements. CRLF will place a copy of this notification in the Facility Operating Record, and notify NMED accordingly.

Signs will be posted at the site entrance and along the perimeter of the landfill boundary at a frequency of two signs per perimeter boundary. The signs will be posted in such a manner that a person can easily read the legend, and will conform to the requirements of 20-inches by 14-inches upright format signs.

Attachment C

LandGEM Model Output (NMOC Emissions)

Summary Report

Landfill Name or Identifier: Camino Real Landfill (Tier 2)

Date: Sunday, November 17, 2019

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*$year^{-1}$*)
L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1977**	
Landfill Closure Year (with 80-year limit)	**2019**	
Actual Closure Year (without limit)	***2019***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.007**	*year $^{-1}$*
Potential Methane Generation Capacity, L_o	**170**	*m^3/Mg*
NMOC Concentration	**999**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Total landfill gas**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1977	3,318	3,650	0	0
1978	3,364	3,700	3,318	3,650
1979	3,409	3,750	6,682	7,350
1980	3,409	3,750	10,091	11,100
1981	3,455	3,800	13,500	14,850
1982	3,500	3,850	16,955	18,650
1983	3,500	3,850	20,455	22,500
1984	3,545	3,900	23,955	26,350
1985	3,591	3,950	27,500	30,250
1986	3,591	3,950	31,091	34,200
1987	84,558	93,014	34,682	38,150
1988	84,558	93,014	119,240	131,164
1989	84,558	93,014	203,798	224,178
1990	211,393	232,532	288,356	317,192
1991	221,518	243,670	499,749	549,724
1992	217,226	238,949	721,268	793,394
1993	246,307	270,938	938,494	1,032,343
1994	197,124	216,837	1,184,801	1,303,281
1995	239,911	263,902	1,381,925	1,520,118
1996	291,389	320,527	1,621,836	1,784,019
1997	353,961	389,357	1,913,224	2,104,547
1998	379,164	417,080	2,267,185	2,493,904
1999	438,253	482,079	2,646,349	2,910,984
2000	418,480	460,328	3,084,602	3,393,063
2001	410,282	451,310	3,503,083	3,853,391
2002	459,916	505,908	3,913,364	4,304,701
2003	465,393	511,933	4,373,280	4,810,609
2004	495,850	545,435	4,838,674	5,322,541
2005	439,540	483,494	5,334,524	5,867,976
2006	537,389	591,127	5,774,064	6,351,470
2007	563,953	620,348	6,311,452	6,942,597
2008	504,619	555,081	6,875,405	7,562,945
2009	325,739	358,313	7,380,024	8,118,026
2010	386,586	425,245	7,705,763	8,476,339
2011	381,189	419,308	8,092,349	8,901,584
2012	330,841	363,925	8,473,538	9,320,892
2013	309,728	340,701	8,804,379	9,684,817
2014	339,607	373,567	9,114,108	10,025,518
2015	351,088	386,196	9,453,714	10,399,086
2016	335,928	369,521	9,804,802	10,785,282

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2017	340,900	374,990	10,140,730	11,154,803
2018	346,332	380,966	10,481,630	11,529,793
2019	363,649	400,014	10,827,962	11,910,759
2020	0	0	11,191,611	12,310,772
2021	0	0	11,191,611	12,310,772
2022	0	0	11,191,611	12,310,772
2023	0	0	11,191,611	12,310,772
2024	0	0	11,191,611	12,310,772
2025	0	0	11,191,611	12,310,772
2026	0	0	11,191,611	12,310,772
2027	0	0	11,191,611	12,310,772
2028	0	0	11,191,611	12,310,772
2029	0	0	11,191,611	12,310,772
2030	0	0	11,191,611	12,310,772
2031	0	0	11,191,611	12,310,772
2032	0	0	11,191,611	12,310,772
2033	0	0	11,191,611	12,310,772
2034	0	0	11,191,611	12,310,772
2035	0	0	11,191,611	12,310,772
2036	0	0	11,191,611	12,310,772
2037	0	0	11,191,611	12,310,772
2038	0	0	11,191,611	12,310,772
2039	0	0	11,191,611	12,310,772
2040	0	0	11,191,611	12,310,772
2041	0	0	11,191,611	12,310,772
2042	0	0	11,191,611	12,310,772
2043	0	0	11,191,611	12,310,772
2044	0	0	11,191,611	12,310,772
2045	0	0	11,191,611	12,310,772
2046	0	0	11,191,611	12,310,772
2047	0	0	11,191,611	12,310,772
2048	0	0	11,191,611	12,310,772
2049	0	0	11,191,611	12,310,772
2050	0	0	11,191,611	12,310,772
2051	0	0	11,191,611	12,310,772
2052	0	0	11,191,611	12,310,772
2053	0	0	11,191,611	12,310,772
2054	0	0	11,191,611	12,310,772
2055	0	0	11,191,611	12,310,772
2056	0	0	11,191,611	12,310,772

Results

Year	NMOC			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1977	0	0	0	0	0	0
1978	2.718E-02	7.582E+00	5.095E-04	2.533E+00	3.796E+03	2.551E-01
1979	5.455E-02	1.522E+01	1.022E-03	5.083E+00	7.619E+03	5.119E-01
1980	8.210E-02	2.291E+01	1.539E-03	7.650E+00	1.147E+04	7.705E-01
1981	1.095E-01	3.054E+01	2.052E-03	1.020E+01	1.529E+04	1.027E+00
1982	1.370E-01	3.823E+01	2.569E-03	1.277E+01	1.914E+04	1.286E+00
1983	1.648E-01	4.597E+01	3.089E-03	1.535E+01	2.301E+04	1.546E+00
1984	1.923E-01	5.366E+01	3.605E-03	1.792E+01	2.686E+04	1.805E+00
1985	2.201E-01	6.140E+01	4.125E-03	2.051E+01	3.074E+04	2.065E+00
1986	2.480E-01	6.919E+01	4.649E-03	2.311E+01	3.464E+04	2.328E+00
1987	2.758E-01	7.693E+01	5.169E-03	2.570E+01	3.852E+04	2.588E+00
1988	9.665E-01	2.696E+02	1.812E-02	9.006E+01	1.350E+05	9.070E+00
1989	1.653E+00	4.611E+02	3.098E-02	1.540E+02	2.308E+05	1.551E+01
1990	2.334E+00	6.512E+02	4.375E-02	2.175E+02	3.260E+05	2.190E+01
1991	4.050E+00	1.130E+03	7.591E-02	3.774E+02	5.657E+05	3.801E+01
1992	5.837E+00	1.628E+03	1.094E-01	5.439E+02	8.153E+05	5.478E+01
1993	7.577E+00	2.114E+03	1.420E-01	7.060E+02	1.058E+06	7.111E+01
1994	9.544E+00	2.662E+03	1.789E-01	8.893E+02	1.333E+06	8.956E+01
1995	1.109E+01	3.095E+03	2.080E-01	1.034E+03	1.550E+06	1.041E+02
1996	1.298E+01	3.622E+03	2.434E-01	1.210E+03	1.814E+06	1.219E+02
1997	1.528E+01	4.264E+03	2.865E-01	1.424E+03	2.135E+06	1.434E+02
1998	1.808E+01	5.044E+03	3.389E-01	1.685E+03	2.525E+06	1.697E+02
1999	2.106E+01	5.877E+03	3.948E-01	1.963E+03	2.942E+06	1.977E+02
2000	2.451E+01	6.839E+03	4.595E-01	2.284E+03	3.424E+06	2.300E+02
2001	2.778E+01	7.749E+03	5.206E-01	2.588E+03	3.879E+06	2.607E+02
2002	3.095E+01	8.634E+03	5.801E-01	2.884E+03	4.323E+06	2.904E+02
2003	3.451E+01	9.627E+03	6.468E-01	3.215E+03	4.820E+06	3.238E+02
2004	3.809E+01	1.063E+04	7.139E-01	3.549E+03	5.320E+06	3.574E+02
2005	4.189E+01	1.169E+04	7.853E-01	3.904E+03	5.851E+06	3.931E+02
2006	4.521E+01	1.261E+04	8.475E-01	4.213E+03	6.315E+06	4.243E+02
2007	4.931E+01	1.376E+04	9.243E-01	4.595E+03	6.887E+06	4.627E+02
2008	5.360E+01	1.495E+04	1.005E+00	4.994E+03	7.486E+06	5.030E+02
2009	5.737E+01	1.600E+04	1.075E+00	5.346E+03	8.013E+06	5.384E+02
2010	5.965E+01	1.664E+04	1.118E+00	5.558E+03	8.331E+06	5.598E+02
2011	6.242E+01	1.741E+04	1.170E+00	5.816E+03	8.718E+06	5.857E+02
2012	6.512E+01	1.817E+04	1.221E+00	6.068E+03	9.095E+06	6.111E+02
2013	6.739E+01	1.880E+04	1.263E+00	6.280E+03	9.412E+06	6.324E+02
2014	6.947E+01	1.938E+04	1.302E+00	6.474E+03	9.703E+06	6.520E+02
2015	7.179E+01	2.003E+04	1.346E+00	6.689E+03	1.003E+07	6.737E+02
2016	7.418E+01	2.070E+04	1.391E+00	6.912E+03	1.036E+07	6.961E+02
2017	7.643E+01	2.132E+04	1.433E+00	7.122E+03	1.068E+07	7.173E+02
2018	7.871E+01	2.196E+04	1.475E+00	7.334E+03	1.099E+07	7.387E+02
2019	8.102E+01	2.260E+04	1.519E+00	7.549E+03	1.132E+07	7.603E+02
2020	8.345E+01	2.328E+04	1.564E+00	7.776E+03	1.166E+07	7.832E+02
2021	8.289E+01	2.313E+04	1.554E+00	7.724E+03	1.158E+07	7.779E+02
2022	8.233E+01	2.297E+04	1.543E+00	7.672E+03	1.150E+07	7.727E+02
2023	8.178E+01	2.282E+04	1.533E+00	7.620E+03	1.142E+07	7.675E+02
2024	8.123E+01	2.266E+04	1.523E+00	7.569E+03	1.135E+07	7.623E+02
2025	8.068E+01	2.251E+04	1.512E+00	7.518E+03	1.127E+07	7.572E+02
2026	8.014E+01	2.236E+04	1.502E+00	7.468E+03	1.119E+07	7.521E+02

ATTACHMENT 21.6

GCCS DESIGN PLAN (40 CFR 60, SUBPART XXX AND 40 CFR 63, SUBPART AAAA)

(JANUARY 2021)

New Mexico Environment Department
Air Quality Bureau
Compliance and Enforcement Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505
Phone (505) 476-4300

Version 07.20.18

NMED USE ONLY	
TEMPO	

REPORTING SUBMITTAL FORM

NMED USE ONLY	
Staff	
Admin	

PLEASE NOTE: ® - Indicates required field

SECTION I - GENERAL COMPANY AND FACILITY INFORMATION

A. ® Company Name: Camino Real Environmental Center, Inc.			**D. ® Facility Name:** Camino Real Landfill		
B.1 ® Company Address: 1000 Camino Real Blvd			**E.1 ® Facility Address:** 1000 Camino Real Blvd		
B.2 ® City: Sunland Park	**B.3 ® State:** NM	**B.4 ® Zip:** 88063	**E.2 ® City:** Sunland Park	**E.3 ® State:** NM	**E.4 ® Zip:** 88063
C.1 ® Company Environmental Contact: Dr. Juan Carlos Tomas	**C.2 ® Title:** Landfill Manager		**F.1 ® Facility Contact:** Dr. Juan Carlos Tomas	**F.2 ® Title:** Landfill Manager	
C.3 ® Phone Number: (575) 589-9440	**C.4 ® Fax Number:** (575) 589-2427		**F.3 ® Phone Number:** (575) 589-9440	**F.4 ® Fax Number:** (575) 589-2427	
C.5 ® Email Address: JuanT@wasteconnections.com			**F.5 ® Email Address:** JuanT@wasteconnections.com		
G. Responsible Official: (Title V only): Dr. Juan Carlos Tomas	**H. Title:** Landfill Manager		**I. Phone Number:** (575) 589-9440	**J. Fax Number:** (575) 589-2427	

K. ® AI Number:	**L. Title V Permit Number:**	**M. Title V Permit Issue Date:**	**N. NSR Permit Number:**	**O. NSR Permit Issue Date:**
167	P186LR3M1	09/14/2020	7592	3/11/2019

P. Reporting Period:
From: N/A To: N/A

Do NOT submit NSPS OOOO or OOOOa well completion or flowback notifications to the Air Quality Bureau. See https://www.env.nm.gov/air-quality/notices-and-faqs-for-compliance-and-enforcement/ for explanation.

SECTION II – TYPE OF SUBMITTAL (check one that applies)

A. ☐	**Title V Annual Compliance Certification**	**Permit Condition(s):**	**Description:**	
B. ☐	**Title V Semi-Annual Monitoring Report**	**Permit Condition(s):**	**Description:**	
C. ☒	**NSPS Requirement (40CFR60)**	**Regulation:** Subpart XXX	**Section(s):** §764(a)(3)(iv)(A)	**Description:** New Mexico EG rule for landfills brings in XXX by reference which requires GCCS Design Plan (see cover letter for more details).
D. ☐	**MACT Requirement (40CFR63)**	**Regulation:**	**Section(s):**	**Description:**
E. ☐	**NMAC Requirement (20.2.xx) or NESHAP Requirement (40CFR61)**	**Regulation:**	**Section(s):**	**Description:**
F. ☐	**Permit or Notice of Intent (NOI) Requirement**	**Permit No.☐: or NOI No.☐:**	**Condition(s):**	**Description:**
G. ☐	**Requirement of an Enforcement Action**	**NOV No. ☐: or SFO No. ☐: or CD No. ☐: or Other ☐:**	**Section(s):**	**Description:**

SECTION III - CERTIFICATION

After reasonable inquiry, I Dr. Juan Carlos Tomas (Name of Certifier) **certify that the information in this submittal is true, accurate and complete.**

® Signature of Certifier:	**® Title:**	**® Date**	**® Responsible Official for Title V?**
Dr. Juan Carlos Tomas	Landfill Manager	01/08/2021	☒ Yes ☐ No

Reviewed By: ______________________ Date Reviewed: ______________

January 8, 2021
SCS Project No. 16220097.00

Ms. Kirby Olson
NMED Air Quality Bureau
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505-1816

Re: New Source Performance Standards (NSPS)
20.2.64 NMAC and 40 CFR 63, Subpart AAAA
Landfill Gas Collection and Control System Design Plan
Camino Real Landfill, Sunland Park, New Mexico
Title V Operating Permit No. P186LR3M1

Dear Kirby:

On behalf of the Camino Real Environmental Center, Inc., SCS Engineers is pleased to present this Landfill Gas Collection and Control System Design Plan for the Camino Real Landfill. This Design Plan replaces the plan submitted in 2017 to satisfy 40 CFR 60, Subpart WWW. This resubmittal was a Title V permit requirement (A110.A) as well, and is being submitted within one year of the Non Methane Organic Compound (NMOC) emission rate being reported as being over 34 Mg/yr under the State of New Mexico's Emission Guideline (EG) Rule (20.2.64 NMAC).

Although the EG rule's provisions, which references 40 CFR 60, Subpart XXX's requirements, would typically take full effect with control requirements within 18 months of this plan's submittal, a recent revision to 40 CFR 63, Subpart AAAA (on March 26, 2020) has accelerated the applicability of the newer operating provisions meant to replace those of 40 CFR 60, Subpart WWW. As such, on September 27, 2021 the recently revised 40 CFR 63, Subpart AAAA replaces the Subpart WWW requirements for this landfill with a combination of requirements in both 40 CFR 60, Subpart XXX and 40 CFR 63, Subpart AAAA. This plan has been prepared to accommodate these new requirements. We have included a Compliance Schedule (Section 2.2) in the plan to specifically discuss the interplay of these rules and when regulatory milestones occur.

By way of this overall submittal, Camino Real Environmental Center is indicating that it will officially transition into the Subpart AAAA requirements on September 27, 2021 and no earlier (the rule allows for owners to opt-in to the new rule earlier). This letter and submittal satisfies the notification requirements of §63.9(b).

Please do not hesitate to contact David Mezzacappa, P.E. with any questions at (817) 358-6108.

Sincerely,

Joseph D. Krasner, P.E.
Project Manager
SCS ENGINEERS

David J. Mezzacappa, P.E.
Vice President
SCS ENGINEERS

Attachments

Cc: Dr. Juan Carlos Tomas, Camino Real Environmental Center, Inc.
Mr. Brady Stewart, P.E., Waste Connections, Inc. (e-copy)

January 18, 2021

Dear Customer,

The following is the proof-of-delivery for tracking number: 772572989950

Delivery Information:

Status:	Delivered	**Delivered To:**	Receptionist/Front Desk
Signed for by:	S.SILVEEAD	**Delivery Location:**	525 CAMINO DE LOS MARQUEZ
Service type:	FedEx Express Saver		
Special Handling:	Deliver Weekday		SANTA FE, NM, 87505
		Delivery date:	Jan 13, 2021 11:06

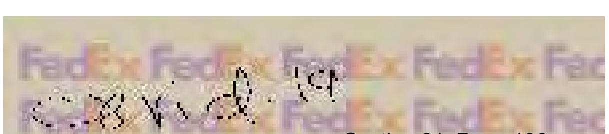
Shipping Information:

Tracking number:	772572989950	**Ship Date:**	Jan 8, 2021
		Weight:	1.0 LB/0.45 KG

Recipient:
Kirby Sue Olson, Ph.D, NMED Air Quality Bureau
525 Camino de los Marquez, Suite 1
SANTA FE, NM, US, 87505

Shipper:
Joey Krasner, P.E., SCS Engineers
1901 CENTRAL DR
STE 550
BEDFORD, TX, US, 76021

Reference	16220097.00 NT
Invoice	Camino GCCS Plan



Landfill Gas Collection and Control System (GCCS) Design Plan

Camino Real Environmental Center, Inc.
1000 Camino Real Blvd
Sunland Park, NM 88063
(575) 589-9440

SCS ENGINEERS

SCS No. 16220097.00 | January 2021

1901 Central Drive, Suite 550
Bedford, Texas 76021
(817) 571-2288

Table of Contents

Appendices

1 CERTIFICATION STATEMENT

I certify that this document fulfills the requirements for the Landfill Gas (LFG) Collection and Control System (GCCS) Design Plan (Plan) under the State of New Mexico Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills (20.2.64 NMAC), which incorporates 40 CFR 60, Subpart XXX (Standards of Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification After July 17, 2014) by reference. This Plan has also been prepared to incorporate relevant provisions of 40 CFR 63, Subpart AAAA as finalized on March 26, 2020, which are applicable beginning September 27, 2021. I further certify that this Plan was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of New Mexico.

Project: Landfill Gas Collection and Control System Design Plan
Camino Real Landfill
Sunland Park, New Mexico

1/8/2021

Signed,

DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER

David J. Mezzacappa, P.E.
New Mexico P.E. #15236
SCS Engineers

I CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE INFORMATION PROVIDED IN THIS PLAN IS COMPLETE AND ACCURATE.

GCCS operation, including associated monitoring, recordkeeping and reporting will be initiated by September 27, 2021 as required by 40 CFR 63, Subpart AAAA. This is as opposed to within 30-months after the date of the first annual non-methane organic compound (NMOC) Emission Rate report which indicates the NMOC emission rate equals or exceeds 34 Mg/yr. In the interim, the site will continue to comply with Subpart WWW requirements for GCCS operations, including associated monitoring, recordkeeping and reporting.

01/08/2021
Date

Dr. Juan Carlos Tomas, Camino Real Landfill Manager

2 INTRODUCTION

2.1 PURPOSE OF DOCUMENT

This Plan was prepared by SCS Engineers (SCS) on behalf of the Camino Real Environmental Center, Inc. (CREC) for the Camino Real Landfill (landfill) to fulfill the requirements of the State of New Mexico EG for MSW Landfills (20.2.64 NMAC), as well as upcoming requirements from 40 CFR 63, Subpart AAAA, the landfill National Emissions Standards for Hazardous Air Pollutants (NESHAPS), which will become effective on September 27, 2021. Since 20.2.64 NMAC incorporates the requirements of 40 CFR 60, Subpart XXX by reference, any 40 CFR Part 60, Subpart XXX references should be understood to satisfy 20.2.64 NMAC requirements.

The landfill is currently subject to the full control requirements of 40 CFR 60, Subpart WWW; however, this rule will be fully replaced on September 27, 2021 by 40 CFR 63, Subpart AAAA requirements that replace Subpart WWW, and reference several subchapters of 40 CFR 60, Subpart XXX. This September 27, 2021 date will supersede the date at which the landfill would have been subject to the full EG control requirements, just as the new Subpart AAAA rule's control requirements supersede the EG rule's control requirements which reference only Subpart XXX.

The landfill became subject to the NSPS control requirements of Subpart WWW on November 16, 2018 after previously reporting a design capacity over the rule's threshold, and reporting NMOC emissions that were over 50 Mg/yr. With New Mexico's most recent EG rule's finalization per 40 CFR 60, Subpart Cf becoming effective October 11, 2019, CREC reported that the landfill's NMOC emissions were over 34 Mg/yr in a submittal dated January 9, 2020. As such, this new GCCS Design Plan is due by no later than January 9, 2021. Normally, the EG control requirements would then become effective 18 months later (July 9, 2022 in this case) and replace the Subpart WWW control requirements. However, on March 26, 2020, a revised 40 CFR 63, Subpart AAAA rule was finalized. The landfill is subject to this new rule since it emits over 50 Mg/yr of NMOCs, and must meet this rule's control requirements by September 27, 2021. The Subpart AAAA requirements also supersede the NSPS/EG control requirements since Subpart AAAA was written to harmonize the various applicable rules; and as such, the July 9, 2022 date will not trigger any new requirements as CREC will already be complying with the requirements set forth in Subpart AAAA. These Subpart AAAA requirements reference large portions of the NSPS Subpart XXX rules, and also include new, AAAA-specific content. As such, this Plan will reference both Subpart XXX and Subpart AAAA; and will wholly replace the subpart WWW Plan that was previously submitted, on September 27, 2021.

The purpose of this document is to provide details of the existing GCCS at the landfill and a plan for future modifications to upgrade the GCCS to achieve compliance with applicable regulatory requirements. The following Plan fulfills the requirements for submittal of a GCCS Design Plan, as set forth in relevant sections of 40 CFR 60, Subpart XXX and 40 CFR 63, Subpart AAAA as described herein. The Plan addresses those areas defined as active areas where the first refuse deposited in the area has reached an age of 5 years or more, or those areas closed or at final grade where the first refuse deposited in the areas has reached an age of 2 years or more (§63.1959(b)(2)(ii)(C)(2)).

This Plan is organized into the following sections:

- Section 1 - Certification;
- Section 2 - Introduction;
- Section 3 - Existing Site Conditions;
- Section 4 - Site Development;
- Section 5 - Compliance Review and Evaluation;
- Section 6 - Proposed Alternatives;
- Section 7 - Operating Under XXX/AAAA; and
- Section 8 - Limitations.

Supporting documents are appended to the Plan and include:

- Appendix A - Drawings including the existing GCCS, proposed GCCS at closure, and various GCCS details;
- Appendix B - Surface Emissions Monitoring Plan;
- Appendix C - LandGEM modeling results for estimating overall gas generation; and
- Appendix D - KYGas modeling results for use in pipe network/sizing.

The landfill has an existing GCCS Design Plan under NSPS (Subpart WWW), and much of the design content included here has been taken from that Plan since it is still valid.

2.2 COMPLIANCE SCHEDULE

As shown in Table 1, this Plan becomes effective for the landfill on September 27, 2021 when 40 CFR 63, Subpart AAAA, as finalized on March 26, 2020, takes effect, also incorporating several subchapters of 40 CFR 60, Subpart XXX. In the interim, the CREC will continue to comply with Subpart WWW requirements for GCCS operations, including associated monitoring, recordkeeping and reporting. Table 1 below illustrates the implementation/compliance schedule for GCCS operations. If the Administrator/NMED requires that this Design Plan be modified, the modification(s) will apply prospectively and not retroactively.

Also, the new Subpart AAAA references the general provisions and initial notifications for whether a site is subject to Subpart AAAA. Since this landfill is currently subject to the pre-March 26, 2020 version of Subpart AAAA already, and since this Plan notifies compliance with the new rule, no additional notification under §63.9(b) will be required. As such, this Plan satisfies the notification requirements under NESHAP, Subpart A.

Table 1 – NSPS XXX/NESHAP AAAA Implementation Schedule

Regulatory Milestone	Date
NMOC Emission Rate Report submitted (NMOC equals or exceeds 34 Mg/yr)	01/09/2020
GCCS Design Plan submitted	01/08/2021
Final day of NSPS WWW requirements	09/26/2021
NSPS XXX/NESHAP AAAA GCCS operations commence	09/27/2021
NSPS XXX/NESHAP AAAA monitoring, recordkeeping, and reporting (MRR) commences	09/27/2021
NSPS XXX/NESHAP AAAA Initial Semi-Annual Report *	03/26/2022

* The Initial semi-annual report required by 40 CFR 60.767(g) will contain the performance test results that were completed for Subpart WWW, since they are still valid, to satisfy the requirements of 60.8, 60.18, and 63.11.

3 EXISTING SITE CONDITIONS

3.1 LANDFILL DESCRIPTION

The landfill is located in Doña Ana County, New Mexico, at 1000 Camino Real Boulevard. Solid waste is delivered to the landfill from Doña Ana County, the City of El Paso, and Chihuahua, Mexico. The landfill receives commercially-delivered residential, construction and demolition, industrial, and commercial wastes. Public (self-haul) waste represents a substantial proportion of the daily traffic but a small percentage of waste volume.

The land now used for the landfill was used for dumping from the 1970's until the current property was purchased by JOAB, Inc., a predecessor to CREC, in April 1987. The landfill was registered with NMED initially as the Nu-Mex Landfill (Nu-Mex), and waste from across the site was collected and consolidated into the first fill area (Unit 1).

The landfill consists of three permitted "Units;" which are actually contiguous fill areas. These units are divided into cells. Unit 1 is the closed, pre-Subtitle D area of the landfill. Units 2 and 3 are both post-Subtitle D areas which have been/will be composite lined. Unit 2 has been completely lined to date and new cell construction has progressed to Unit 3. New filling takes place mostly in Unit 3, but also in Unit 2 until final grades are achieved. There is a permitted area for a Unit 4 also to the southeast of, and adjacent to Unit 2; however, this unit is not being included in this plan since its base and final grades have not yet been finalized.

Unit 1 is approximately 50 acres in size, while Unit 2 is approximately 126 acres in size. Unit 3 is approximately 83 acres in size. The units are shown on the GCCS layout drawings included with this plan.

3.2 EXISTING GAS COLLECTION AND CONTROL SYSTEM

Drawing 1 shows a map of the existing GCCS. The GCCS in its current configuration was constructed beginning in June 1999. The GCCS has been maintained and expanded to collect gas from areas that have had waste in-place for more than 5 years but that are not yet at final grade, and 2 years or more if at final grade since the 40 CFR 60, Subpart WWW date for control installation (November 2018). These 2 and 5-year provisions for collecting LFG have not changed with the newer rules being addressed in this Plan, and this standard will continue to be maintained to plan periodic GCCS expansions.

Since the existing GCCS has been designed to comply with Subpart WWW, no changes are required for compliance with 40 CFR 60, Subpart XXX or 40 CFR 63, Subpart AAAA requirements. These new rules did not change spacing, timing, or other GCCS Design requirements.

The primary control for the GCCS is currently a treatment system for an adjacent, separately owned and operated, landfill gas-to-energy (LFGE) facility. The LFGE facility includes two caterpillar G3520 C generators that, when operating, can accept just over 500 cfm of LFG each. The landfill owns a 3,000 cubic feet per minute (cfm)-capacity candlestick flare with two Hoffman 38303 Gas Blowers, each capable of providing 300 scfm to 1,500 scfm in flow at a vacuum of up to 60 inches of water column. This flare combusts what the plant does not take or when the plant is down for any reason.

The proposed GCCS as set forth in this Plan for final landfill build-out (Drawing 2), consists of vertical LFG collection wells connected to below-grade header piping. The LFG collection wells will be spaced and designed such that their radius-of-influence covers the landfill mass, helping to facilitate efficient LFG collection. The header piping will be sized such that negative pressures can be maintained throughout the system, and so that blowers can adequately convey s to the control device(s). The LFG will be conveyed to a control device(s) meeting regulatory requirements throughout the life of the landfill. Blower and control device capacity will be upgraded as needed to adequately convey and control LFG throughout the required control period. Please refer to the drawings and more detailed descriptions in later portions of this Plan for more details and specifics about the proposed system.

4 SITE DEVELOPMENT

4.1 LANDFILL DEVELOPMENT PLAN

Fill sequencing at the landfill should not negatively impact GCCS expansions or design for compliance with the relevant requirements. The LFG modeling took into account the overall projected life of the landfill through Unit 3, and various types of LFG collectors can be used depending on the interim waste configurations as the landfill waste mass progresses. As noted in Section 3.1, cells in Unit 3 are being constructed and filling is taking place in these new cells and to complete the previously lined, adjacent sections of Unit 2. In general the GCCS will simply be expanded into these new lateral areas as filling progresses to meet the requirements to have collection in areas that have had waste in place for 5 years or more if at interim grade, or 2 years or more if at final grade. Section 5.5.8 of this Plan discussed how the GCCS will also be maintained and be compatible with any end-use after closure.

4.2 FUTURE GAS COLLECTION AND CONTROL SYSTEM

The proposed GCCS as set forth in this Plan for final landfill build-out, consists of vertical LFG collection wells connected to below-grade header piping. The LFG collection wells will be spaced and designed such that their radius-of-influence covers the landfill mass, helping to ensure efficient LFG collection. The header piping will be sized such that negative pressures can be maintained throughout the system, and so that blowers can adequately convey LFG to the control device(s). The LFG will be conveyed to a control device(s) meeting relevant requirements (treatment or open flare conforming to §60.18/§63.11 performance standards). Please refer to the drawings and more detailed descriptions in later portions of this Plan for more details and specifics about the proposed GCCS.

A phased GCCS design will be implemented in order to comply with the requirements for GCCS expansions stipulated in §63.1959(b)(2)(ii)(C)(2) which contains the following four requirements:

- Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment;
- Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade;
- Collect gas at a sufficient extraction rate; and
- Be designed to minimize off-site migration of subsurface gas.

Conceptual layout drawings depicting the final build-out of the existing GCCS and standard details are included in Appendix A.

As the site develops, additional LFG extraction wells will be installed as needed to control migration and surface emissions of methane. The locations and details of the anticipated final proposed LFG extraction wells are shown in Appendix A. Where needed, interim horizontal collection trenches may also be installed in areas of the landfill that are not yet at final grade. Once the landfill achieves its final elevation, vertical wells will be likely be installed to replace the interim horizontal collection trenches. The future LFG extraction well layout was developed with both perimeter and internal extraction wells with the maximum radius-of influence (ROI) of 200 feet is utilized on topslopes, and 150 feet on sideslopes to assure that well spacing does not become too diffuse when deep wells are utilized. The current wellfield also conforms to these standards. Each LFG extraction well will be equipped with a control valve and monitoring ports similar to Drawing 4 in Appendix A. These control valves and monitoring ports, used in conjunction with controls on the blower, will allow the GCCS operator to regulate vacuum and LFG levels at each individual LFG extraction well. This will allow for adjustments in order to effectively reduce the potential for air intrusion, subsurface migration, and odors, in addition to protect the integrity of the final cover system. The proposed GCCS components will serve to expand the existing GCCS and will be installed in phases as needed.

Future LFG piping will be sized to accommodate the maximum expected LFG flow rate as estimated by LFG generation rate modeling. The results of the LandGEM model that was used to calculated maximum LFG flow rate is included in Appendix C, and the KYGas Model that was used to determine the future pipe sizing is included in Appendix D of this Plan.

4.3 INTERIM GCCS CONDITION

Interim operating conditions occur when the landfill is still actively accepting waste, and before it is closed or reaches final grade. During these interim conditions, the GCCS is typically being installed or expanded to comply with all requirements, while the landfill is also balancing the requirements of the day-to-day activities of an active landfilling operation. Interim GCCS components will be installed as needed. Drawing 2 in Appendix A depicts the GCCS following closure of the landfill and may not be representative of interim GCCS construction details during active landfill operations. However, the GCCS will at all times be constructed or expanded to maintain compliance with applicable requirements. Due to possible future landfill operational changes, the GCCS design may also be altered to maintain compliance as needed, but to also accommodate actual field conditions at the time of construction. Several provisions have been included in the GCCS design to accommodate future system expansion such as:

- Extendable LFG extraction wells and details for horizontal collection trenches (if needed) to be installed as filling progresses;
- Maintain additional capacity in the LFG conveyance piping system through conservative pipe sizing based on future projected flow conditions;
- Pre-installed isolation valves and blind flanges where needed in the LFG conveyance system to allow for ease of isolation and making new header and lateral piping connections without having to shut down the entire GCCS;
- Reserve excess design capacity in the blower/flare equipment to handle incremental increases in operating capacity and pressure as the system is expanded; and
- Overall GCCS design that is developed to be incrementally expanded over time as the landfill grows as additional LFG generation occurs.

5 COMPLIANCE REVIEW AND EVALUATION

The purpose of this section is to describe and document information required to certify compliance of the GCCS with the applicable sections of 40 CFR 63, Subpart AAAA, and 40 CFR 60, Subpart XXX.

5.1 COMPLIANCE WITH §63.1958: OPERATIONAL STANDARDS FOR COLLECTION AND CONTROL SYSTEMS

5.1.1 Compliance with §63.1958(a)

§63.1958(a) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:

(1) 5 years or more if active; or
(2) 2 years or more if closed or at final grade.

The GCCS will be installed to collect gas from areas of waste in accordance with §63.1958(a). Future expansions of the GCCS will also comply with §63.1958(a). Information regarding interim system expansions will be included in the required semi-annual reports.

5.1.2 Compliance with §63.1958(b)

§63.1958(b) Operate the collection system with negative pressure at each wellhead except under the following conditions:

1) *A fire or increased well temperature. The owner or operator must record instances when positive pressure occurs in efforts to avoid a fire. These records must be submitted with the semi-annual reports as provided in §63.1981(h);*

2) *Use of a geomembrane or synthetic cover. The owner or operator must develop acceptable pressure limits in the design plan;*

3) *A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes must be approved by the Administrator as specified in §63.1981(d)(2).*

The GCCS will be operated with negative pressure at each wellhead except under these three conditions in accordance with the above stated rule provisions.

5.1.3 Compliance with §63.1958(c)

§63.1958(c) Operate each interior wellhead in the collection system as specified in §60.753(c) until the landfill owner or operator elects to meet the operational standard for temperature in §63.1958(c)(1), except:

1) *Beginning no later than September 27, 2021, operate each interior wellhead in the collection system with a landfill gas temperature less than 62.8 degrees Celsius (145 degrees Fahrenheit).*

2) *The owner or operator may establish a higher operating temperature value at a particular well. A higher operating value demonstration must be submitted to the Administrator for approval and must include supporting data demonstrating that the elevated parameter neither causes fires nor significantly inhibits anaerobic decomposition by killing methanogens. The demonstration must satisfy both criteria in order to be approved (i.e., neither causing fires nor killing methanogens is acceptable).*

This part of the rule describes operational requirements at the wellhead to minimize the potential for subsurface oxidation events. The GCCS will be operated in accordance with above stated rule provision. However, on an as-needed basis, a higher operating value (HOV) demonstration may be requested as set forth in the rules or as provided for in other parts of this Plan. Any existing HOVs that were previously approved will continue to apply and will not require further approval. Lastly, since this Plan takes effect on September 27, 2021, at which time §63.1958(c)(1) will be the wellhead standard as opposed to §60.753(c).

5.1.4 Compliance with §63.1958(d)

§63.1958(d)

1) *Operate the collection system so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan must be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.*

2) *Beginning no later than September 27, 2021, the owner or operator must:*

   (i) Conduct surface testing using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in §63.1960(d).
   (ii) Conduct surface testing at all cover penetrations. Thus, the owner or operator must monitor any cover penetrations that are within an area of the landfill where waste has been placed and a gas

collection system is required.

(iii) Determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.

The portions of §63.1958(d) that are triggered after September 27, 2021 are relevant to this Plan. Appendix B contains the Surface Emissions Monitoring Plan, which conforms to these requirements. The Surface Emissions Monitoring Plan discusses conformance with determining the latitude and longitude of each exceedance and penetration monitoring per the requirements above.

The GCCS will be designed to minimize both subsurface lateral migration and surface emissions of LFG. Surface emissions monitoring data and repairs to the landfill's cover and gas system will ensure that the compliance with surface emissions standards is maintained.

The landfill's surface will be monitored for emissions in accordance with this Plan and in full compliance with the rules. If the GCCS does not meet the measures of performance for the surface emissions as required, the GCCS and/or landfill cover will be adjusted or modified accordingly.

Drawing B.1 in Appendix B includes the proposed route for surface emissions monitoring. Prior to each monitoring event, route planning will be conducted where the best route for that round of monitoring will be decided. This will be decided based on landfill operating conditions and topographical features at the time of each monitoring event. Excluded areas will include dangerous areas with roads, truck traffic areas, paved areas excluding cracks, steep slopes, areas covered with snow or ice, and active filling areas of the landfill due to the health and safety risk of working around heavy equipment traffic.

5.1.5 Compliance with §63.1958(e)

§63.1958(e) *Operate the system as specified in §60.753(e) of this chapter, except:*

(1) Beginning no later than September 27, 2021, operate the system in accordance to §63.1955(c) such that all collected gases are vented to a control system designed and operated in compliance with §63.1959(b)(2)(iii). In the event the collection or control system is not operating:

(i) The gas mover system must be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere must be closed within 1 hour of the collection or control system not operating; and

(ii) Efforts to repair the collection or control system must be initiated and completed in a manner such that downtime is kept to a minimum, and the collection and control system must be returned to operation.

The §63.1955(c) referenced above reads as follows:

§63.1955(c) *At all times, beginning no later than September 27, 2021, the owner or operator must operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for* *minimizing emissions. The general duty to minimize emissions does not require the owner or operator to make any further efforts to reduce emissions if the requirements of this subpart have been achieved. Determination of whether a source is operating in compliance with operation and maintenance requirements will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.*

The portions of §63.1958(e) that are triggered after September 27, 2021 are relevant to this Plan. Per and according to the §63.1955(c) requirements, the GCCS will be operated and maintained in a manner consistent with safety and good air pollution control practices for minimizing emissions. Also, in accordance with these requirements, the gas mover system and all valves in the GCCS, which could contribute to venting, will be closed within 1 hour of the GCCS not operating. This will meet the work practice standard of the regulation. Repairs will be made in a manner such that downtime is minimized so that the GCCS can return to operation.

5.1.6 Compliance with §63.1958(f)

§63.1958(f) *Operate the control system at all times when the collected gas is routed to the system.*

The control devices (open flare and treatment system currently, or other future control devices) will only operate when LFG is routed to them. The GCCS is design to shut down when the control device is not operating.

5.1.7 Compliance with §63.1958(g)

§63.1958(g) *If monitoring demonstrates that the operational requirements in paragraph (b), (c), or (d) of this section are not met, corrective action must be taken as specified in §63.1960(a)(3) and (5) or (c). If corrective actions are taken as specified in §63.1960, the monitored exceedance is not a deviation of the operational requirements in this section.*

This requirement is acknowledged and these provisions will be discussed in Section 5.2 (Compliance Provisions), which covers the requirements of §63.1960.

5.2 COMPLIANCE WITH §63.1960: COMPLIANCE PROVISIONS

5.2.1 Compliance with §63.1960(a)(1)

§63.1960(a)(1) *For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with §63.1959(b)(2)(ii)(C)(1), either Equation 5 or Equation 6 must be used. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the Administrator. The methane generation rate constant (k) and methane generation potential (L_o) kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site-specific values demonstrated to be* *appropriate and approved by the Administrator.*

Peak LFG generation was estimated using Equation 1 (referred to as equation 5 above) in the United States (U.S.) Environmental Protection Agency's (EPA's) LandGEM model, which is included in Appendix C.

For LFG modeling, the k and L_0 factors used in the LandGEM were those published in the most recent "Compilation of Air Pollutant Emission Factors" (AP-42). The LandGEM model uses Equation 1 when the waste input is provided by year. As recommended by EPA's AP-42 emissions estimation guide for landfills, the k and L_0 factors used in the model were 0.02/year and 100 m^3/Mg (3,204 ft^3/ton), respectively. These values were then input into the LandGEM model, which provided the LFG generation rate projections. Although a site-specific NMOC rate was calculated for the landfill using Tier 2 testing in 2016, the LandGEM default NMOC concentration was used for this modeling since the NMOC content will vary over time, and since NMOC content has no bearing on LFG generation. Also, although a site-specific "k" factor for the landfill of 0.007 was determined through "Tier 3" NSPS testing in 1999, the k value of 0.02 is being used here for conservativeness since this will result in a sharper LFG generation "peak" on the gas curve. These default values are conservative here due to typically lower than expected generation in the arid climate.

Using both historical and projected annual waste disposal rates and the default k and L_0 factors discussed above, a LandGEM model was prepared to project the maximum LFG generation rate for the GCCS design.

At maximum LFG generation (the assumed landfill closure year), a GCCS collection efficiency of 85 percent of generated LFG was assumed. This percentage is higher than the 75 percent substantiated by AP-42 as being within the typical range of collection efficiency for landfills since the final cover should help increase collection efficiency.

The LandGEM model requires that waste intake be input for every year (past and future). Historical and future disposal rates input to the LandGEM models were obtained from landfill records and based on the following assumptions, which were kept to match the Subpart WWW Plan that was previously submitted for consistency:

- Waste disposal rates for 1977 through 1996, were referenced from the NSPS Non-Methane Organic Compound Emission Rate Estimate Report (NSPS Tier 2, prepared by Weaver Boos & Gordon, Inc., February 1999).
- Waste disposal rates between 1997 and 2015 were as reported on New Mexico Environmental Department (NMED), Solid Waste Bureau (SWB) Annual Reports.
- The waste disposal rate for 2016 was obtained from the site's monthly summaries that are included in Title V air operating permit reporting.
- Based on landfill volumetrics and current compaction rates, it was calculated that Units 2 and 3 had approximately 13.057 million cubic yards of airspace remaining as of January 1, 2017.
- Based on current solid waste projections, annual waste intake is assumed to increase at the rate of 0.5 percent per year. This increase was used from 2017 through landfill closure.
- Based on these assumptions Units 2 and 3 are assumed to reach capacity sometime in 2038. Of

course, the ultimate date will depend on future waste intake, ongoing compaction rates, and the ultimate constructed capacity of future cells.

The historic and projected future disposal rates developed for the landfill are shown in the LandGEM model results included in Appendix C. Based on the model results, the following conclusions can be drawn and are shown in Table 2. In the table below, the assumed recovery column shown is 85 percent of generation – the collection efficiency assumed for the closed, capped landfill. No additional factor-of-safety was added to this result since the landfill is in a very arid environment and generation may be lower than predicted in the LandGEM model using default coefficients.

Table 2 - Camino Real Landfill Projected Maximum Recovery

Year	LandGEM LFG Generation (cfm)	Design Recovery (cfm)
2039	3,663	3,113

5.2.2 Compliance with §63.1960(a)(3)

§63.1960(a)(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with §63.1959(b)(2)(ii)(B)(3), the owner or operator must measure gauge pressure in the gas collection header applied to each individual well monthly. Any attempted corrective measure must not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval. If a positive pressure exists, follow the procedures as specified in §60.755(a)(3), except:

(i) Beginning no later than September 27, 2021, if a positive pressure exists, action must be initiated to correct the exceedance within 5 days, except for the three conditions allowed under §63.1958(b).

(A) If negative pressure cannot be achieved without excess air infiltration within 15 days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to §63.1983(e)(3).
(B) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in §63.1981(h)(7) as part of the next semi-annual report. The owner or operator must keep records according to §63.1983(e)(5).
(C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action

analysis, and corresponding implementation timeline to the Administrator, according to §63.1981(j). The owner or operator must keep records according to §63.1983(e)(5).

The portions of §63.1958(e) that are triggered after September 27, 2021 are relevant to this Plan. The GCCS will be operated in a manner to maintain compliance with this provision.

Monthly monitoring and wellfield balancing will be performed which will include monitoring for pressure. Exceedances will be mitigated in accordance with this rule and reported in the semi-annual reports. If corrective actions are taken as set forth in §63.1960, the monitoring exceedance is not a violation; and therefore will not be considered a deviation.

Future GCCS expansions will be designed to accommodate additional LFG flow from the extraction wells and pressure drop through the piping in order to maintain a negative pressure as stated in the above rule. If this condition cannot be maintained, modifications to the GCCS will be made. Alternatives to the negative pressure requirement and monitoring follow-up may also be utilized as allowed by the rules and as set forth in this Plan.

5.2.3 Compliance with §63.1960(a)(4)

§63.1960(a)(4) *Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph §63.1958(c), for the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must follow the procedures as specified in §60.755(a)(5) of this chapter, except:*

(i) Once an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in §63.1958(c)(1), the owner or operator must monitor each well monthly for temperature. If a well exceeds the operating parameter for temperature as provided in §63.1958(c)(1), action must be initiated to correct the exceedance within 5 days. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(A) If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit), the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) was first measured. The owner or operator must keep records according to §63.1983(e)(3).
(B) If corrective actions cannot be fully implemented within 60 days following the temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator must submit the items listed in §63.1981(h)(7) as part of the

next semi-annual report. The owner or operator must keep records according to §63.1983(e)(4). (C) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to §63.1981(h)(7) and (j). The owner or operator must keep records according to §63.1983(e)(5). (D) If a landfill gas temperature measured at either the wellhead or at any point in the well is greater than or equal to 76.7 degrees Celsius (170 degrees Fahrenheit) and the carbon monoxide concentration measured, according to the procedures in §63.1961(a)(5)(vi) is greater than or equal to 1,000 ppmv the corrective action(s) for the wellhead temperature standard (62.8 degrees Celsius or 145 degrees Fahrenheit) must be completed within 15 days.

The GCCS will be operated in a manner maintaining compliance with this provision.

Monthly monitoring and wellfield balancing will be performed which includes monitoring for temperature. Exceedances will be mitigated in accordance with this rule and Plan, and reported in the semi-annual reports. In addition, the GCCS design criteria will be followed to minimize surface air infiltration. If corrective actions are taken as set forth in §63.1960, the monitoring exceedance is not a violation; and therefore will not be considered a deviation. Alternatives to the temperature requirement and monitoring follow-up may also be utilized as allowed by the rules and as set forth in this Plan.

5.2.4 Compliance with §63.1960 (c) and (d)

This provision lists specific requirements for surface emission monitoring and is covered by the discussions regarding §30.1958(d) (Section 5.1.4 of this Plan), and the Surface Emissions Monitoring Plan (Appendix B).

5.3 COMPLIANCE WITH §63.1961: MONITORING OF OPERATIONS

§63.1961(a) *Each owner or operator seeking to comply with §63.1959(b)(2)(ii)(B) for an active gas collection system must install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each wellhead and:*

(1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in §63.1960(a)(3); and

(2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as follows:

i. The nitrogen level must be determined using EPA Method 3C of appendix A-2 to part 60 of this chapter, unless an alternative test method is established as allowed by §63.1981(d)(2).

ii. Unless an alternative test method is established as allowed by §63.1981(d)(2), the oxygen level must be determined by an oxygen meter using EPA Method 3A or 3C of appendix A-2 to part 60 of this chapter or ASTM D6522-11 (incorporated by reference, see §63.14). Determine the oxygen level by an oxygen meter using EPA Method 3A or

3C of appendix A-2 to part 60 or ASTM D6522-11 (if sample location is prior to combustion) except that:
(A) The span must be set between 10 and 12 percent oxygen;
(B) A data recorder is not required;
(C) Only two calibration gases are required, a zero and span;
(D) A calibration error check is not required;
(E) The allowable sample bias, zero drift, and calibration drift are ±10 percent.

iii. *A portable gas composition analyzer may be used to monitor the oxygen levels provided:;*
    A. *The analyzer is calibrated; and*
    B. *The analyzer meets all quality assurance and quality control requirements for Method 3A or ASTM D6522-11 (incorporated by reference, see §63.14).*

(3) *Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the temperature and nitrogen or oxygen operational standards in introductory paragraph §63.1958(c), the owner or operator must follow the procedures as specified in §60.756(a)(2) and (3) of this chapter. Monitor temperature of the landfill gas on a monthly basis as provided in §63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter.*

The GCCS will be operated in a manner maintaining compliance with this provision.

Monthly monitoring and wellfield balancing will be performed which includes monitoring for oxygen. Alternatives to the monitoring may also be utilized as allowed by the rules and as set forth in this Plan.

(4) *Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in §63.1958(c)(1), monitor temperature of the landfill gas on a monthly basis as provided in §63.1960(a)(4). The temperature measuring device must be calibrated annually using the procedure in Section 10.3 of EPA Method 2 of appendix A-1 to part 60 of this chapter. Keep records specified in §63.1983(e).*

(5) *Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with the operational standard for temperature in §63.1958(c)(1), unless a higher operating temperature value has been approved by the Administrator under this subpart or under 40 CFR part 60, subpart WWW; 40 CFR part 60, subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR part 60, subpart Cc or 40 CFR part 60, subpart Cf, you must initiate enhanced monitoring at each well with a measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) as follows:*
    i. *Visual observations for subsurface oxidation events (smoke, smoldering ash, damage to well) within the radius of influence of the well.*
    ii. *Monitor oxygen concentration as provided in paragraph (a)(2) of this section;*
    iii. *Monitor temperature of the landfill gas at the wellhead as provided in paragraph (a)(4) of this section.*
    iv. *Monitor temperature of the landfill gas every 10 vertical feet of the well as provided in paragraph (a)(6) of this section.*

v. Monitor the methane concentration with a methane meter using EPA Method 3C of appendix A-6 to part 60, EPA Method 18 of appendix A-6 to part 60 of this chapter, or a portable gas composition analyzer to monitor the methane levels provided that the analyzer is calibrated and the analyzer meets all quality assurance and quality control requirements for EPA Method 3C or EPA Method 18.

vi. Monitor carbon monoxide concentrations, as follows:

(A). Collect the sample from the wellhead sampling port in a passivated canister or multi-layer foil gas sampling bag (such as the Cali-5-Bond Bag) and analyze that sample using EPA Method 10 of appendix A-4 to part 60 of this chapter, or an equivalent method with a detection limit of at least 100 ppmv of carbon monoxide in high concentrations of methane; and

(B), Collect and analyze the sample from the wellhead using EPA Method 10 of appendix A-4 to part 60 to measure carbon monoxide concentrations.

vii. The enhanced monitoring this paragraph (a)(5) must begin 7 days after the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit); and

viii. The enhanced monitoring in this paragraph (a)(5) must be conducted on a weekly basis. If four consecutive weekly carbon monoxide readings are under 100 ppmv, then enhanced monitoring may be decreased to monthly. However, if carbon monoxide readings exceed 100 ppmv again, the landfill must return to weekly monitoring.

ix. The enhanced monitoring in this paragraph (a)(5) can be stopped once a higher operating value is approved, at which time the monitoring provisions issued with the higher operating value should be followed, or once the measurement of landfill gas temperature at the wellhead is less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit).

(6) For each wellhead with a measurement of landfill gas temperature greater than or equal to 73.9 degrees Celsius (165 degrees Fahrenheit), annually monitor temperature of the landfill gas every 10 vertical feet of the well. This temperature can be monitored either with a removable thermometer, or using temporary or permanent thermocouples installed in the well.

The GCCS will be operated in a manner maintaining compliance with this provision. Monthly monitoring and wellfield balancing will be performed which includes monitoring for temperature. Alternatives to the monitoring may also be utilized as allowed by the rules and as set forth in this Plan. As noted in §63.1961(a)(4), previously approved higher operating temperatures may be utilized if needed.

§63.1961(c) *Each owner or operator seeking to comply with §63.1959(b)(2)(iii) using a non-enclosed flare must install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:*

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame; and

(2) A device that records flow to or bypass of the flare. The owner or operator must:

(i) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the control device at least every 15 minutes; and
(ii) Secure the bypass line valve in the closed position with a car-seal or a lock and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

The GCCS includes an open flare for LFG combustion (which currently acts as a backup), with the primary LFG control being off-site treatment under §63.1961(g). Therefore, the provisions that apply from §63.1961 for control devices at this time are (c) and (g).

§63.1961(f) *Each owner or operator seeking to demonstrate compliance with the 500-ppm surface methane operational standard in §63.1958(d) must monitor surface concentrations of methane according to the procedures in §63.1960(c) and the instrument specifications in §63.1960(d). If you are complying with the 500-ppm surface methane operational standard in §63.1958(d)(2), for location, you must determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters and the coordinates must be in decimal degrees with at least five decimal places. In the semi-annual report in 63.1981(i), you must report the location of each exceedance of the 500-ppm methane concentration as provided in §63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.*

This provision will be met and these requirements are detailed in the Surface Emissions Monitoring Plan included as Appendix B.

§63.1961(g) *Each owner or operator seeking to demonstrate compliance with §63.1959(b)(2)(iii)(C) using a landfill gas treatment system must calibrate, maintain, and operate according to the manufacturer's specifications a device that records flow to the treatment system and bypass of the treatment system (if applicable). Beginning no later than September 27, 2021, each owner or operator must maintain and operate all monitoring systems associated with the treatment system in accordance with the site-specific treatment system monitoring plan required in §63.1983(b)(5)(ii). The owner or operator must:*

(1) Install, calibrate, and maintain a gas flow rate measuring device that records the flow to the treatment system at least every 15 minutes; and

(2) Secure the bypass line valve in the closed position with a car-seal or a lock and-key type configuration. A visual inspection of the seal or closure mechanism must be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.

The treatment system monitoring equipment is to be maintained and operated by the third-party developer who operates the LFGE facility in accordance with their Treatment System Monitoring Plan, which will be maintained at their facility.

5.4 COMPLIANCE WITH §60.767: DESIGN PLAN REQUIREMENTS

§60.767(c) Collection and control system design plan. Each owner or operator subject to the provisions of §60.762(b)(2) must submit a collection and control system design plan to the Administrator for approval according to the schedule in paragraph (c)(4) of this section. The collection and control system design plan must be prepared and approved by a professional engineer and must meet the following requirements:

(1) The collection and control system as described in the design plan must meet the design requirements in §60.762(b)(2).

(2) The collection and control system design plan must include any alternatives to the operational standards, test methods, monitoring, recordkeeping or reporting provisions of §60.763 through §60.768 proposed by the owner or operator.

(3) The collection and control system design plan must either conform with specifications for active collection system in §60.769 or include a demonstration to the Administrator's satisfaction of the sufficiency of the alternative provisions to §60.769.

(4) Each owner or operator of an MSW landfill having a design capacity equal to or greater than 2.5 million megagrams and 2.5 million cubic meters must submit a collection plan to the Administrator for approval within 1 year of the first NMOC emission rate report in which the NMOC emission rate equals or exceeds 34 megagrams per year… except as specified in (c)(4)(i through iii).

(5) The landfill owner or operator must notify the Administrator that the design plan is completed and submit a copy of the plan's signature page. The Administrator has 90 days to decide whether the design plan should be submitted for review. If the Administrator chooses to review the plan, the approval process continues as described in paragraph (c)(6) of this section. However, if the Administrator indicates that submission is not required or does not respond within 90 days, the landfill owner or operator can continue to implement the plan with the recognition that the owner or operator is proceeding at their own risk. In the event the design plan is required to be modified to obtain approval, the own or operator must take any steps necessary to conform any prior actions to the approved design plan and any failure to do so could result in an enforcement action.

(6) Upon receipt of an initial or revised design Plan, the Administrator must review the information submitted under paragraphs (c)(1) through of this section and either approve it, disapprove it, or request that additional information be submitted…If the

Administrator does not approve or disapprove the design plan, or does not request that additional information be submitted within 90 days of receipt, then the owner or operator may continue with implementation of the design plan, recognizing they would be proceeding at their own risk.

(7) If the owner or operator chooses to demonstrate compliance with the emission control requirements of this subpart using a treatment system as defined in this subpart, then the owner or operator must prepare a site-specific treatment system monitoring plan as specified in §60.768(b)(5).

This Plan fulfills the requirements of a collection and control system design plan as required by §60.767(c). A copy of the Treatment System Monitoring Plan will be maintained at the LFGE facility.

5.5 COMPLIANCE WITH §60.769(A)(1)

§60.769(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat and ability to isolate individual components or sections for repair or troubleshooting without shutting down the entire collection system.

The following sections address compliance with the applicable sections of §60.769(a)(1).

5.5.1 Control of Surface Emissions

The proposed GCCS and future expansions will be designed to minimize subsurface lateral migration and surface emissions of LFG. Surface emissions monitoring as set forth in Appendix B will be conducted to show that the GCCS will be able to comply with surface emissions control criteria. If the GCCS does not meet the measures of performance for the surface emissions as required, the cover will be repaired, repairs to the GCCS will be made, or the GCCS will be adjusted or modified accordingly.

5.5.2 Depths of Refuse

Depths of refuse and liner elevations are calculated prior to installation of vertical LFG extraction wells, condensate sumps, and other infrastructure based record documentation of landfill cell liner elevations. Wells will be installed deep enough to capture LFG from the refuse without causing damage to the underlying landfill liner.

5.5.3 Refuse Gas Rates and Flow Characteristics

The maximum expected LFG flow rate was used for sizing the GCCS at final grade/closure conditions. As a basis of design, estimates of the LFG generation were determined using the EPA's LandGEM first-order kinetic model. Input data for the LandGEM included annual historical and projected waste acceptance rates over the operating life of the landfill and LFG generation parameters. Please refer to Section 5.2.1 for a detailed discussion of this modeling.

5.5.4 Landfill Cover Properties

Materials excavated on-site are suitable for use as intermediate cover to adequately control LFG surface emissions when used with a GCCS. Soil for these activities is obtained on-site from borrow areas. Cover soils are placed to perform the following functions:

- To separate the waste from the environment;
- Adjust the landfill surface topography to provide appropriate slopes to promote run-off and controlled drainage of surface water;
- Control erosion by conveying run-off at non-scouring flow rates;
- Minimize infiltration of surface water into the waste; and
- Control and contain LFG.

Unit 1 of the landfill has been closed with a soil-based cap. This Unit already has comprehensive gas system coverage. This coverage will be maintained and should create no adverse impacts with respect to this cap.

For Units 2 and 3, the currently approved cap is a soil-based evapotranspirative (ET) cap. This 4-foot overall cap layer consists of the following layers from bottom to top:

- 6-inch-thick topsoil/vegetative layer;
- 30-inch-thick infiltration layer (compacted); and
- 12-inch-thick intermediate cover (compacted).

Each of the layers that comprise this ET cap will be subject to various construction and/or materials requirements; please refer to the solid waste permit and application for full details. It should be noted that other configurations may be approved in the future as well. The gas system designed here can also accommodate geosynthetic-based final covers.

A collection efficiency of 85 percent of LFG generated was assumed in this plan since the final cover will generally serve to increase LFG collection efficiency by allowing less LFG to escape through the landfill cover prior to collection.

5.5.5 Gas System Expandability

Blind flanges will be incorporated into the GCCS as it is being built in interim phases to facilitate future expansions. Additionally, the header and lateral will be HDPE which is easily tied-into with branch saddles or new fittings for future expansion and/or the addition of additional collectors. The header system will meet the following requirements: gas system expandability, accessibility, corrosion resistance, fill settlement, required materials of construction, and ability to withstand planned overburden or traffic loads.

5.5.6 Leachate and Condensate Management

Leachate is collected in Units 2 and 3 through sloped cell grades, which drain into a leachate collection pipe network that conveys the leachate to a manhole located on the northeast end of Unit 2, or in Unit 3 individual cell sumps.

Condensate is generated within the current gas system and managed through the following methods:

- The GCCS includes sumps that collect condensate at low points and a condensate forcemain that conveys the condensate to the Unit 2 leachate manhole for management with the landfill's leachate;
- Condensate is generated from the blower/flare skid also that goes into the condensate forcemain to the Unit 2 leachate manhole; and
- Although not a part of the landfill's system, condensate from the LFGE facility at the landfill is stored in condensate tanks and separately managed from the condensate generated at the landfill.

The expanded GCCS will be designed and operated to manage impacts from leachate and condensate. Although not anticipated, wells will be dewatered as needed if excess liquids accumulate in them for any reason such that compliance with operating parameters cannot be maintained.

It is anticipated that, as is currently done, condensate will continue to be managed along with the landfill's leachate through various methods approved in the landfill's permit (disposed of at a publically-owned treatment works (POTW), or used for dust control over lined landfill areas). Future approvals from the Solid Waste Bureau may allow for other management methods. Additionally, condensate may be managed separately from leachate if necessary in the future for any reason.

5.5.7 Compatibility with Filling

It is most desirable to place vertical wells in areas which have reached their maximum permitted grades; however, due to the landfill's development sequence, LFG collection will be required for areas at "interim" grades in order to meet the requirement to collect gas from areas not at final grade within 5 years of waste placement. These interim collection points will likely be in the form of vertical wells or horizontal collectors. If vertical wells are used, these wells may be raised with additional lifts of waste unless they are deemed to have reduced functionality or no longer meet relevant operational requirements, at which time they may be replaced/redrilled. In any event, collection will be maintained in and around filling operations as required. As set forth in this plan, GCCS materials are designed to be compatible with landfill operations, corrosiveness, and pressures. Section 7 of this Plan specifically includes requested operational flexibilities designed to accommodate GCCS operation around landfilling activities.

5.5.8 Integration with Closure End Use Accessibility

No future land use other than open space has currently been designated for this landfill. If an alternate end use plan is pursued in the future, CREC acknowledges that this end use must be compatible with the integrity of the GCCS, final cover system, or any other components of the containment and monitoring system. CREC also acknowledges that the specification of a certain type of end use will in no way provide an exemption from the required GCCS requirements.

Accessibility to the GCCS will be maintained throughout the landfill's life and into the post-closure period for maintenance and monitoring until the system is decommissioned with the understanding that decommissioning cannot occur until all regulatory requirements allowing for decommissioning are met.

5.5.9 Air Intrusion Control

Air intrusion will be controlled through maintenance of the landfill cover and periodic monitoring and adjustment of the GCCS. Air intrusion control measures will include the following:

- Timely placement and maintenance of cover materials in applicable areas;
- Deeper extraction zones and effective well seal designs for vertical extraction wells; and
- Regular collector monitoring and balancing operations to meet routine compliance requirements.

Following the installation of final cover, the final cover system will reduce the potential for air intrusion during GCCS operation. The final cover system will also assist in inhibiting surface emissions of LFG into the atmosphere. Air intrusion will also be controlled by installing low-permeability soils and/or bentonite seals as backfill materials when constructing the extraction wells. Within interim waste fill areas, the placement of daily and intermediate cover will assist in preventing air intrusion.

This will be confirmed by the periodic monitoring of the required LFG collection points to identify potential air intrusion in accordance with operating and recordkeeping requirements.

5.5.10 Corrosion Resistance

Corrosion resistance of the GCCS components will be achieved through the use of corrosion resistant materials, or materials that have a corrosion resistant coating. All GCCS and condensate piping will be constructed mostly of HDPE; however, PVC materials may also be used for the vertical well casings, or at other system locations where this material may be deemed more appropriate. Thermoplastic materials are inherently resistant to corrosion from chemicals commonly found in LFG and LFG condensate. Polyethylene pipe pigments (carbon black) also are inherently resistant to ultraviolet (UV) degradation. Metal components (steel or iron flanges, etc.) will be stainless steel, galvanized or epoxy-coated.

The GCCS components described within this Plan represent "state-of-the-practice" materials, and have proven to be resistant to corrosion with proper installation, operation, and maintenance in GCCS applications across the United States.

5.5.11 Fill Settlement

Settlement or subsidence of waste fill can affect a GCCS in numerous ways, including:

- Damage or destruction of below-grade header and lateral piping systems;

- Blockage of header and lateral piping systems as a result of condensate collecting in the piping; and
- Damage, displacement or destruction of well casings, seals, and filter materials, as a result of settlement in the landfill mass adjacent to the well.

The potential for significant refuse settlement is somewhat mitigated through the use of standard compaction practices during site operations. However, some settlement will still occur over time due to decomposition and consolidation of the refuse materials. The GCCS components are designed and installed with several features to account for expected settlement including:

- The wellhead assembly connecting the LFG extraction well casing to the LFG collection piping will be installed using flexible couplings and a flexible hose. This design feature will accommodate differential movement between the well casing and the collection piping connection before significant stress or strain begins to form on the connection points. This design will also enable the wellhead assembly to be easily disconnected and height adjustments made to the well lateral piping to relieve stress or strain on the connections and to compensate for the settlement.
- HDPE piping which is used for header and lateral piping is somewhat flexible and has the ability to withstand deformation from some settlement.
- All GCCS collection piping installed within the limits of waste will be installed with sufficient grade to compensate for settlement that could hinder condensate drainage.
- Buried LFG components will be constructed using piping of sufficient wall thickness to reduce significant deformations due to settlement loads, which would hinder system operation. Buried pipe will be installed with higher grades than aboveground pipe.

5.5.12 Resistance to Decomposition Heat

Resistance of the GCCS to the heat generated as a result of refuse decomposition will be achieved through the use of materials tested and proven to withstand temperatures well above those typically found in landfills. If heat damage of the GCCS components or abnormally high gas temperatures are observed during wellfield monitoring, the cause of the damage or high temperatures will be investigated, and the GCCS will be repaired, adjusted, or modified in accordance with sound industry practices.

5.5.13 Ability to Isolate Individual GCCS Components/Troubleshooting

Isolation valves are and will continue to be located at key locations in the collection header network. These valves can manually shut-off the applied vacuum to a particular section of header pipe. This will allow portions of the wellfield to be isolated for monitoring and maintenance purposes. Individual wells can also be shut down for troubleshooting. The GCCS includes multiple blowers, which are alternated in operation and for redundancy. Lastly, the condensate sumps are designed to allow for pump removal without disturbing the overall system vacuum and the condensate forcemain and air supply lines within the condensate removal system include isolation and blow-off valves, respectively to help diagnose issues more effectively.

5.6 COMPLIANCE WITH §60.769(A)(2)

5.6.1 Control of Surface Emissions

§60.769(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

LFG extraction wells/horizontal collection trenches are and will continue to be installed in active areas where waste has been in-place for five (5) years or more, or two (2) years or more in areas that are closed or at final grade. Per the definition stated in §60.761, "sufficient density" means "any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control, as determined by measures of performance set forth in this part."

The collector spacing used for the GCCS design should provide more than a sufficient density of collectors. However, if there is not sufficient coverage to meet the relevant requirements based on monitoring, procedures will be implemented to correct this, such as installing additional wells, cover repairs, upgrading other GCCS components, or repairs to existing wells.

5.7 COMPLIANCE WITH §60.769(A)(3) COLLECTION DEVICES PLACEMENT

§60.769(a)(3) The placement of gas collection devices determined in paragraph (a)(1) of this section must control all gas producing areas, except as provided by paragraphs (a)(3)(i) and(ii) of this section.

§60.769(a)(3)(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under §60.768(d). The documentation must provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and must be provided to the Administrator upon request.

§60.769(a)(3)(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

§60.769(a)(3)(iii) The values for k and CNMOC determined in field testing must be used if field testing has been performed in determining the NMOC emission rate or the radii of influence (this distance from the well center to a point in the landfill where the pressure gradient applied by the blower or compressor approaches zero). If field testing has not been performed, the default values for k, Lo and CNMOC provided in §60.764(a)(1) or the alternative values from §60.764(a)(5) must be used. The mass of nondegradable solid waste contained within the given section may be subtracted from the total mass of

the section when estimating emissions provided the nature, location, age, and amount of the nondegradable material is documented as provided in paragraph (a)(3)(i) of this section.

No areas of the landfill are being proposed as nonproductive. Section 5.2.1 covers LFG generation modeling and the values selected. Additional vertical wells, and /or horizontal collection trenches will be added, as required, to the GCCS to ensure compliance.

5.8 COMPLIANCE WITH §60.769(B)(1), (2) AND (3)

§60.769(b)(1) Each owner or operator seeking to comply with §60.762(b)(2)(ii)(C) shall construct the gas collection devices using the following equipment or procedures:

5.8.1 Construction of System Components

§60.769(b)(1) The landfill gas extraction components must be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to: convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system must extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors must be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations must be situated with regard to the need to prevent excessive air infiltration.

As described in previous sections of this Plan, the GCCS components will be constructed of materials suitable for LFG applications.

5.8.1.1 Materials

All GCCS components have been and will be constructed of materials such as HDPE, PVC, fiberglass, stainless steel, and other nonporous, corrosion-resistant materials, in accordance with §60.769(b)(1) and whose compatibility is discussed in other sections of this Plan.

5.8.1.2 Component Sizing

The final GCCS piping network is sized for the peak potential LFG extraction rate as described in Section 5.2.1 of this Plan, and a design blower vacuum of no less than 45 inches of water column (possibly 60-80 inches for future LFGE possibilities). The modeling (included in Appendix D) indicated that 45 inches vacuum accommodates up to 5 inches of vacuum loss in the GCCS, providing for 20 inches of vacuum for well tuning, and up to 20 inches for positive displacement to a typical open flare or other control device(s). If more blower vacuum is provided above 45 inches, this would provide for more positive displacement to any future LFGE facilities, flow meters, valves, etc. Of course, as the landfill and GCCS are developed over time, component sizing may change based on actual LFG flow conditions, LFGE facilities being added, and the configuration and needs of different control devices.

KYGas was utilized to balance the vacuum in the proposed system and to design pipe sizes. Each segment is assigned a label by the program in order to identify the segment properties. Several design criteria were used in sizing the header pipes as follows:

- KYGas was used to simulate the GCCS network in order to size the piping, model output is provided in Appendix D;
- The maximum LFG flow over the life of the landfill was considered in all pipe sizing;
- Gas velocity in pipes was generally limited to 20 feet/sec for countercurrent flow of LFG and condensate, and 40 feet/sec for concurrent flow of LFG and condensate (the values can be exceeded in some cases to avoid inconsistent pipe sizing for short pipe lengths, etc.);
- Pipes were sized so that vacuum loss did not exceed 1 inch of water column (1" W.C.) per 100 feet of pipe;
- A vacuum at the blower/flare station of 40 inches W.C. was used in the model; and
- It was verified that a vacuum of no less than 20 inches W.C. would be available for every well.

Drawing 2 in Appendix A shows the GCCS layout and indicates the size of all piping to meet these criteria; all pipe sizes shown represent minimums. By assuring that LFG velocity in the pipes generally met the 20 and 40 feet/sec criteria listed above for countercurrent and concurrent pipes, respectively, there was more than sufficient vacuum available at all wells to meet the 20" W.C. limit at all wells, and to meet the 1" W.C. per 100 feet of pipe limit listed above.

All crossover headers were sized to be 12-inch diameter pipe, while the outer header loop was sized at no smaller than 12 inches as well, transitioning up to a maximum size of 24 inches.

KYGas model output pages are included in Appendix D at peak LFG recovery. The first page provides a summary output showing various maximum values throughout the system. Maps are included in this output as well, showing the well numbers, pipe sizes (in inches), pipe segment vacuums, pipe segment flows, and the naming convention for each pipe segment.

The KYGas output files show that there is a total system pressure drop of approximately 5 inches of W.C. from the blower (which is assumed to have a vacuum of 40 inches of W.C. for modeling purposes) to the most remote well.

5.8.1.3 Component Loading

Below-grade GCCS components consist primarily of LFG wells and laterals. Road crossings are and will be constructed at a sufficient depth to protect the pipe from vehicle loading where needed. Applied loads on GCCS components within the landfill, as well as settlement forces, vary within the landfill due to the non-homogeneous nature of the refuse. However, below-grade components within the landfill have been designed to be consistent with industry-accepted GCCS design and construction practices. Lastly, piping subject to loading is designed to be HDPE, which has good compatibility, strength, and flexibility at the wall strengths designed for the expected loadings based on decades of use in hundreds of landfills throughout the United States.

The loading of condensate into the GCCS will also be considered in the design and handled through the use of sufficiently numerous sumps and pumps. Since the GCCS has been operating for years, the number of sumps included in the design are certified to be sufficient to handle the amount of condensate that is expected.

5.8.1.4 System Expansion

The existing and future portions of the GCCS are and will be designed and expanded over the life of the landfill to handle the extracted LFG quantities as described in this Plan. In addition, areas where the landfill is at or near final elevation, new vertical wells may be installed as required to provide comprehensive coverage. See Section 4.3 of this Plan for additional design details that will be employed to facilitate GCCS expansion over time.

If the GCCS does not meet the measures of performance set forth in the rule's requirements, the GCCS will be adjusted or modified as required.

5.8.1.5 Component Perforation

When initially drilled, vertical LFG collection wells are generally designed to have a minimum of 20 feet and a maximum of 40 feet of solid pipe from the landfill surface down. After this, the pipe is perforated to allow the LFG to flow into the pipe for collection. For wells greater than 40 feet in depth, if the perforated sections are placed at depths shallower than 20 feet from the landfill surface, the induced vacuum on the well can draw excessive amounts of air (specifically oxygen) into the waste and potentially cause a condition of subsurface oxidation. If the perforated pipe is started deeper than 40 feet, the applied vacuum on the upper layers of waste is minimized, which reduces gas collection efficiency. For wells less than 40 feet in total length, the solid depth is typically set at no less than 15 feet. For such shallow wells, it is assumed that they would be needed for coverage, and that a shorter solid length is justified (and will be operated at lower vacuum than normal to limit air infiltration). Current gas wells meet these general criteria.

The solid/perforated ratio may be further adjusted prior to construction depending on the quality of the LFG that is required. However, in any case, the ratio will always fully accommodate operational requirements and allow for air intrusion to be limited while sufficient LFG collection occurs.

Existing wells that are extended with solid pipe as waste is filled around them may vary from these solid/perforated ratios. At some point in the future these may be replaced with new redrills to more effectively capture waste above the extended well's perforations.

Horizontal collectors placed near sideslopes will have perforations set away from the sideslope to avoid air infiltration. Also for horizontal collectors, vacuum will not be applied until sufficient waste has been placed over them to allow for vacuum application without air infiltration.

5.8.1.6 Air Infiltration

Air intrusion control is discussed in Sections 5.5.9 and 5.8.1.5. Although these discussions are not repeated here, components will be designed and the GCCS operated to avoid air infiltration, which can cause various undesirable issues.

5.8.1.7 Installation of System Components and Placement

§60.769(b)(2) Vertical wells must be placed so as not to endanger underlying liners and must address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors must be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices must be designed so as not to allow indirect short-circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

Waste depths for design of GCCS components will be determined based on both; (1) the as-built plan for the top of the landfill's base or intermediate liner elevations; and (2) the most recent site topography for the active areas and the proposed final grading for the future undeveloped areas. The proposed vertical LFG extraction wells/sumps or horizontal collectors will be installed to depths of no closer than 10 feet to the top of the underlying liner system. This should be sufficient to control the deepest LFG generated at the site. For deeper landfills, vertical wells are often not drilled to more than 140 feet in depth as well due to the cost, specialized equipment needed, and diminishing collection of gas at these depths.

Prior to commencing any well drilling activities, all proposed vertical well locations, sumps, and any horizontal collector locations will be staked and surveyed to confirm their actual surface elevations. The proposed well schedule/sump locations will be modified to reflect the actual surface elevations at the time of construction and to adjust drilling/excavation depths accordingly.

5.8.1.8 Water

The occurrence of water within the landfill will be addressed by the leachate and condensate management systems as stated in Section 5.5.6 of this Plan. If liquids in the waste mass cause issues with the GCCS function and required operating or monitoring requirements, measures will be taken to mitigate/remove the liquids as needed. Since this is a relatively arid site, water impacts are not anticipated.

5.8.1.9 Holes and Trenches

Vertical boreholes or horizontal trenches constructed for LFG collection elements will be of sufficient cross-section to allow for their proper construction and completion, including centering of pipes and placement of gravel backfill.

5.8.1.10 Component Short Circuiting

LFG collection elements will be designed to prevent air infiltration through the cover, refuse contamination of the collection elements, and direct venting of LFG to the atmosphere. For example, vertical well perforations will not be set too close to the cover surface so that sufficient vacuum can be applied at the well without excess air infiltration.

Direct venting of the LFG to the atmosphere will be avoided by operating the GCCS under vacuum. Any leaks will therefore, result in air entering the GCCS, as opposed to LFG being released into the atmosphere. Also, surface scans as set forth in Appendix B will identify areas where LFG may be escaping through the landfill surface which should also be a route for short-circuiting.

5.8.1.1 Gravel Backfill

Gravel of sufficient size will be used to prevent penetration or blockages of the LFG collector pipe perforations. The gravel will also be specified such that it does not have calcium carbonate content to the extent that it might dissolve and clog well perforations.

5.8.2 System Component Connections to LFG Piping

§60.769(b)(3) Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly must include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices must be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.

Collection devices will be connected to the collection header pipes via lateral piping. Connections to lateral piping will be through a wellhead assembly including, a control valve, a flow-measuring device such as a Pitot tube or an orifice plate, a thermometer, and associated sample ports. Lateral piping will be connected to the header using a positive closing throttle valve, necessary seals and couplings, and a sampling port. The collection devices will be constructed of PVC, HDPE, fiberglass, stainless steel, and other nonporous material of suitable thickness. The GCCS components will be designed and installed to withstand installation, static, settlement forces, and overburden or traffic loads.

5.9 CONVEYANCE SYSTEM

§60.769(c) Each owner or operator seeking to comply with §60.762(b)(2)(iii) must convey the landfill gas to a control system in compliance with §60.762(b)(2)(iii) through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment.

§60.769(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.

§60.769(c)(2) For new collection systems, the maximum flow rate must be in accordance with §60.765(a)(1).

Section 5.2.1 discusses how maximum flows were projected to determine the ultimate conveyance needed. Also, although there is an existing GCCS at the landfill, this was not used to directly calibrate the flow models due to typically lower than expected generation in the arid climate (so the model was maintained with suggested default parameters for conservativeness).

The landfill-owned control device for the GCCS is a 3,000 cfm open flare with two Hoffman 38303 Gas Blowers, each capable of providing 300 scfm to 1,500 scfm in flow at a vacuum of up to 60 inches of water column. The adjacent, separately owned and operated, LFGE facility includes two caterpillar

G3520 C generators that, when operating, can accept just over 500 cfm of LFG each. The landfill flare is essentially a backup for the LFGE facility. The overall capacity for both gas moving and control more than meet the landfill's requirements, and will be expanded in the future as needed to maintain LFG collection and control as required.

In summary, LFG conveyance capacity is presently sufficient to provide gas management for the entire coverage area, and future expansions will be designed to accommodate future additional wells or other collection methods, should they be required, based upon surface emissions monitoring. Blower and control device capacity will be expanded as needed to keep pace with LFG collection.

Design modifications required to accommodate collection of LFG generated by future waste disposal and subsequent expansions of the GCCS coverage area will be submitted with the semi-annual reports.

6 ALTERNATIVES

The following requirement allows for alternatives (flexibilities) to the operational standards, test methods, procedures, compliance requirements, monitoring, recordkeeping, and reporting provisions to be requested in the GCCS Design Plan.

§60.767(c)(2) The collection and control system design plan must include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, record keeping or reporting provisions of §60.763 through §60.768 proposed by the owner or operator.

6.1 PROPOSED ALTERNATIVES

6.1.1 GCCS Components and Monitoring

The following alternatives relate to GCCS components and monitoring.

6.1.1.1 Monthly Well Monitoring Device

The requirements of 40 CFR §63.1961(a)(2) allow for the monitoring of nitrogen or oxygen concentrations in the LFG monthly. 40 CFR §63.1961(a)(2)(i) and (ii), allow for the use of EPA Method 3C to measure the nitrogen levels and the use of either EPA Method 3A, 3C, or ASTM D6522-11 to establish the oxygen content. In accordance with current state-of-the-practice procedures, CREC proposes to use a portable monitoring instrument (e.g., Landtec GEM 500, Landtec GEM 2000, LMS, Envision, or equivalent instrument) to perform this monitoring. The monitoring equipment will be calibrated in accordance with manufacturer's recommendations to ensure accurate measurement of all parameters for which it is used to monitor.

6.1.1.2 Alternative Remedy for Pressure or Temperature Events

§63.1960(a)(3) and (4) Compliance Provisions: "…action must be initiated to correct the exceedance within 5 days, except for the three conditions allowed under §63.1958(b). If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement…" and "…action shall be initiated to correct the exceedance within 5 calendar days. Any attempted corrective measure must not cause exceedances of other operational performance standards. If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement…"

These rules require that, if a required collection point shows an exceedance in pressure or temperature requirements, action must be taken within 5 days and that re-monitoring must show that within 15 days that the point is in compliance. If compliance is not achieved within 15 days, a root cause analysis is required while corrective actions continue (must be conducted no later than 60 days after the initial reading exhibited an exceedance). There are other steps to be taken if this is also not successful. If, after 120 days, the reading at the well is still not in compliance, and corrective action will take longer than 120 days, the rule requires a submittal to the Administrator.

There are several cases in which exceedances cannot be remedied within the allowable 15-day timeframe or remedial activities/new construction completed within the 120-day timeframe. Examples of this would be if a lateral needs repair and pipe must be ordered or if a well becomes watered-in and must be pumped down over a number of days. Weather or construction equipment availability may also be a limiting factor; especially during the winter months in many locations.

When an extension to the aforementioned 120-day timeframe is necessary, with this flexibility, a notification will be provided to NMED in the first semi-annual monitoring report after the time for which the notification was required. If this procedure is followed, no deviation or exceedance will have occurred if the 15-day or 120-day timeframe (whichever is requested) is not met. This procedure will eliminate the need for interim paperwork and frequent approval for individual wells. Instead, the Air Quality Bureau may review the notification and details provided (as well as any follow-up data provided) with the monitoring report and respond to the owner/operator with further follow-up requirements, information requests, etc.

It should be noted that throughout any requested extended timeline period, monthly well monitoring and recording of these values will continue. However, once past the initial 5-day action period and 15-day re-monitoring period for that parameter, subsequent follow-ups after the monthly reading would not be required for subsequent months until the end of the extended timeframe.

Lastly, in limited circumstances, the operator may determine that after the initial reading and 5-day action, that more than 15 days will be needed to remedy the issue. If this is the case and a 15-day reading is not taken, this will not be a deviation/exceedance. As with other items discussed for this flexibility, it will be noted in the first monitoring report after it occurs so that NMED may review the notification and any details provided (as well as any follow-up data provided) respond to the owner/operator with further follow-up requirements, information requests, etc.

6.1.1.3 Establish Higher Temperature Operating Value for Elevated Temperature Landfills

§63.1960(a)(4) Compliance Provisions: *"For the purposes of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must follow the procedures as specified in §60.755(a)(5)."*

§60.765(a)(5) reads that: "If a well exceeds one of the operating parameter for temperature, action must be initiated to correct the exceedance within 5 calendar days."

Some LFG collectors may have higher temperatures caused by the accumulation of heat that is generated through the methanogenic process and/or from abiotic reactions occurring within the waste due to the variety of accepted waste materials. Whether from biological or abiotic reactions, higher temperatures are frequently not attributed to a subsurface oxidation event.

Therefore, the following procedure is proposed for higher temperatures at LFG collectors. Collectors exhibiting operating temperatures above 145°F, but below 160°F with no signs of smoke or subsurface oxidation, will be operated, monitored, and reported at their operating temperature with no further action required. However, if it is suspected that an oxidation event is occurring at the collector(s), the situation will be further investigated (e.g., collector will be tested for elevated carbon monoxide, monitored for visible evidence of combustion, etc.) If it is confirmed that an oxidation event is occurring, the LFG collector(s) will be shut off as provided for under §63.1958(b), and corrective measures shall be implemented. Any collectors shut down due to potential oxidation will be discussed in the semi-annual report. The following steps will be taken for wells over 160°F:

1. Collectors exhibiting operating temperatures above 160°F shall be field-tested for hydrogen gas.
2. If the field test indicates hydrogen concentrations above 1% by volume, and no evidence of subsurface oxidation exists, the well shall be identified as an elevated-temperature collector. The collector shall be operated, monitored, and reported in a manner to effect the removal of heat in the vicinity with no further action.
3. If the field test indicates hydrogen concentrations below 1% by volume, the permittee shall collect a gas sample for laboratory analysis within 30 days of the initial monitoring event. Any collector with a temperature greater than 160°F with a lab test showing less than 1% hydrogen will be shut down and treated as a potential oxidation event.
4. Collectors shall be identified when operating as an elevated-temperature collector or as a collector which has been shut down due to potential oxidation event in the semi-annual report.
5. Elevated-temperature collectors shall be monitored monthly for visible evidence of smoke and/or char.
6. Records of all monitoring shall be maintained at the landfill and made available for inspection upon request. These records will be maintained for period not less than five (5) years.

6.1.1.4 Monthly Monitoring and Associated Corrective Actions

§60.767(j)(1) and (2) *For corrective action that is required according to §60.765(a)(3)(iii) or (a)(5)(iii) and is expected to take longer than 120 days after the initial exceedance to complete, you must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator as soon as practicable but no later than 75 days after the first measurement of positive pressure or temperature monitoring value of 62.8 degrees Celsius (145 degrees Fahrenheit)… For corrective action that is required according to §60.765(a)(3)(iii) or (a)(5)(iii) and is not completed within 60 days after the initial exceedance, you must submit a notification to the Administrator as soon as practicable but no later than 75 days after the first measurement of positive pressure or temperature exceedance*

So that final action can be taken in these circumstances, if this filing is completed and no response within 40 days of submittal, it will be assumed that the implementation timeline is approved and the exceedance and corresponding alternative timeline will not be considered a reportable deviation in subsequent Title V reports.

6.1.1.5 Monitoring of Collection Device during Well Raising

New vertical gas extraction wells are often placed in the active area of the landfill several years before the waste has reached final grades to comply with control requirements. Similarly, there will be wells located in areas of cover construction. Since these wells are placed in active and construction areas, they periodically need to be “raised” and/or temporarily disconnected (i.e. the well casing extended 15 to

25 feet vertically) in order to not be buried under lifts of waste. When they are raised, the HDPE lateral line which provides the applied vacuum is temporarily disconnected until the surrounding lift of waste or final cover is brought high enough to reconnect the well. The timeframe between when a well is disconnected and raised, and when the waste height and/or final cover is high enough to reconnect the lateral, can often range from a few weeks to a few months. This can result in missed monthly readings at the well, since the well casing is too high for the technician to safely reach.

Since the rules allow for exclusion of surface monitoring in “dangerous areas” of the landfill, it is reasonable to request an alternative to monitoring wells that are deemed dangerous for personnel to access (i.e., raised, active and construction areas). As such, CREC proposes that monthly readings be taken only at wells that can be safely accessed.

6.1.1.6 Exclusion of Near Surface Collectors not in Waste or not used for XXX /AAAA Compliance

The buildup of excessive LFG pressure below the geomembranes can cause or contribute to cover system stability failure. Excessive pressure reduces the effective normal stress on the lower geomembrane interface and can cause veneer instability and/or cap system failure resulting in environmental impacts. Therefore, to protect the cover system, if a cap is ever installed at the landfill that includes a geomembrane layer, surface collectors/vents may be installed underneath the final cap. Given that near surface collectors/vents will not be installed in waste they are not considered part of the required GCCS and as such not subject to the monitoring and operating requirements. Furthermore, given these collectors/vents would not be installed in the waste they would not be counted as penetrations.

6.1.1.7 Exclusion of Odor or Migration Control Wells not in Waste or not used for XXX/AAAA Compliance

Any wells or vents placed outside limits of waste are not subject to required operation, monitoring, recordkeeping, and reporting requirements as they are not interior wells as defined in the rules. As such, any future LFG extraction wells installed outside limits of waste for migration control purposes will be excluded from the required operation, monitoring, recordkeeping, and reporting requirements.

6.1.2 Surface Emissions Monitoring

6.1.2.1 Alternative Remedy for SEM Events

§63.1960(c)(4)(v) Compliance Provisions: *“For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the administrator for approval.”*

The rule above indicates that, if a surface scan exceedance occurs three times within a quarter, that a new well or collection device (or other constructed gas system improvement) must be in place within 120 days; however, in some cases the new construction or selected improvement cannot be completed in this timeframe. As such, when an extension to the 120-day timeframe is necessary, a notification will be provided in the first monitoring report after the timeframe for which the alternate remedy is required. This will eliminate the need for interim paperwork and NMED approval. Instead, the Air Quality Bureau can review the notification and details provided (as well as any follow-up data provided) and respond with further follow-up requirements, information requests, etc. The notification will contain the proposed alternate remedy and/or timeline. If this procedure is followed, no deviation or exceedance will have occurred if the 120-day timeframe is not met.

Additionally, for SEM exceedances, corrective measures may include modifications to the GCCS other than the installation of additional LFG collection devices to meet the 120-day timeline unless an alternative timeline has been established. The following alternative remedies will be implemented to correct SEM exceedances within the 120-day timeline and would not require additional approval from NMED. These corrective actions may include one or more of the following measures:

a. Installation/upgrades to the blower/flare skid equipment (e.g., bigger blowers, larger flare, additional blowers, etc.);
b. Installation of a liquid management system in the extraction wells or sumps;
c. Installation/modification of other ancillary equipment (e.g., larger air compressor, additional air and condensate force main lines, etc.);
d. Re-drilling or installation of additional/replacement LFG collection devices;
e. Repair of landfill cap/cover to lessen the chance of encountering ambient air; or
f. Repair/replace header valves.

6.1.2.2 SEM for Closed Portions of the Landfill

Any portions of the landfill that have been certified closed or have been closed and capped in accordance with the cover conditions contained according to the these rules or Subtitle D are requested to be treated as a closed landfill for SEM events. These closed portions of the landfill will be monitored in accordance with the following section of Subpart AAAA:

§63.1961(f) …Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for the landfill to quarterly monitoring.

In accordance with this requirement, the landfill is requesting that SEM be performed on all closed areas of the landfill in accordance with the requirements of §63.1961(f).

6.1.3 Control Devices

6.1.3.1 Flow Meters when no Bypass is Present

§63.1961(b)(2)(i)&(ii) requires the owner/operator to install a flow meter to record flow to or bypass of the control device. However, in a prior Municipal Solid Waste Landfill NSPS/EG Questions and Answers

(Q&A) document from the EPA, it was indicated that flow measurement or lock and key requirements would not apply to a GCCS that is designed such that there is no physical means to bypass the flow before it reaches the control device. In the event that a malfunction occurs with the GCCS equipment, an electric or pneumatically-operated valve has been designed to close to prevent the direct venting of raw LFG into the atmosphere. LFG flares and any other treatment or control devices at the landfill is or will be designed to satisfy the foregoing flow measurement/lock-and-key waiver criteria; therefore, this request would confirm that, for this landfill, there is not a requirement to install and operate this flow-measuring device in accordance with the requirements of the provision. If a flow measuring device is installed, it will not be required to monitor or record flow.

7 OPERATING UNDER XXX/AAAA

Per 40 CFR §60.767(c)(2), the GCCS Design Plan shall include proposed alternatives to the prescriptive monitoring, recordkeeping and reporting requirements. Section 6 above addresses such items. Section 7 however, is for requests that should be viewed as the proposed implementation of NSPS XXX/NESHAPS AAAA.

7.1 OPERATIONAL STANDARDS

§63.1958(a) Operational Standards for Collection and Control Systems: *"Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:*

- *5 years or more if active; or*
- *2 years or more if closed or at final grade."*

In some cases, the owner/operator may need or wish to install regulated collection points at an accelerated pace compared to regulatory requirements. Therefore, this procedure proposes to clarify that monitoring this requirement shall not be required for collection points that were installed in areas where waste has been in place for less than 5 years (active areas) or 2 years (closed areas or areas at final grade) until the previously mentioned time periods have expired.

7.2 DECOMMISSIONING OF A COLLECTION DEVICE

§63.1958(b)(3) Operational Standards for Collection and Control Systems: *"A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows."*

The relevant requirements contain no special procedures for decommissioning a collection point. However, the EPA Applicability Determination Index (ADI) Control No. 0600062 addressed this issue and provides a procedure for the decommissioning of low-producing extraction wells. This procedure, listed below, will be followed for low producing collection points. It will also be used generally for when a required collection point requires decommissioning for any other reason.

It should be noted that decommissioning is not meant to be used in the same way as the term "abandonment" here (which is covered in "Collection Device Abandonment" of this section). A decommissioned collection point is simply a shutdown for a period of time (by fully closing the well valve or by disconnecting the collection point from the collection lateral), but is maintained for potential future use. This might be necessary if, for example, the collection point is shutdown as a remedial method for a period of time, or if a collection point is shutdown based on poor gas quality until the gas is able to recharge sufficiently. The decommissioning procedure will be as follows:

- For regulated collection points where oxygen concentrations do not decline to acceptable levels after more than one hour following a valve adjustment, the wellhead valve may be fully closed until the gas quality recovers.

- The monthly monitoring required by §63.1960 will be conducted for collection points that have been shutdown, but positive pressure will not be considered exceedances of the operating limits in §63.1958.

- If monthly monitoring indicates that pressure has built up in the collection point, the collection point will be opened to relieve the pressure, and then will be shutdown until it is monitored the following month.

When a collection point needs to be decommissioned for any reason, this reason will be noted and the collection point shutdown. Additionally, quarterly surface scans will still be conducted as if the collection point was still active to make sure fugitive LFG emissions are controlled in that area.

If a collection point remains decommissioned for six consecutive months, then a notification will be included in the first semi-annual report after this six-month consecutive period of decommissioning. This notification will describe whether the collection point is proposed for abandonment or redrilling or will provide a plan as to how this collection point will eventually be brought back online, or any reason why it might not be abandoned completely by that point. This notification will allow the Administrator option to respond with a request for further follow-up or additional information, etc.

§63.1958(d) Operational Standards for Collection and Control Systems: *"…A surface monitoring design plan shall be developed…Areas with steep slopes or other dangerous areas may be excluded from surface testing."*

It is proposed to exclude dangerous areas such as roads, the active area, truck traffic areas, paved areas excluding cracks, areas covered with snow and ice, and slopes steeper than 4H:1V from surface testing as set forth here and in the Surface Monitoring Emissions Plan (Appendix B).

7.3 COMPLIANCE PROVISIONS

§63.1960(a)(3) Compliance Provisions: *"…must measure gauge pressure in the gas collection header applied to each individual well monthly."*

This would seem to indicate that the pressure is to be measured on the header side of the wellhead valve instead of the well side of the wellhead valve (landfill side). Other sections of the rule simply states "at the wellhead." In order to prevent confusion between regulators and operators, gauge pressure will be measured on the landfill side. This represents a more conservative approach.

§63.1960(a)(3) and (4) Compliance Provisions: *"…action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under §63.1958(b)…If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement…" and "…action must be initiated to correct the exceedance within 5 calendar days. If a landfill gas temperature less than or equal to 62.8 degrees Celsius (145 degrees Fahrenheit) cannot be achieved within 15 days of the first measurement …"*

These rules require that, if a required collection point shows an exceedance in pressure or temperature, action must be taken within 5 days and that re-monitoring must show that within 15 days that the collection point is within compliance. If compliance is not achieved within 15 days, and if provisions of 6.1.1.2 are not selected by CREC, a root cause analysis must be conducted and the exceedance corrected no later than 60 days after the initial exceedance. If compliance is not achieved within 60 days, a corrective action analysis and an implementation schedule must be conducted and the items listed in §63.1981(h)(7) submitted as part of the next semi-annual report and correct the exceedance no later than 120 days after the initial exceedance. If compliance is not achieved within 120 days, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator according to §63.1981(h)(7) and (j). Some exceedances cannot be remedied within the allowable 15-day timeframe or remedied within the 120-day timeframe. Examples of this would be if a lateral needs repair and pipe must be ordered, or if a well becomes watered-in and must be pumped down over a number of days. Weather or drilling equipment availability may also be a limiting factor; especially during the winter months in many locations.

It should be noted that throughout any requested extended timeline period, monthly well monitoring and recording of these values will continue. However, once an extended timeline is filed because of a specific parameter, the 5-day action period and 15-day re-monitoring period for that parameter would not be required for subsequent months until the end of the extended timeframe request.

In addition, this item is a clarification that there are no submittal requirements outside of existing reporting unless the exceedance goes beyond 120 days from the initial exceedance. Therefore, the root cause analysis, corrective action analysis, and implementation schedule prior to 120 days will be maintained onsite.

7.4 SURFACE EMISSIONS MONITORING

§63.1960(c)(4)(v) Compliance Provisions: *"For any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period, a new well or other collection device must be installed within 120 days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval."*

The rules also require that, if a surface scan exceedance occurs three times within a quarter, that a new well or collection device (or other constructed gas system improvement) must be in place within 120 days; however, in some cases the construction or selected improvement cannot be completed in this timeframe. If the GCCS cannot be brought back into compliance during the 120-day period, CREC will prepare an alternative compliance schedule for review and approval by the Administrator or consider other alternatives in this Plan (Section 6.1.2.1). If this procedure is followed, no deviation or exceedance will have occurred if the 120-day timeframe is not met.

7.5 REPORTING REQUIREMENTS

§60.767(g)(3) Reporting Requirements: "Description and duration of all periods when the control device or treatment system was not operating and length of time the control device or treatment system was not operating."

This is included here as a clarification based upon experience from submitting numerous annual and semi-annual reports. The provision listed here is separate from §60.767(g)(4) which requires reporting of all periods when the collection system was not operating. It should be noted that these two requirements differ in that one references the control device and the other references the collection system. These provisions were purposely written this way because §60.767(g)(3) is meant to refer only to cases where the control device is down but the overall collection system is still operating.

Therefore, this request is included here to clarify that, for reporting purposes, it will be assumed that this reporting requirement is for the case where the collection system is operating but the control device is not operating such that uncombusted LFG is being vented.

7.6 MISCELLANEOUS

7.6.1 Collection Device Abandonment

Due to changing conditions such as damage to a well during operations or long term nonproductive areas, required collection points may need to ultimately be abandoned (without replacement). This is different from the term "decommissioning," which is meant to be temporary, and is described in flexibility request "Decommissioning of a Collection Device" in Section 7.2.

For abandonment, it is proposed that abandonment can be completed without prior approval provided that written notification stating that the landfill will still have sufficient well density and a certified updated GCCS layout drawing by a professional engineer is provided in the semi-annual report.

As with a decommissioned collection point, the area around any abandoned collection point will still be subject to surface emissions monitoring requirements.

7.6.2 Monitoring in Dangerous Areas

The rules do not address monthly wellfield monitoring which takes place in potentially dangerous areas. Daily conditions exist, especially for active landfills, which pose safety concerns for field technicians such as waste filling/compacting operations, cap construction operations, and seasonal weather-related dangers, etc. Because the health and safety of personnel must be considered tantamount, CREC must be given wide latitude in making dangerous area determinations.

Therefore, CREC proposes to temporarily exclude any dangerous areas from monitoring. Such unsafe areas will be documented by site personnel in the wellfield monitoring records as reasons for not monitoring. Monitoring of locations will resume once personnel deem it safe to work in the area.

7.6.3 Clarification on the Applicability of Additional Wells or Collectors

The GCCS may utilize connections to leachate sumps and cleanout risers in order to extract gas from the leachate collection system. A review of the monitoring data and experience at other regulated sites shows that these connections sometimes contain concentrations of nitrogen and oxygen similar to that of ambient air, and may require operation at a positive pressure to collect gas, but not to cause undue air intrusion (which is outside of normal operating standards for a typical collection point). Therefore, it is proposed that the operating limits for negative pressure not apply to components strictly designed for odor control. To verify comprehensive control of the GCCS, the site will perform the required surface emissions monitoring.

7.6.4 Open Flare Performance Test

Since the performance test requirements have not changed between 40 CFR 63, Subpart AAAA/40 CFR 60, Subpart XXX and 40 CFR 60, Subpart WWW; and since the control device at this landfill is the same unit, a previous source test performed for Subpart WWW may be utilized (and resubmitted), with the new initial semi-annual report that will be required under 40 CFR 63, Subpart AAAA.

7.6.5 As-Builts

§60.768(d) *"Except as provided in §60.767(c)(2), each owner or operator subject to the provisions of this subpart must keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector."*

As-builts will be updated on a semi-annual basis for required collection points only as part of the semi-annual reports.

7.6.6 Penetrations and Openings

§63.1958(d)(1) and (d)(2)(ii) *"...the owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover." and "Conduct surface testing at all cover penetrations. Thus, the owner or operator must monitor any cover penetrations that are within an area of the landfill where waste has been placed and a gas collection system is required."*

A "penetration" under this Plan will be defined as any LFG collection well or LFG collection device included in the Plan that completely passes through the landfill cover into waste and is located within an area of the landfill where waste has been placed and a gas collection system is required. Cover penetrations do not include items such as survey stakes, fencing or litter fencing, flags, signs, trees, and utility poles.

For the purposes of monitoring "any openings," "openings" is defined here to mean any cover penetration as defined above, and any area where waste has been placed and a GCCS is required that visually exhibits distressed vegetation and cracks and seeps in the cover.

7.6.7 Reduced Monitoring Frequency for Closed Landfills/Areas

§63.1961(f) "Each owner or operator seeking to demonstrate compliance with the 500-ppm surface methane operational standard in §63.1958(d) must monitor surface concentrations of methane according to the procedures in §63.1960(c) and the instrument specifications in §63.1960(d). If you are complying with the 500-ppm surface methane operational standard in §63.1958(d)(2), for location, you must determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters and the coordinates must be in decimal degrees with at least five decimal places. In the semi-annual report in 63.1981(i), you must report the location of each exceedance of the 500-ppm methane concentration as provided in §63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring."

Any methane reading of 500 ppm or more above background detected during the annual monitoring still allows for corrective action in accordance to §63.1960(c)(4). As such, if the exceedance can be corrected under the timeframe in accordance to §63.1960(c)(4), SEM monitoring will not revert back to a quarterly monitoring frequency.

Any closed or inactive landfill, or any closed or inactive areas on an active landfill that has no monitored exceedances of the 500 ppm limit above background in three consecutive quarterly monitored periods after landfill closure and normal system operation may reduce the monitoring frequency to annual monitoring. Any methane reading of 500 ppm or more above the background detected during an annual monitoring event shall automatically return the frequency back to a quarterly frequency. If the exceedance can be corrected under the timeframe in accordance to §63.1960(c)(4), the landfill would not be required to return to quarterly monitoring.

7.6.8 Synthetic Cover

§63.1958(b)(2) "Use of a geomembrane or synthetic cover. The owner or operator must develop acceptable pressure limits in the design plan."

Wells may be operated with positive pressure if located in an area where geomembrane or synthetic cover is implemented. A geomembrane or synthetic cover typically retains more gas in the landfill for collection by the GCCS and will not allow migration; therefore, positive pressure is not a concern or indicator of possible migration issues.

7.6.9 Removal Criteria

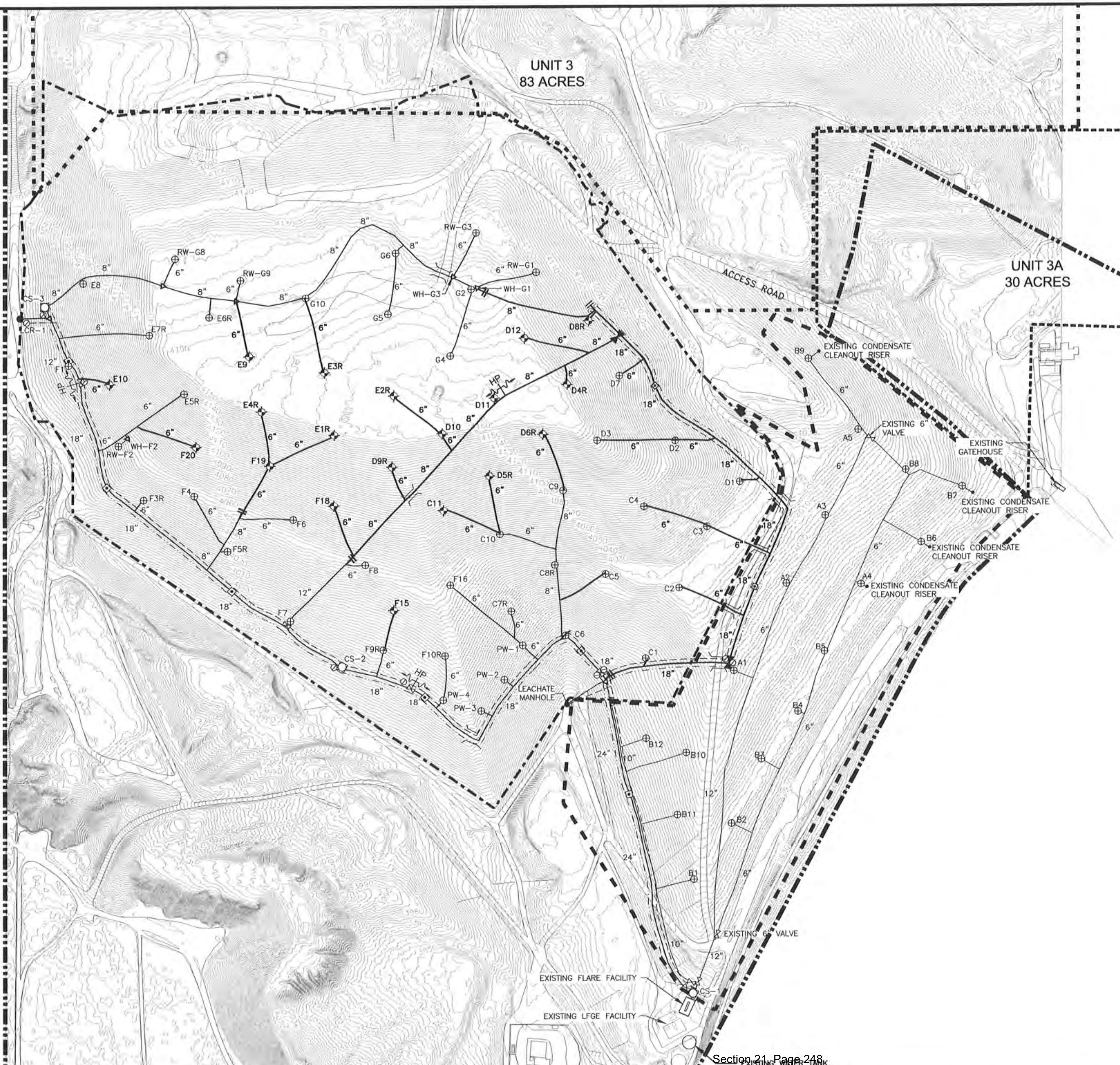
§60.762(b)(2)(v)(B) "The collection and control system has been in operation a minimum of 15 years or the landfill owner or operator demonstrates that the GCCS will be unable to operate for 15 years due to declining gas flow."

The 15-year period for qualifying for removal of the GCCS commences at the date of the initial performance tests under 40 CFR 60 Subpart WWW.

8 LIMITATIONS

This Plan has been prepared specifically for the Camino Real Landfill, located in Sunland Park, New Mexico. The report has been prepared in accordance with the care and skill generally exercised by reputable professionals, under similar circumstances, in this, or similar localities. No other warranty, expressed or implied, is made as to the professional opinions presented herein.

Appendix A
Drawings



0 200 400
SCALE IN FEET

LEGEND

- EXISTING CONTOURS (SEE NOTE 1)
- SOLID WASTE FACILITY BOUNDARY
- LIMIT OF WASTE FOR UNIT 1 (CLOSED)
- LIMIT OF WASTE FOR UNIT 2
- EXISTING HEADER/LATERAL PIPING
- EXISTING AIR SUPPLY LINE
- EXISTING 3"/4" CONDENSATE FORCEMAIN
- G4/RW-G3 EXISTING VERTICAL/REMOTE LFG EXTRACTION WELL
- WH-G3 EXISTING REMOTE WELLHEAD
- EXISTING LEACHATE CONNECTION RISER/MANHOLE
- EXISTING HEADER ISOLATION VALVE
- EXISTING BLIND FLANGE
- INSTALLED LFG COLLECTION PIPING
- INSTALLED AIR SUPPLY LINE
- INSTALLED 3" CONDENSATE FORCEMAIN
- D10 INSTALLED LFG EXTRACTION WELL
- INSTALLED HEADER ISOLATION VALVE
- INSTALLED FORCEMAIN ISOLATION VALVE
- INSTALLED AIR SUPPLY LINE ISOLATION VALVE
- INSTALLED HEADER ACCESS RISER
- INSTALLED BLIND FLANGE
- INSTALLED HDPE CAP
- HP INSTALLED HIGH POINT
- INSTALLED ROAD CROSSING

NOTES

1. EXISTING TOPOGRAPHY IS FROM AN AERIAL SURVEY FLOWN ON FEBRUARY 15, 2020.
2. THE EXISTING GCCS LAYOUT IS CONSISTENT WITH GCCS RECORD DRAWING PREPARED BY SCS ENGINEERS, DATED MAY 31, 2019.

DAVID J. MEZZACAPPA
NEW MEXICO
15236
PROFESSIONAL ENGINEER
1/8/2021

FOR COMPLIANCE PURPOSES ONLY

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: SITE LAYOUT

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

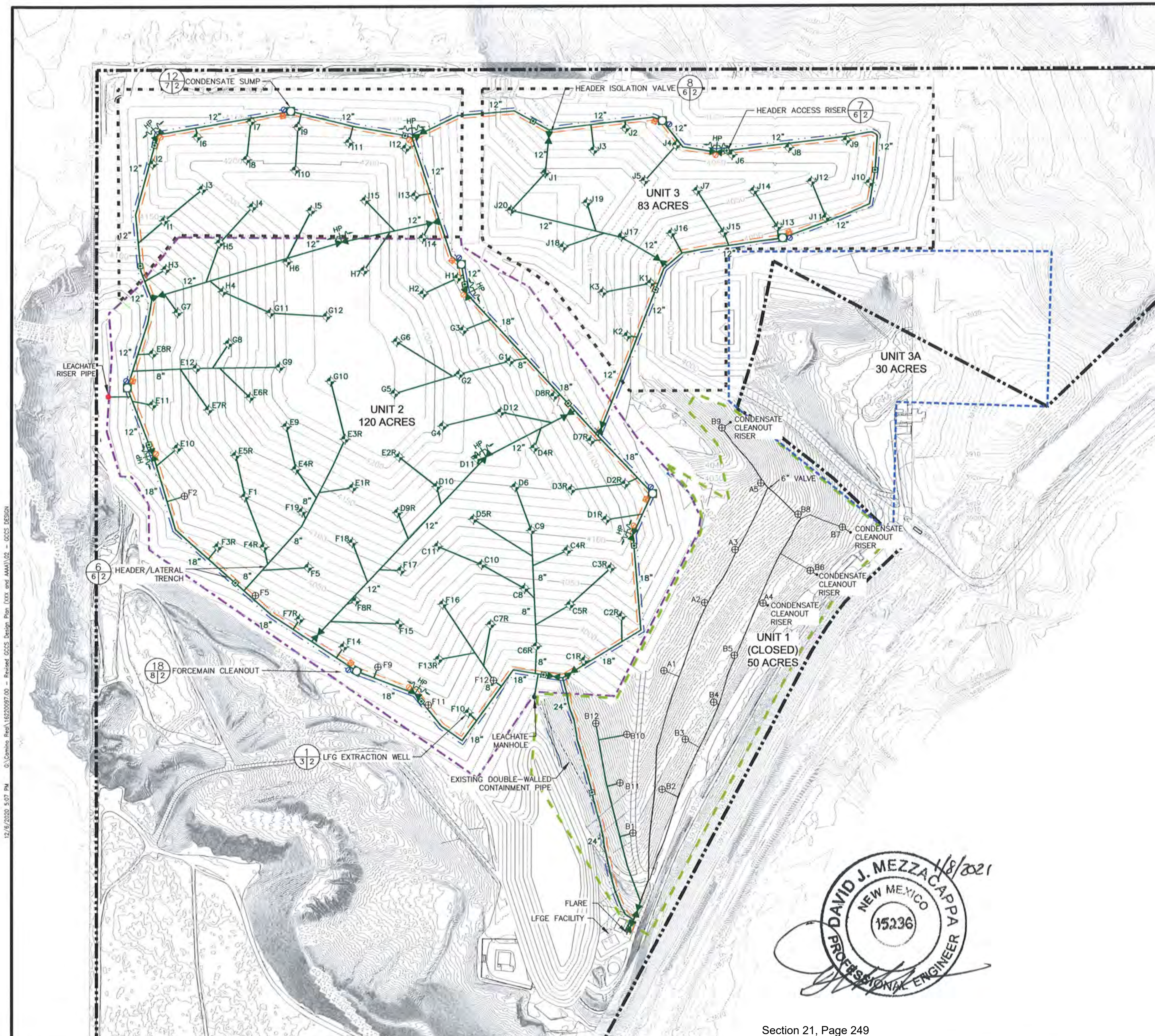
CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-6060 FAX NO. (505) 349-6061

PROJ. NO. 16220097.00 | DSN. BY: DJM | DWN. BY: AGA | CHK. BY: AGA | Q/A RVW BY: LA | APP. BY: DJM

CADD FILE: 01 - EXISTING GCCS (2020)
DATE: 12/2020
SCALE: AS SHOWN
DRAWING NO. 1

1/5/2021 3:31 PM G:\Camino Real\16220097.00 - Revised GCCS Design Plan (XXX and 4AAA)\01 - Existing GCCS (2020)



0 250 500

SCALE IN FEET

LEGEND

EXISTING CONTOURS (SEE NOTE 1)

PERMITTED FINAL COVER CONTOUR (SEE NOTE 2)

SOLID WASTE FACILITY BOUNDARY

PERMITTED LIMIT OF WASTE FOR UNIT 1 (CLOSED)

PERMITTED LIMIT OF WASTE FOR UNIT 2

CONCEPTUAL LIMIT OF WASTE FOR UNIT 3

CONCEPTUAL LIMIT OF WASTE FOR UNIT 3A

EXISTING HEADER/LATERAL PIPING

E1 EXISTING GCCS WELL

PROPOSED HEADER/LATERAL PIPING

PROPOSED AIR SUPPLY LINE

PROPOSED CONDENSATE FORCEMAIN

F10 PROPOSED LFG EXTRACTION WELL

PROPOSED CONDENSATE SUMP

PROPOSED HEADER ISOLATION VALVE

PROPOSED FORCEMAIN ISOLATION VALVE (OPTIONAL)

PROPOSED AIR SUPPLY LINE ISOLATION VALVE (OPTIONAL)

PROPOSED HEADER ACCESS RISER (OPTIONAL)

PROPOSED FORCEMAIN CLEANOUT (OPTIONAL)

HP PROPOSED HIGH POINT

NOTES

1. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2020 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2020 TOPOGRAPHIC SURVEY FROM AN AERIAL SURVEY FLOWN ON FEBRUARY 15, 2020.

2. THE PERMITTED FINAL GRADES ARE BASED ON SITE DEVELOPMENT SEQUENCING INFORMATION PREPARED BY GORDON ENVIRONMENTAL, INC., DATED MAY 23, 2007.

3. THE NSPS REQUIRED COLLECTION AND CONTROL SYSTEM DESIGN PLAN IS BASED ON THE FINAL GRADES CURRENTLY PERMITTED. THE FACILITY IS CURRENTLY AT INTERIM GRADES. THE EVOLUTION OF THE COLLECTION AND CONTROL SYSTEM AS THE LANDFILL IS FILLED WILL ULTIMATELY PRODUCE A DESIGN CONSISTENT WITH THIS PLAN. UNTIL THE LANDFILL HAS REACHED FINAL GRADES, THE COLLECTION AND CONTROL OF LANDFILL GAS PURSUANT TO THE NSPS MAY BE ACCOMPLISHED USING VARIOUS METHODS NOT SPECIFICALLY INCLUDED AS PART OF THE FINAL DESIGN. HOWEVER, ONCE THE FACILITY HAS REACHED THE FINAL GRADES, THE COLLECTION AND CONTROL SYSTEM WILL MEET THE CRITERIA SPECIFIED WITHIN THIS DESIGN PLAN.

4. LOCATION AND INSTALLATION OF THE PROPOSED GAS EXTRACTION WELLS, HEADER AND LATERAL ALIGNMENT, CONDENSATE MANAGEMENT FACILITIES, AND CONTROL DEVICE MAY VARY TO ACCOMMODATE FINAL CONSTRUCTED LANDFILL SLOPE OR SITE OPERATIONS. WELL LOCATIONS MAY CHANGE IF OBSTRUCTIONS ARE ENCOUNTERED DURING DRILLING.

5. REFER TO TABLE 3.2 IN THE LANDFILL GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN FOR A PLANNING-LEVEL WELL SCHEDULE.

6. ROAD CROSSINGS ON LANDFILL TO BE ADDED AS NEEDED WHEN FINAL ACCESS ROADS ARE DESIGNED.

7. PIPE SLOPE OF 5% WITHIN THE WASTE FOOTPRINT IS PREFERRED. IN NO CASES SHALL BELOW-GROUND HEADER PIPE WITHIN THE FOOTPRINT OF WASTE BE DESIGNED OR INSTALLED WITH LESS THAN 3% SLOPE. OUTSIDE OF THE WASTE FOOTPRINT A MINIMUM SLOPE OF 1% IS PREFERRED.

8. ALL PIPE SIZES SHOWN ON THIS DRAWING ARE MINIMUM SIZES. LATERALS FOR ONE WELL ARE SIZED AT NO LESS THAN 4 INCHES, WHILE LATERALS SERVING TWO OR MORE WELLS ARE A MINIMUM OF 6 INCHES IN DIAMETER ALONG THE ENTIRE LENGTH.

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12/6/2020 5:07 PM G:\Camino Real\16220097.00 - Revised GCCS Design Plan (XXX and AAAA)\02 - GCCS DESIGN

REV | DATE | DESCRIPTION | BY

DRAWING TITLE
GCCS LAYOUT PLAN

PROJECT TITLE
CAMINO REAL LANDFILL
LANDFILL GAS COLLECTION AND
CONTROL SYSTEM DEISGN PLAN

CLIENT
CAMINO REAL ENVIRONMENTAL
CENTER, INC.
1000 CAMINO REAL BLVD.
SUNLAND PARK, NM 88063

SCS ENGINEERS
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PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: RRK
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

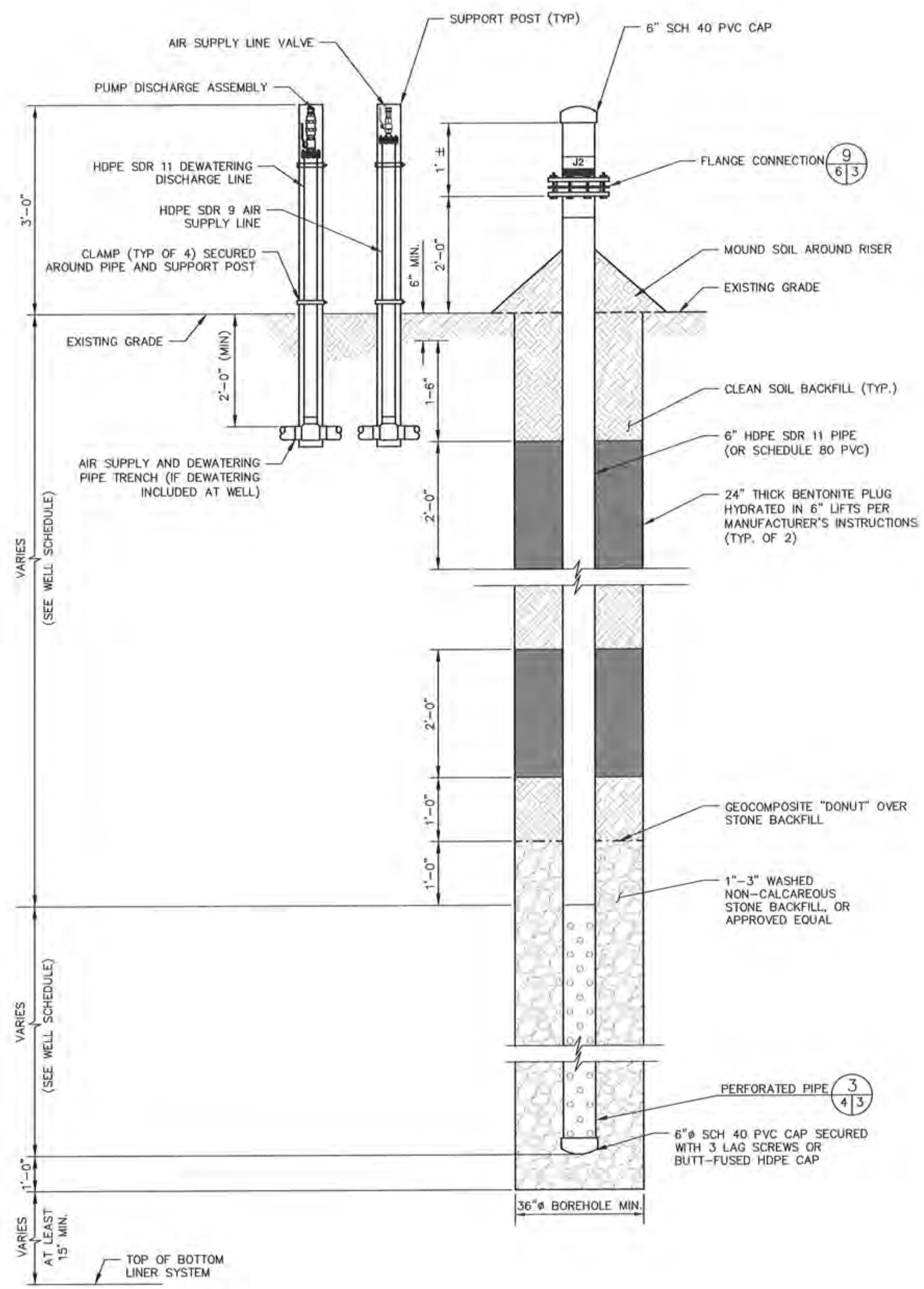
CADD FILE: 02 - GCCS DESIGN

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO.
2

FOR COMPLIANCE PURPOSES ONLY



LFG EXTRACTION WELL 1 3|2
NTS

X — DETAIL DESIGNATION
X — DRAWING DETAIL REFERENCES
X — DRAWING DETAIL SHOWN ON

DAVID J. MEZZACAPPA NEW MEXICO 15236 PROFESSIONAL ENGINEER 1/8/2021

FOR COMPLIANCE PURPOSES ONLY

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: **VERTICAL EXTRACTION WELL DETAILS - 1**

PROJECT TITLE: **CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN**

CLIENT: **CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063**

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PROJ. NO. 16220097.00 | DSN. BY: DJM | DWN. BY: AGA | CHK. BY: AGA | Q/A RVW BY: IA | APP. BY: DJM

CADD FILE: 03 - 05 GCCS DETAILS

DATE: 12/2020

SCALE: AS SHOWN

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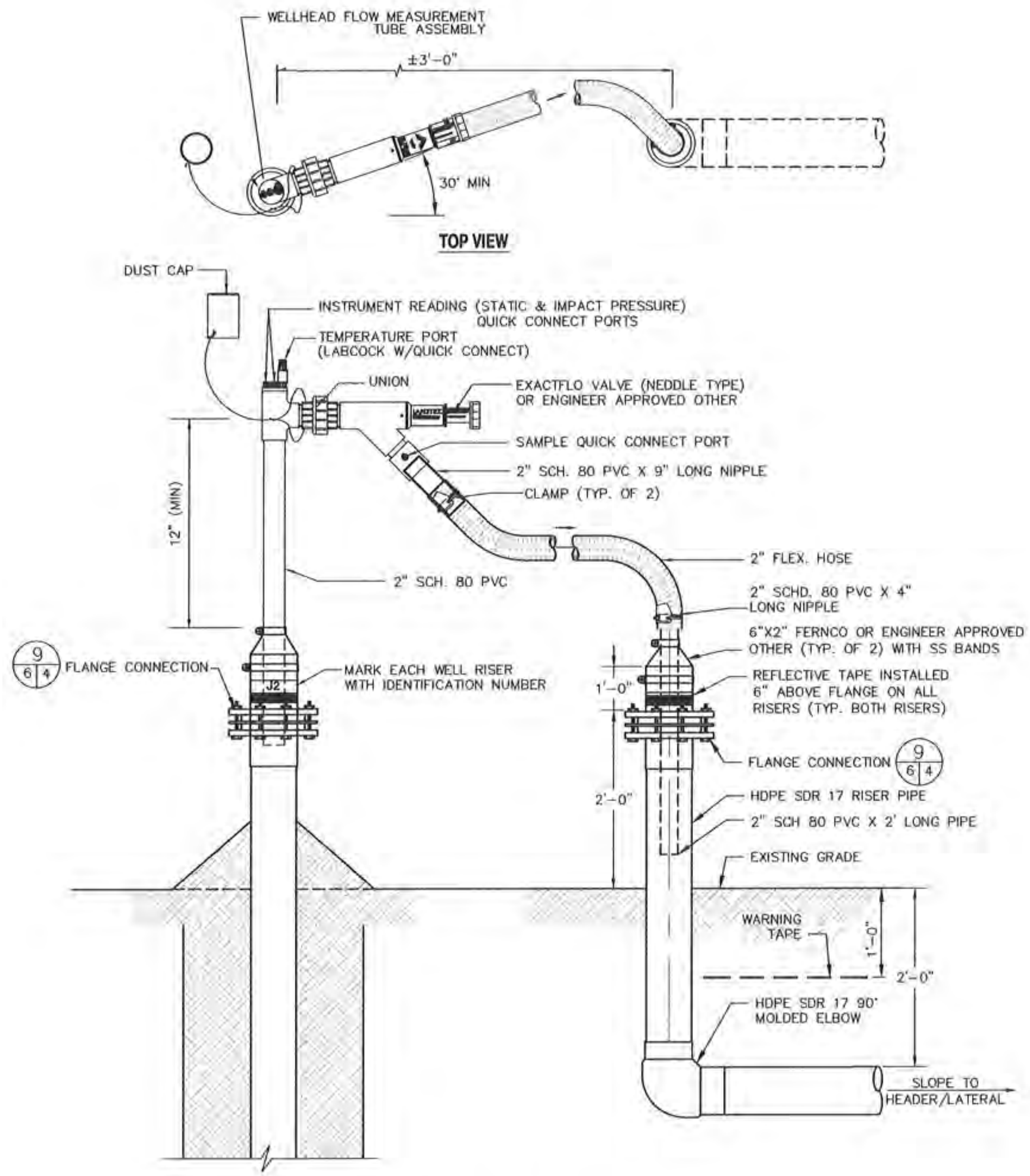
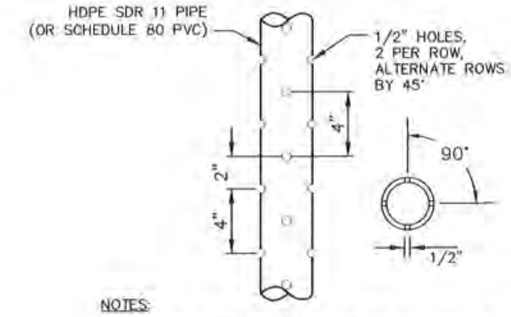


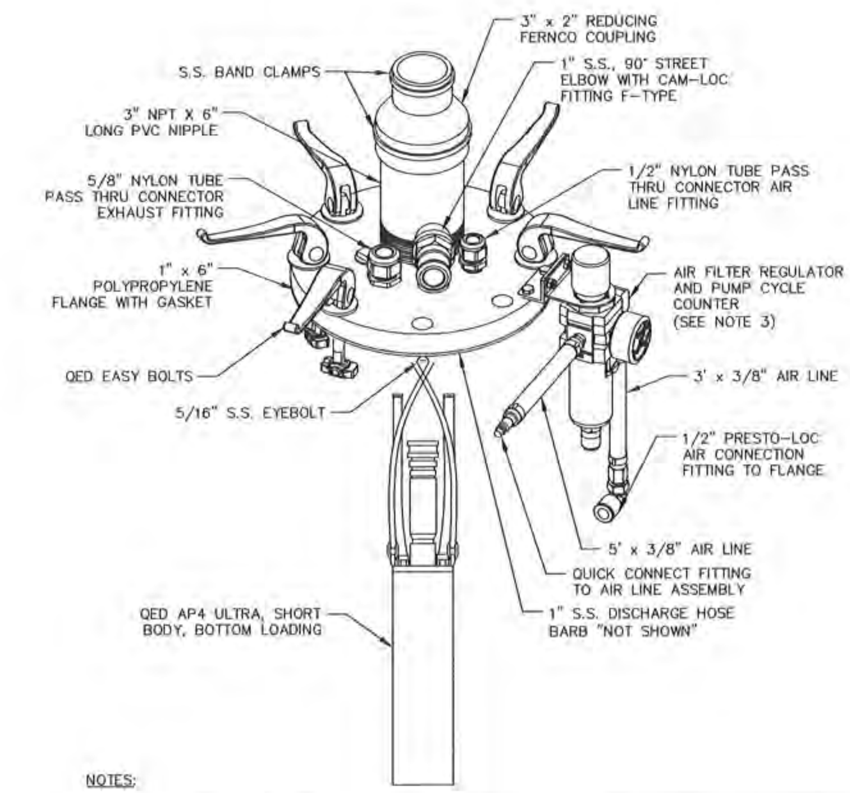
LFG EXTRACTION WELLHEAD (2 / 4 | –)
NTS



NOTES:

1. PERFORATIONS SPACED 90° APART HORIZONTALLY.
2. PERFORATIONS SPACED 4" APART VERTICALLY.
3. 90° AND 270° ROWS STAGGERED 2" BELOW 0° AND 180° ROWS.

PERFORATED PIPE (3 / 4 | 3,7)
NTS



NOTES:

1. ANY PROPOSED NEW WELL IDENTIFIED FOR DUAL-EXTRACTION SHALL RECEIVE DUAL-EXTRACTION WELL FLANGE CAP AND BOTTOM LOADING PNEUMATIC PUMP. TUBING SHALL BE CONNECTED TO PUMP WITH EASY FITTINGS. PUMP EXHAUST LINES SHALL BE VENTED TO THE ATMOSPHERE; NOT WITHIN THE WELL CASING.
2. AIR REGULATORS SHALL BE INSTALLED WITH QED HIGH FLOW SHUTOFF VALVE, IF AVAILABLE. VALVE SHALL BE INSTALLED ON AIR SUPPLY LINE BETWEEN THE AIR REGULATOR AND PUMP ON THE OUTSIDE OF WELL CASING.

DUAL-EXTRACTION WELL FLANGE CAP (4 / 4 | –)
NTS

DETAIL DESIGNATION
DRAWING DETAIL REFERENCES
DRAWING DETAIL SHOWN ON

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: VERTICAL EXTRACTION WELL DETAILS - 2

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

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PROJ. NO. 16220097.00 | DWN. BY: AGA | Q/A RVW BY: JA
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 03 - 05 GCCS DETAILS
DATE: 12/2020
SCALE: AS SHOWN
DRAWING NO. 4

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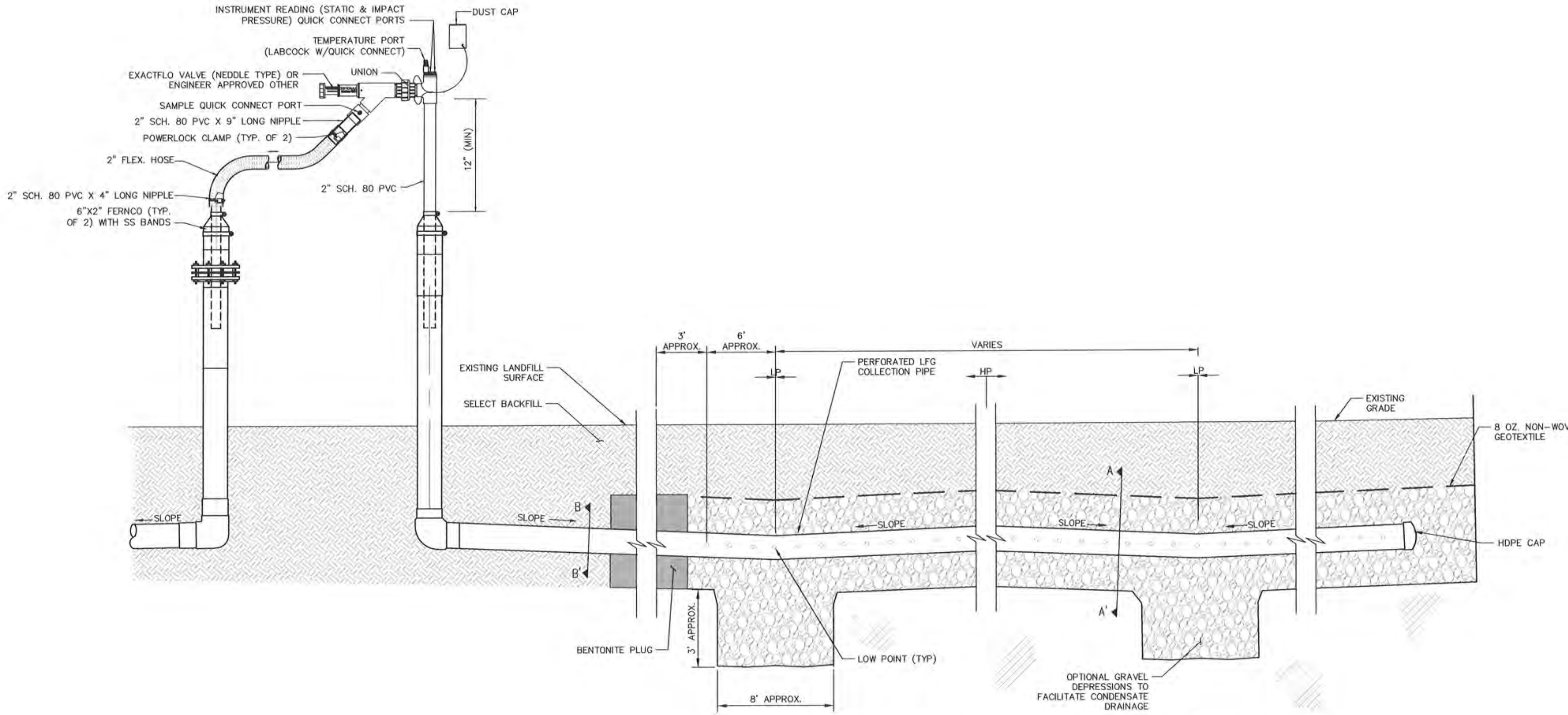
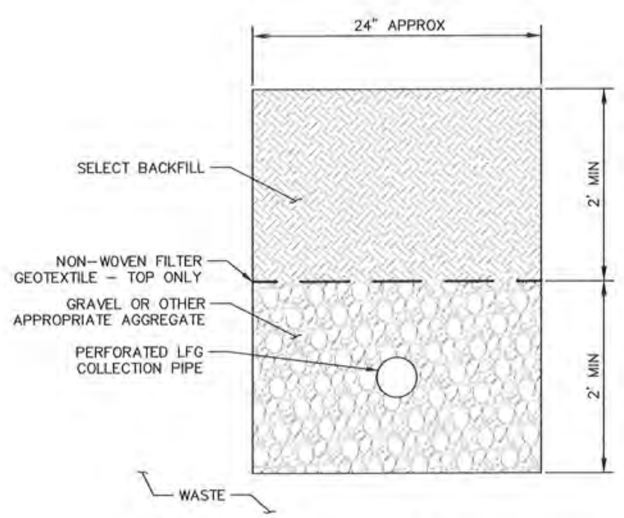
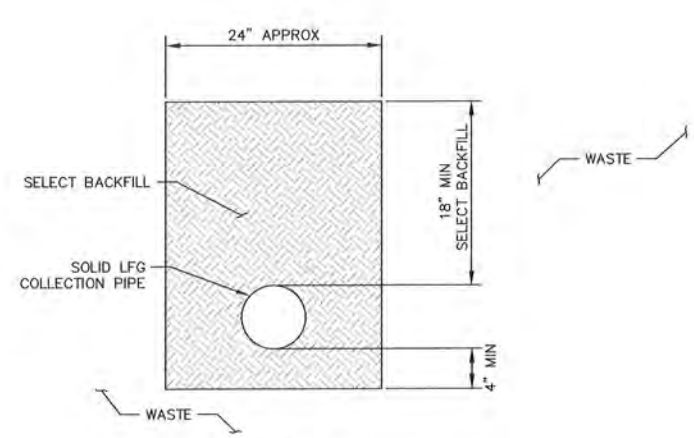


NOTE: CONFIGURATION OF HORIZONTAL MAY BE VARIED BY ELIMINATING OPERATIONAL DEPRESSIONS OR ENHANCING THEM WITH VERTICAL CHIMNEY WELLS, DEPENDING ON THE DESIGN ENGINEER, WASTE CONFIGURATION, AND FUTURE POSSIBLE LANDFILL GAS-TO-ENERGY NEEDS.

TYPICAL HORIZONTAL LFG COLLECTOR 5 / 5 -
NTS



SECTION A-A'
NTS



SECTION B-B'
NTS

DAVID J. MEZZACAPPA NEW MEXICO 15236 PROFESSIONAL ENGINEER 1/8/2021

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REV | DATE | DESCRIPTION | BY

DRAWING TITLE: HORIZONTAL EXTRACTION WELL DETAIL

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

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PROJ. NO. 16220097.00 | DWN. BY: AGA | Q/A RVW BY: LA
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 03 - 05 GCCS DETAILS

DATE: 12/2020

SCALE: AS SHOWN

DRAWING NO. 5

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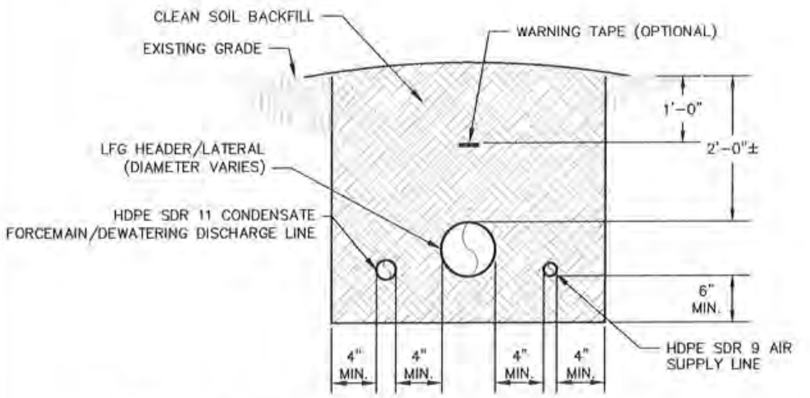
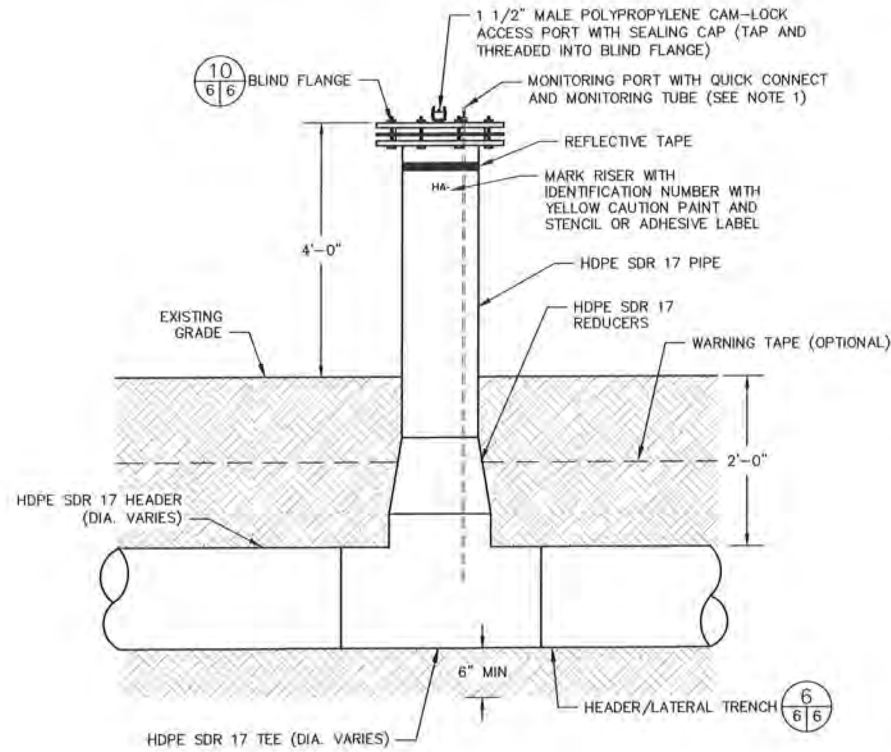
FOR COMPLIANCE PURPOSES ONLY



NOTES:

1. WARNING TAPE SHALL BE MIN. 3" WIDE AND IMPRINTED WITH "GAS LINE BURIED BELOW."
2. THE NUMBER AND TYPES OF PIPES INSTALLED IN THE TRENCH MAY VARY.
3. CONDENSATE/AIR LINES ARE NOT NECESSARILY INCLUDED ALONG LATERAL/HEADER PIPING.

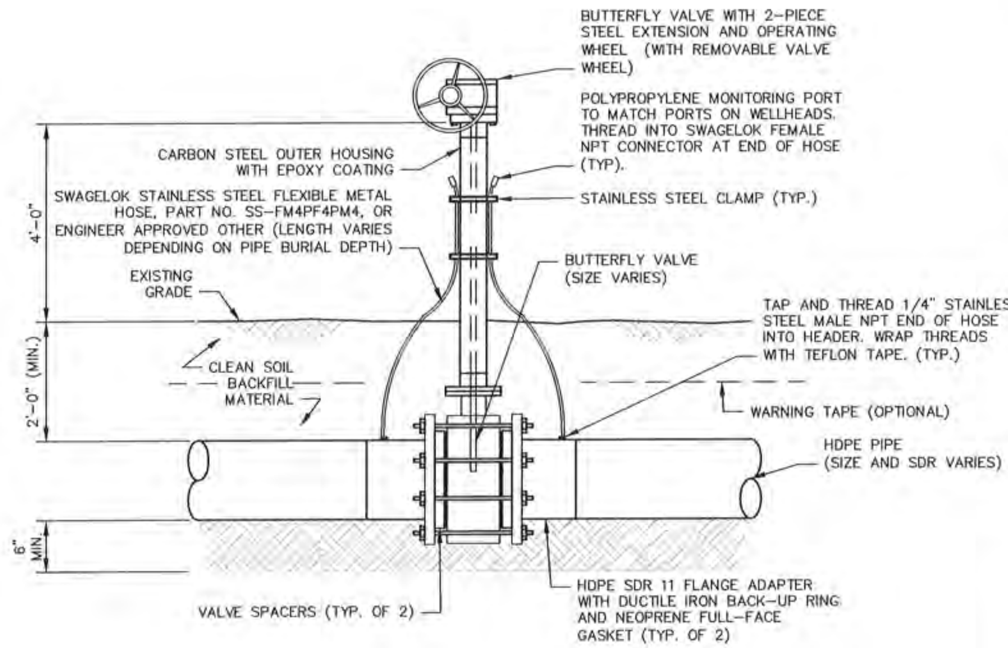
HEADER/LATERAL TRENCH (6 / 6|2)
NTS



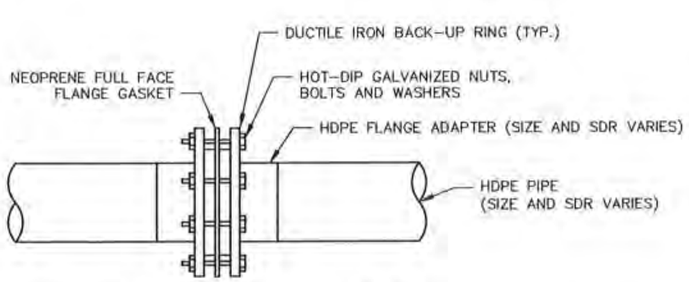
NOTE:

1. TUBING SHALL BE 3/8" STAINLESS STEEL PIPE AND EXTEND TO CENTERLINE OF HEADER

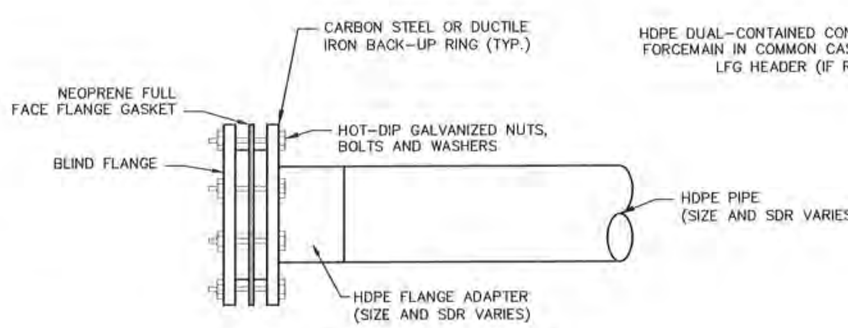
HEADER ACCESS RISER (7 / 6|2)
NTS



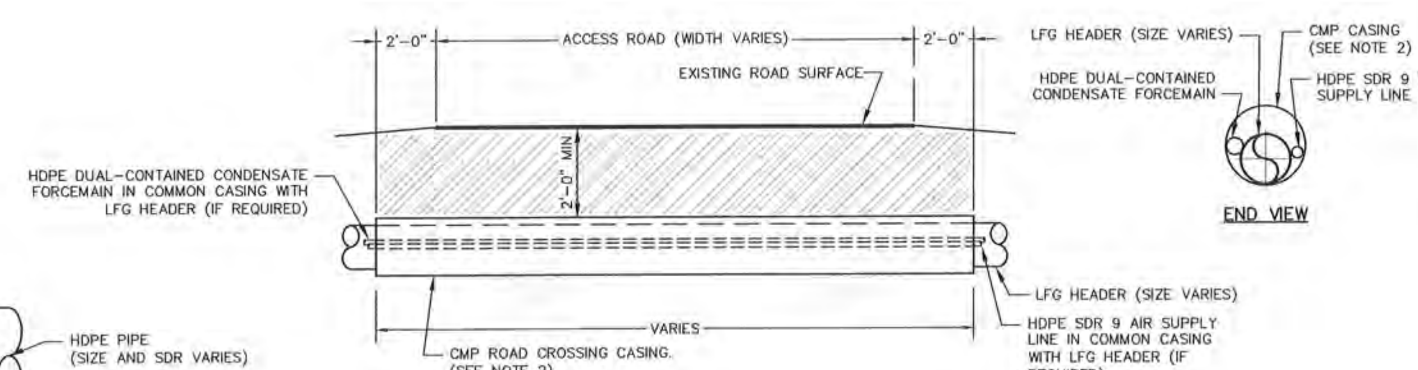
HEADER/LATERAL ISOLATION VALVE (8 / 6|2)
NTS



FLANGE CONNECTION (9 / 6|3,4,7,8)
NTS



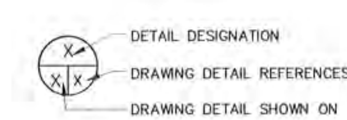
BLIND FLANGE (10 / 6|6,7,8)
NTS



NOTES:

1. ROAD SHALL BE RESTORED TO MATCH ORIGINAL CONDITIONS.

ROAD CROSSING (11 / 6|–)
NOT TO SCALE



12/8/2020 4:29 PM G:\Camino Real\16220017.00 - Revised GCCS Design Plan (XXX and AAAA)\06 - 08 CONDENSATE MGMT DETAILS

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: PIPE DETAILS

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

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PROJ. NO.: 16216113.00 | DWN. BY: AGA | Q/A RVW BY: RRK
CHK. BY: DJM | DSN. BY: AGA | APP. BY: DJM

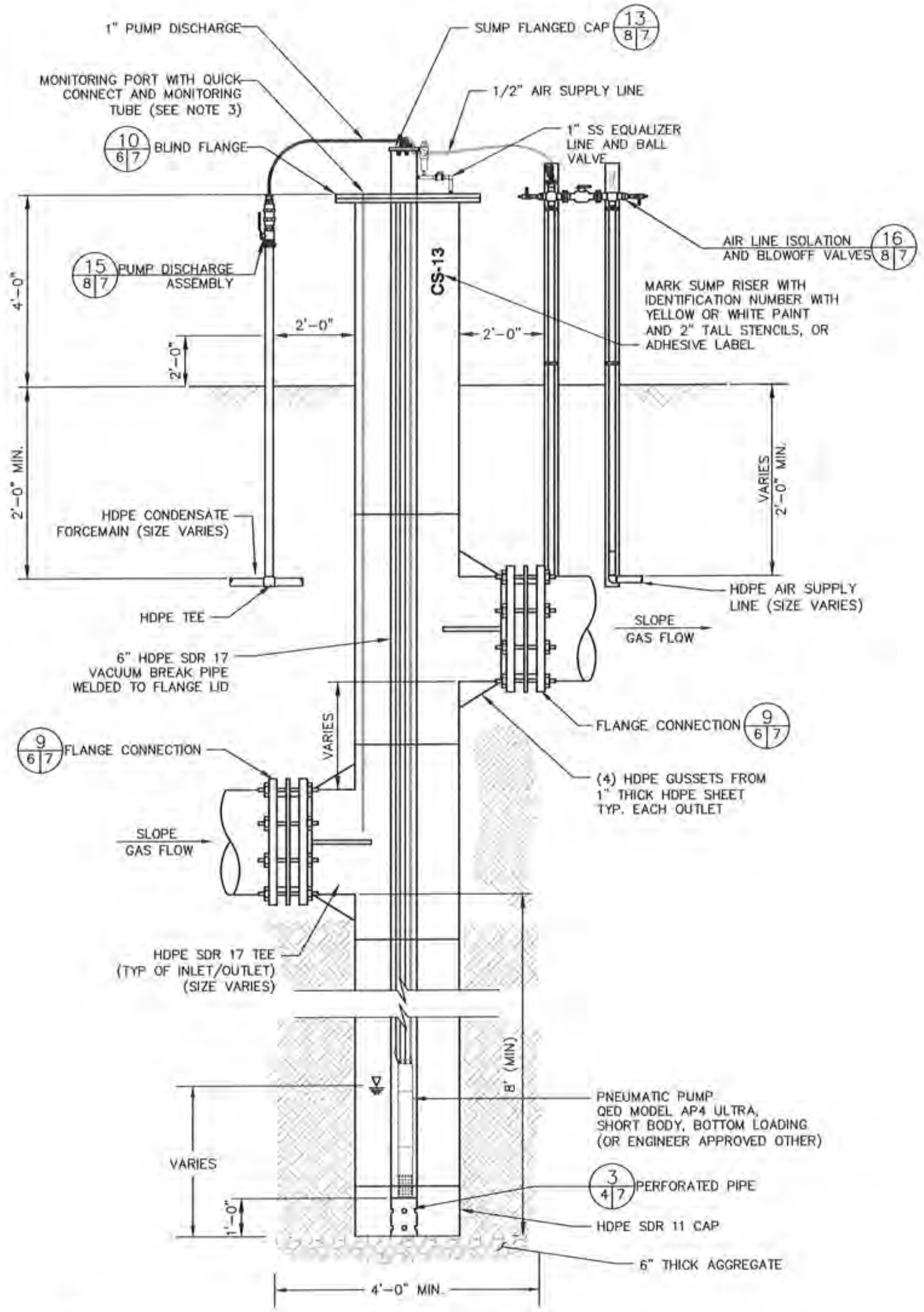
CADD FILE: 06 - 08 CONDENSATE MGMT DETAILS

DATE: 5/2017

SCALE: AS SHOWN

DRAWING NO. 6

FOR COMPLIANCE PURPOSES ONLY



NOTES:

1. SUMP SHALL BE FABRICATED FROM HDPE SDR 17 PIPE AND FITTINGS (SIZE VARIES), CORRESPONDING TO ADJOINING HEADER. CONTRACTOR SHALL CONFIRM ORIENTATION OF TEES PRIOR TO SUMP FABRICATION.
2. 6"ø HDPE SDR 17 VACUUM BREAK PIPE EXTRUSION WELDED TO FLANGE LID. 1'-0" OF PIPE TO PROTRUDE THROUGH TOP OF FLANGE. CENTER OF PIPE LOCATED 2" OFF CENTER OF BLIND FLANGE.
3. TUBING SHALL BE 3/8" STAINLESS STEEL PIPE EXTENDED TO CENTERLINE OF INLET PIPE.
4. PUMP SHALL BE CONNECTED TO PUMP WITH QED EASY FITTINGS OR ENGINEER APPROVED OTHER.
5. IF SUMP IS IN WASTE, DESIGN ENGINEER/CQA SHALL CONFIRM THAT BOTTOM OF SUMP HAS SUFFICIENT SEPARATION FROM THE LANDFILL LINER.

CONDENSATE SUMP 12/7|2
NTS

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1/8/2021

X/X|X — DETAIL DESIGNATION — DRAWING DETAIL REFERENCES — DRAWING DETAIL SHOWN ON

REV | DATE | DESCRIPTION | BY

DRAWING TITLE: CONDENSATE MANAGEMENT DETAILS - 1

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
3351 CANDELARIA ROAD NE, SUITE D
ALBUQUERQUE, NM 87107
PH (505) 349-6060 FAX NO. (505) 349-6061

PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: RRK
CHK. BY: AGA | DSN. BY: DJM | APP. BY: DJM

CADD FILE: 06 – 08 CONDENSATE MGMT DETAILS

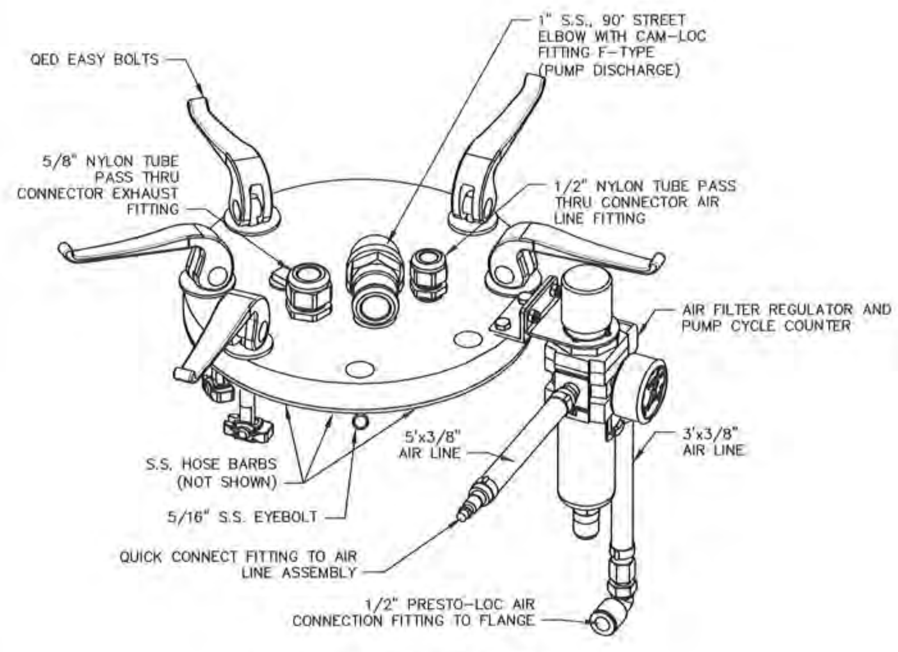
DATE: 5/2017

SCALE: AS SHOWN

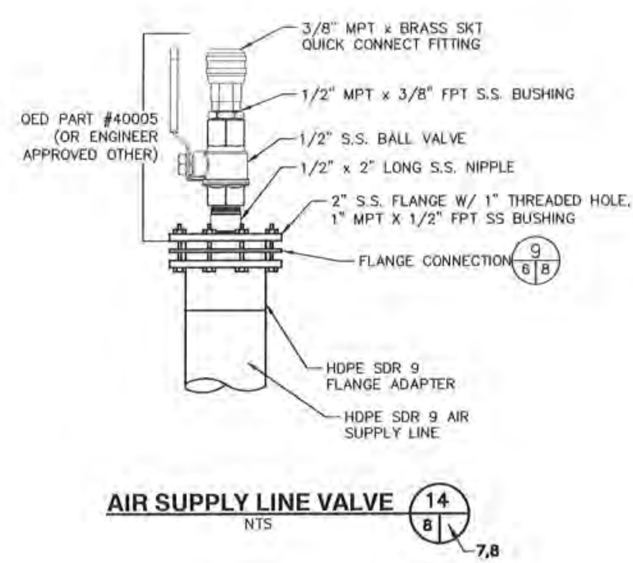
DRAWING NO. 7

12/6/2020 4:30 PM G:\Camino Real\16220097.00 – Revised GCCS Design Plan (XXX and AAAA)\06 – 08 CONDENSATE MGMT DETAILS

FOR COMPLIANCE PURPOSES ONLY



SUMP FLANGE CAP 13 / 8 | 7
NTS



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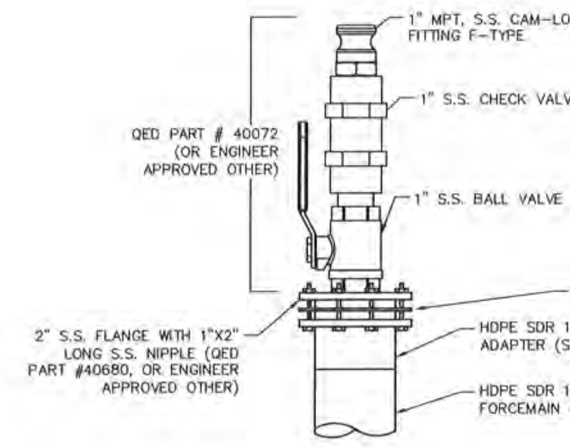
NTS



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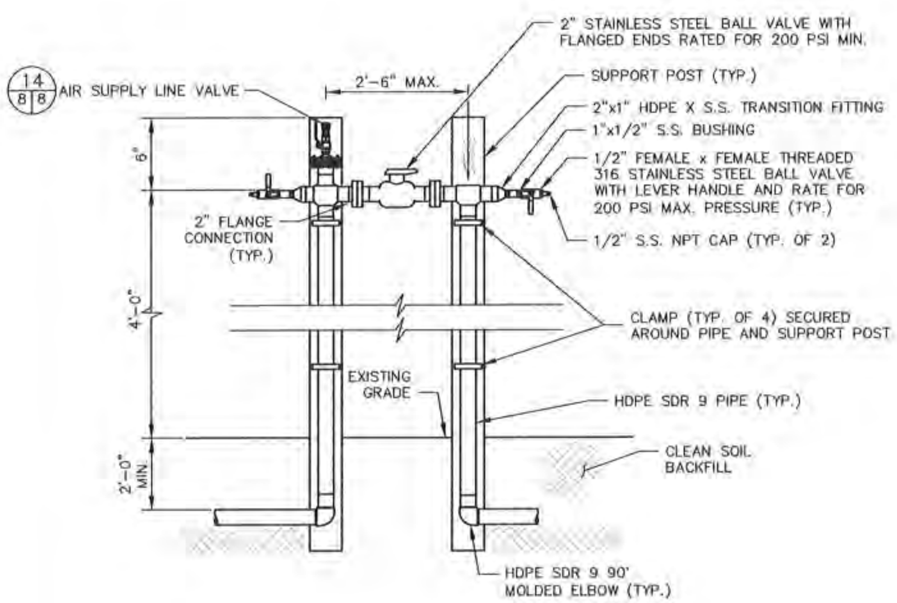

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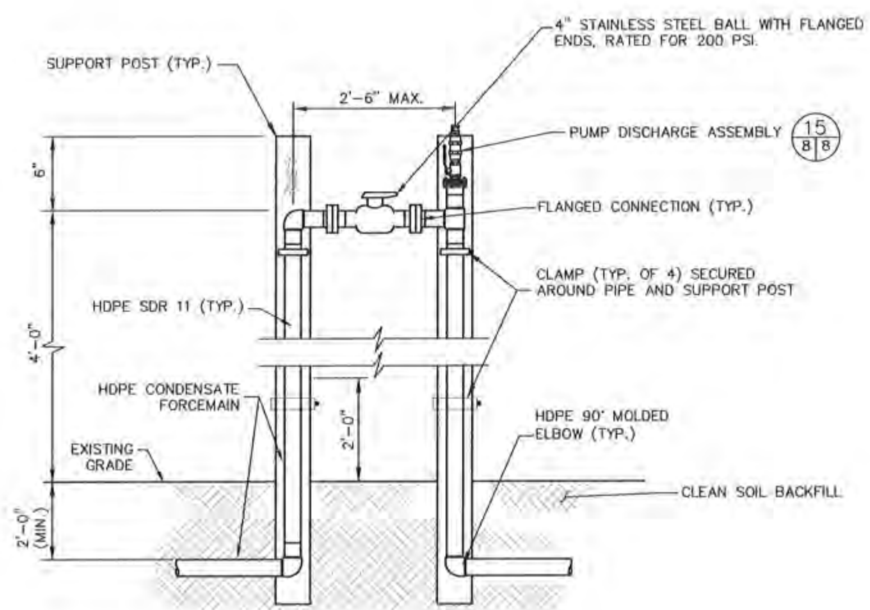
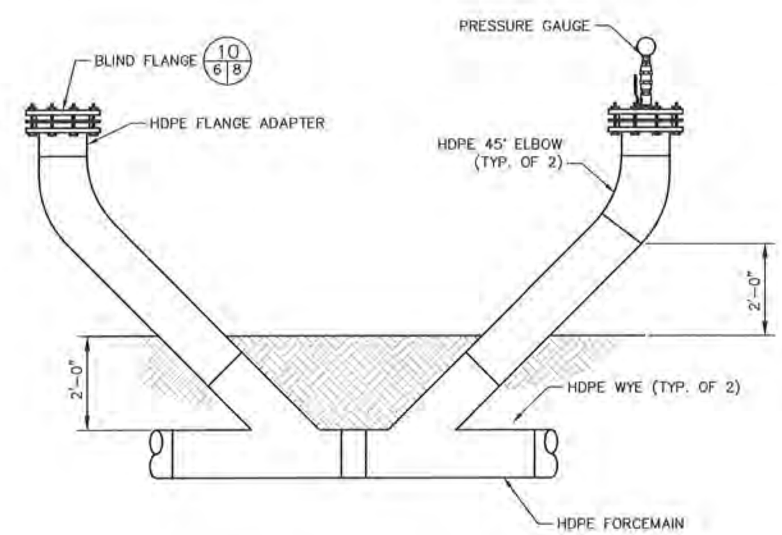
NTS



CONDENSATE FORCEMAIN ISOLATION VALVE 17 / 8 | 2
NTS



FORCEMAIN CLEANOUT 18 / 8 | 2
NTS

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DRAWING DETAIL REFERENCES
DRAWING DETAIL SHOWN ON

12/6/2020 4:31 PM G:\Camino Real\18220097.00 - Revised GCCS Design Plan (XXX and AAA)\06 - 08 CONDENSATE MGMT DETAILS

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: CONDENSATE MANAGEMENT DETAILS - 2

PROJECT TITLE: CAMINO REAL LANDFILL LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT: CAMINO REAL ENVIRONMENTAL CENTER, INC. 1000 CAMINO REAL BLVD. SUNLAND PARK, NM 88063

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PROJ. NO. 16216119.00 | DWN. BY: AGA | Q/A RVW BY: RFK
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 06 - 08 CONDENSATE MGMT DETAILS
DATE: 5/2017
SCALE: AS SHOWN
DRAWING NO. **8**

FOR COMPLIANCE PURPOSES ONLY

Appendix B
Surface Emissions Monitoring Plan

APPENDIX B
SURFACE EMISSIONS MONITORING PLAN

B INTRODUCTION

Per §63.1958(d)(1), as indicated in Section B.2 below, this section constitutes the formal "Surface Emissions Monitoring (SEM) plan" for landfill.

B.1 COMPLIANCE WITH SEM OPERATIONAL STANDARDS §63.1958(d)(1)

§63.1958(d)(1) *Operate the collection system so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator must conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan must be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.*

As indicated above, this appendix constitutes the SEM Plan. Drawing B.1 at the end of this SEM Plan shows the proposed route for surface emissions monitoring (including a background topographical map) at landfill completion. Prior to each monitoring event, route planning will be conducted where the best route for that round of monitoring will be decided. This will be decided based on site operating conditions and topographical features at the time of each monitoring event.

As required by §63.1958(d)(1), the surface testing will be conducted using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specification provided in §63.1960(d). This quarterly surface testing will be performed to determine that the GCCS is being operated so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill at an elevation of 5 to 10 centimeters above the surface.

The surface testing will be conducted around the perimeter of the required GCCS collection area (e.g., areas with 5-year old refuse and/or areas with 2-year old refuse that are at final grade) and along a pattern that traverses the landfill at 30-meter intervals and where visual observations indicate elevated concentrations of LFG, such as distressed vegetation and cracks or seeps in the cover, and all cover penetrations.

Openings (penetrations) that are within an area of the landfill where waste has been placed and a GCCS is required will be monitored.

A "penetration" under this GCCS Design Plan and SEM Plan will be defined as any LFG collection well or LFG collection device required to be in place that completely passes through the landfill cover into waste and is located within an area of the landfill where waste has been placed and a gas collection system is required. Cover penetrations do not include items such as survey stakes, fencing or litter fencing, flags, signs, trees, and utility poles.

For the purposes of monitoring “any openings,” “openings” is defined here to mean any cover penetration as defined above, and any area where waste has been placed and a GCCS is required by the rule that visually exhibits distressed vegetation and cracks and seeps in the cover.

Excluded areas from surface monitoring will include dangerous areas with roads, truck traffic areas, paved areas excluding cracks, steep slopes, areas covered with snow or ice, and active filling areas of the landfill due to the health and safety risk of working around heavy equipment traffic. Prior to each monitoring event, route planning will be completed where excluded areas will be delineated and any modifications to the route will be recorded. Any deviations to the proposed route will be recorded and included in the final SEM report for that quarter.

B.2 COMPLIANCE WITH SEM COMPLIANCE PROVISIONS §63.1960(c) and (d)

§63.1960(c) *The following procedures must be used for compliance with the surface methane operational standard as provided in §63.1958(d).*

> *(1) After installation and startup of the gas collection system, the owner or operator must monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section.*
> *(2) The background concentration must be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.*
> *(3) Surface emission monitoring must be performed in accordance with section 8.3.1 of EPA Method 21 of appendix A–7 of part 60 of this chapter, except that the probe inlet must be placed within 5 to 10 centimeters of the ground. Monitoring must be performed during typical meteorological conditions.*
> *(4) Any reading of 500 ppm or more above background at any location must be recorded as a monitored exceedance and the actions specified in paragraphs (c)(4)(i) through (v) of this section must be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of § 63.1958(d).*
>
>> *(i) The location of each monitored exceedance must be marked and the location and concentration recorded. Beginning no later than September 27, 2021, the location must be recorded using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.*
>> *(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance must be made and the location must be remonitored within 10 days of detecting the exceedance.*
>> *(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in paragraph (c)(4)(v) of this section must be taken, and no further monitoring of that*

location is required until the action specified in paragraph (c)(4)(v) of this section has been taken.
(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in paragraph (c)(4)(ii) or (iii) of this section must be re-monitored 1 month from the initial exceedance. If the 1-month remonitoring shows a concentration less than 500 ppm above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month remonitoring shows an exceedance, the actions specified in paragraph (c)(4)(iii) or (v) of this section must be taken.
(v) For any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period, a new well or other collection device must be installed within 120 days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

(5) The owner or operator must implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

§63.1960(c)(1) requires quarterly monitoring of the surface of the required GCCS area for methane. Quarterly monitoring will take place along the entire perimeter of the required collection area and along a serpentine pattern spaced 30 meters apart for each collection area on a quarterly basis. This monitoring will be performed using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this section and detailed below.

Per §63.1960(c)(2), the background concentration will be determined immediately prior to conducting the survey. The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at least 30 meters from the outermost perimeter wells. The background concentration, measurement location, basic meteorological conditions, and any other factors that could affect the background concentration may also be noted.

Per §63.1960(c)(3) and Section 8.3.1 of Method 21, the surface monitoring shall be performed by moving the probe along the landfill surface (using the mapped route) while observing the instrument readout. The probe must be placed within 5 to 10 centimeters of the ground. If the maximum observed meter reading is greater than 500 ppm, the result will be recorded and reported. As previously mentioned, monitoring will not be performed during extreme meteorological conditions. Monitoring will be rescheduled as soon as practicable if it cannot be conducted because conditions are outside of what could reasonably be considered as typical.

Per §63.1960(c)(4) If a reading in excess of 500 ppm is recorded, the following actions shall be taken (as long as these actions are taken, the exceedance is not a violation of the operational requirements of § 63.1958(d)):

1) The location of the monitored exceedance shall be marked, the concentration measured, and the location recorded. The location must be noted with latitude and longitude coordinates using an instrument with an accuracy of at least 4 meters, the coordinates must be in decimal degrees with at least 5 decimal places.

2) Cover maintenance and/or adjustments to the vacuum of the adjacent wells, or other actions will be performed to increase gas collection in the vicinity of each exceedance. The location will then be re-monitored within 10 calendar days of detecting the exceedance.

3) If the re-monitoring of the location shows a second exceedance, additional corrective action will be taken and the location will be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in item (5) to follow will be taken, and no further monitoring of that location is required until the action specified in item (5) is taken.

4) Any location that initially showed an exceedance, but has a methane content less than 500 ppm methane above background at the first of second 10-day re-monitoring will also be monitored 1 month from the initial exceedance. If the 1 month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of the location is required until the next quarterly monitoring period. If the 1 month re-monitoring shows an exceedance, the actions specified in item (5) to follow will be taken.

5) For any location where the monitored methane concentration equals or exceeds 500 parts per million above background three times in a quarterly period, a new well or other collection device will be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the landfill cover or cap, blower, header pipes, or control device, and a corresponding timeline for installation may be submitted to the administrator for approval (or alternate provision requested in Section 6 utilized if more time is needed).

§63.1960(c)(5) requires a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis. This may be performed during surface scan events quarterly to cover those months. During surface scan events, the monitoring technician will also look for signs of compromised cover integrity such as stressed vegetation, cracks, and erosion. If a monthly check is performed during the quarterly scans, the inspection should be documented in the surface scan monitoring form and appropriate site personnel be notified so that appropriate actions can be taken.

§63.1960(d) *Each owner or operator seeking to comply with the provisions in paragraph (c) of this section must comply with the following instrumentation specifications and procedures for surface emission monitoring devices:*

(1) The portable analyzer must meet the instrument specifications provided in section 6 of EPA Method 21 of appendix A of part 60 of this chapter, except that ''methane'' replaces all references to ''VOC''.
(2) The calibration gas must be methane, diluted to a nominal concentration of 500 ppm in air.
(3) To meet the performance evaluation requirements in section 8.1 of EPA Method 21 of appendix A of part 60 of this chapter, the instrument evaluation procedures of section 8.1 of EPA Method 21 of appendix A of part 60 must be used.
(4) The calibration procedures provided in sections 8 and 10 of EPA Method 21 of appendix A of part 60 of this chapter must be followed immediately before commencing a surface monitoring survey.

The monitoring will be conducted with an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications located in 40 CFR §63.1960(d):

> *The portable analyzer must meet the instrument specifications provided in Section 6 of Method 21 of Appendix A of this part, except that "methane" shall replace all references to "VOC."*

To meet the performance evaluation requirements in Section 6 of Method 21, the instrument evaluation procedures of Section 8.1 of Method 21 will be used. Also, the calibration procedures provided in sections 8 and 10 of Method 21 of Appendix A of this part will be followed immediately before commencing a surface monitoring survey. The performance evaluation results include response factor, calibration precision, and response time. The calibration gas shall be methane, diluted to a concentration of 500 parts per million in air. These results will be documented for each monitoring event.

B.3 COMPLIANCE WITH SEM MONITORING PROVISIONS §63.1961(f)

§63.1961(f) *Each owner or operator seeking to demonstrate compliance with the 500-ppm surface methane operational standard in § 63.1958(d) must monitor surface concentrations of methane according to the procedures in § 63.1960(c) and the instrument specifications in § 63.1960(d). If you are complying with the 500-ppm surface methane operational standard in § 63.1958(d)(2), for location, you must determine the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters and the coordinates must be in decimal degrees with at least five decimal places. In the semi-annual report in 63.1981(i), you must report the location of each exceedance of the 500-ppm methane concentration as provided in § 63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.*

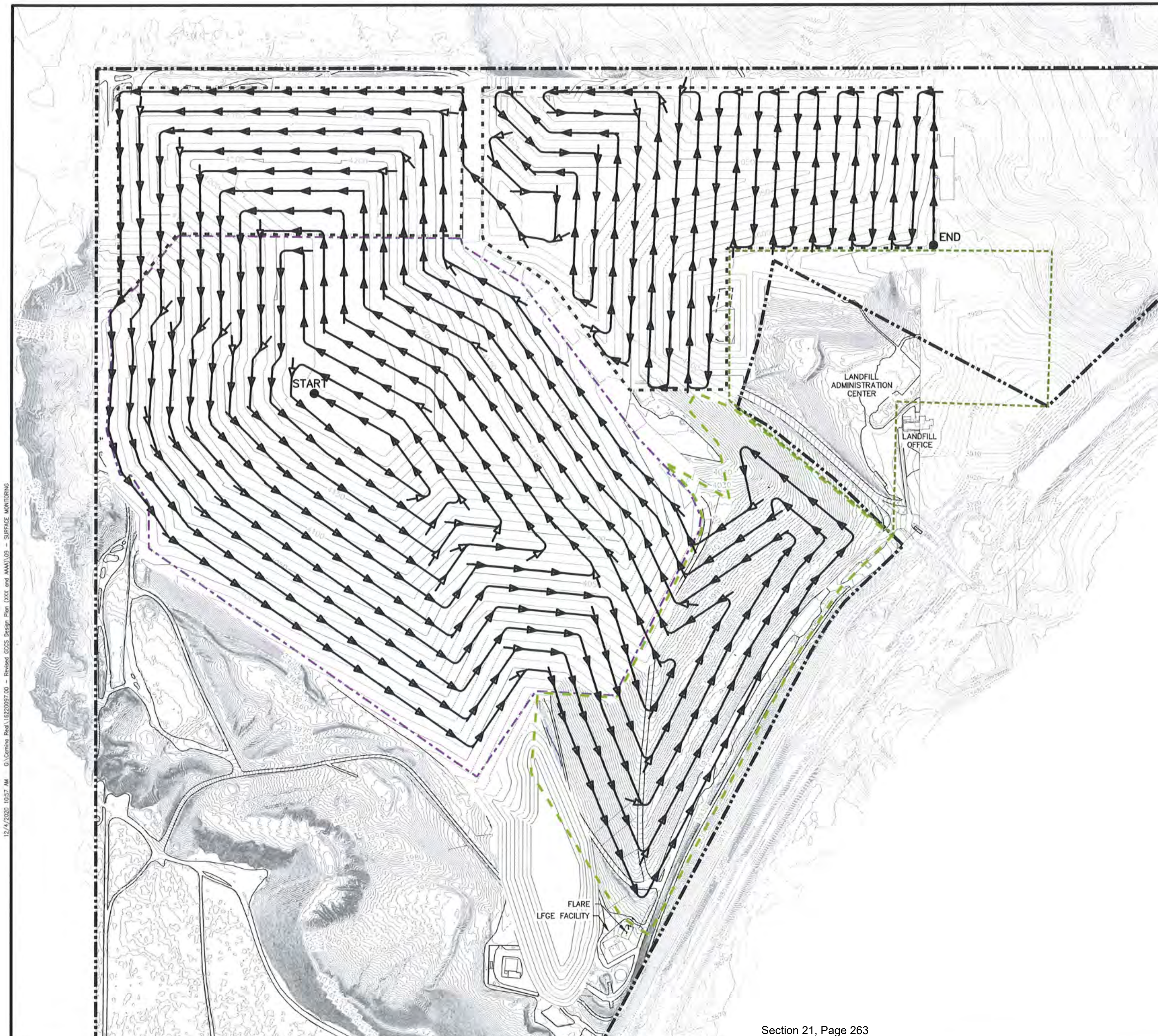
Sections B.1 and B.2 of this Surface Emissions Monitoring Plan discuss the operational standards, monitoring requirements, and instrument specifications cited in §63.1961(f).

40 CFR §63.1961(f) also allows for any closed landfill that has no monitored exceedances of the 500 ppm limit above background in three consecutive quarterly monitored periods after landfill closure to reduce the monitoring frequency to annually. Any methane reading of 500 ppm or more above the background detected during an annual monitoring event shall automatically return the frequency back to a quarterly frequency. This provision may be exercised if the surface scans meet these criteria after landfill closure. This would apply to any closed areas of an active landfill, which are allowed to complete annual monitoring.

B.4 COMPLIANCE WITH SEM REPORTING REQUIREMENTS §63.1981(h)(5)

§63.1981(h)(5) *The location of each exceedance of the 500-ppm methane concentration as provided in § 63.1958(d) and the concentration recorded at each location for which an exceedance was recorded in the previous month. Beginning no later than September 27, 2021, for location, you record the latitude and longitude coordinates of each exceedance using an instrument with an accuracy of at least 4 meters. The coordinates must be in decimal degrees with at least five decimal places.*

As provided in Section B.2 of this Surface Emissions Monitoring Plan, the location of each monitored exceedance of the 500 parts per million methane concentration will be marked and the location recorded. The location will be noted with latitude and longitude coordinates using an instrument with an accuracy of at least 4 meters, the coordinates must be in decimal degrees with at least 5 decimal places.



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SCALE IN FEET

LEGEND

- PERMITTED FINAL COVER CONTOUR (SEE NOTE 1)
- SOLID WASTE FACILITY BOUNDARY
- PERMITTED LIMIT OF WASTE FOR UNIT 1 (CLOSED)
- PERMITTED LIMIT OF WASTE FOR UNIT 2
- CONCEPTUAL LIMIT OF WASTE FOR UNIT 3
- CONCEPTUAL LIMIT OF WASTE FOR UNIT 3A
- CELL BOUNDARY
- MONITORING ROUTE

NOTES

1. EXISTING TOPOGRAPHY IS A COMPOSITE OF 2005 AND 2020 SURVEYS.

   2005 TOPOGRAPHIC SURVEY PROVIDED BY THE COOPER AERIAL SURVEYS CO., OF TUCSON, ARIZONA FROM AN AERIAL SURVEY FLOWN JUNE 27, 2005.

   2020 TOPOGRAPHIC SURVEY FROM AN AERIAL SURVEY FLOWN ON FEBRUARY 15, 2020.

2. THE SURFACE SCAN SHOWN HERE IS AN EXAMPLE. AS LONG AS THE ROUTE MEETS THE REQUIREMENTS SET FORTH IN THE GCCS DEISGN PLAN AND NSPS RULES, IT MAY VARY FROM THE EXACT ROUTE SHOWN HERE..

DAVID J. MEZZACAPPA NEW MEXICO 15236 PROFESSIONAL ENGINEER

1/8/2021

REV	DATE	DESCRIPTION	BY

DRAWING TITLE
SURFACE MONITORING ROUTE

PROJECT TITLE
CAMINO REAL LANDFILL
LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEISGN PLAN

CLIENT
CAMINO REAL ENVIRONMENTAL CENTER, INC.
1000 CAMINO REAL BLVD.
SUNLAND PARK, NM 88063

SCS ENGINEERS
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CONSULTING ENGINEERS
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ALBUQUERQUE, NM 87107
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PROJ. NO. 16220097.00 | DWN. BY: AGA | Q/A RVW BY: JA
DSN. BY: DJM | CHK. BY: AGA | APP. BY: DJM

CADD FILE: 09 - SURFACE MONITORING

DATE: 12/2020

SCALE: AS SHOWN

DRAWING NO. B.1

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Appendix C
LandGEM Modeling Results

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15236
PROFESSIONAL ENGINEER

1/8/2021

Pages C-1 through C-5

Summary Report

Landfill Name or Identifier: Camino Real Landfill (GCCS Design Plan Generation)

Date: Monday, February 20, 2017

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate (*$year^{-1}$*)

L_o = potential methane generation capacity (*m^3/Mg*)

M_i = mass of waste accepted in the i^{th} year (*Mg*)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1977**	
Landfill Closure Year (with 80-year limit)	**2038**	
Actual Closure Year (without limit)	***2038***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity		*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.020**	*year $^{-1}$*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**595**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**NMOC**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**Total landfill gas**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1977	3,318	3,650	0	0
1978	3,364	3,700	3,318	3,650
1979	3,409	3,750	6,682	7,350
1980	3,409	3,750	10,091	11,100
1981	3,455	3,800	13,500	14,850
1982	3,500	3,850	16,955	18,650
1983	3,500	3,850	20,455	22,500
1984	3,545	3,900	23,955	26,350
1985	3,591	3,950	27,500	30,250
1986	3,591	3,950	31,091	34,200
1987	84,558	93,014	34,682	38,150
1988	84,558	93,014	119,240	131,164
1989	84,558	93,014	203,798	224,178
1990	211,393	232,532	288,356	317,192
1991	221,518	243,670	499,749	549,724
1992	217,226	238,949	721,267	793,394
1993	246,307	270,938	938,494	1,032,343
1994	197,125	216,837	1,184,801	1,303,281
1995	217,334	239,067	1,381,925	1,520,118
1996	291,388	320,527	1,599,259	1,759,185
1997	410,788	451,867	1,890,647	2,079,712
1998	408,878	449,765	2,301,435	2,531,579
1999	463,854	510,240	2,710,313	2,981,344
2000	473,185	520,504	3,174,167	3,491,584
2001	438,349	482,183	3,647,353	4,012,088
2002	479,132	527,046	4,085,701	4,494,271
2003	485,045	533,550	4,564,834	5,021,317
2004	517,138	568,852	5,049,879	5,554,867
2005	451,086	496,195	5,567,017	6,123,719
2006	551,485	606,634	6,018,104	6,619,914
2007	586,547	645,202	6,569,589	7,226,548
2008	533,701	587,071	7,156,136	7,871,750
2009	476,427	524,070	7,689,837	8,458,821
2010	565,595	622,155	8,166,264	8,982,891
2011	530,591	583,650	8,731,859	9,605,045
2012	463,482	509,830	9,262,450	10,188,695
2013	393,128	432,440	9,725,932	10,698,525
2014	416,466	458,113	10,119,060	11,130,966
2015	449,172	494,089	10,535,526	11,589,079
2016	416,782	458,460	10,984,698	12,083,168

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2017	418,865	460,752	11,401,480	12,541,628
2018	420,960	463,056	11,820,345	13,002,380
2019	423,065	465,371	12,241,305	13,465,436
2020	425,180	467,698	12,664,370	13,930,807
2021	427,306	470,037	13,089,550	14,398,505
2022	429,443	472,387	13,516,856	14,868,542
2023	431,590	474,749	13,946,299	15,340,929
2024	433,748	477,123	14,377,889	15,815,678
2025	435,916	479,508	14,811,637	16,292,801
2026	438,096	481,906	15,247,554	16,772,309
2027	440,286	484,315	15,685,650	17,254,215
2028	442,488	486,737	16,125,936	17,738,530
2029	444,700	489,170	16,568,424	18,225,267
2030	446,924	491,616	17,013,124	18,714,437
2031	449,158	494,074	17,460,048	19,206,053
2032	451,405	496,545	17,909,206	19,700,127
2033	453,662	499,028	18,360,611	20,196,672
2034	455,930	501,523	18,814,273	20,695,700
2035	458,209	504,030	19,270,203	21,197,223
2036	460,500	506,550	19,728,412	21,701,253
2037	462,803	509,083	20,188,912	22,207,803
2038	388,242	427,066	20,651,714	22,716,886
2039	0	0	21,039,956	23,143,952
2040	0	0	21,039,956	23,143,952
2041	0	0	21,039,956	23,143,952
2042	0	0	21,039,956	23,143,952
2043	0	0	21,039,956	23,143,952
2044	0	0	21,039,956	23,143,952
2045	0	0	21,039,956	23,143,952
2046	0	0	21,039,956	23,143,952
2047	0	0	21,039,956	23,143,952
2048	0	0	21,039,956	23,143,952
2049	0	0	21,039,956	23,143,952
2050	0	0	21,039,956	23,143,952
2051	0	0	21,039,956	23,143,952
2052	0	0	21,039,956	23,143,952
2053	0	0	21,039,956	23,143,952
2054	0	0	21,039,956	23,143,952
2055	0	0	21,039,956	23,143,952
2056	0	0	21,039,956	23,143,952

Results (Continued)

Year	Carbon dioxide			Total landfill gas		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
1977	0	0	0	0	0	0
1978	1.204E+01	6.577E+03	4.419E-01	1.643E+01	1.315E+04	8.838E-01
1979	2.400E+01	1.311E+04	8.811E-01	3.275E+01	2.623E+04	1.762E+00
1980	3.590E+01	1.961E+04	1.318E+00	4.898E+01	3.922E+04	2.635E+00
1981	4.756E+01	2.598E+04	1.746E+00	6.489E+01	5.196E+04	3.491E+00
1982	5.915E+01	3.231E+04	2.171E+00	8.071E+01	6.463E+04	4.342E+00
1983	7.068E+01	3.861E+04	2.594E+00	9.644E+01	7.722E+04	5.188E+00
1984	8.198E+01	4.478E+04	3.009E+00	1.119E+02	8.957E+04	6.018E+00
1985	9.322E+01	5.092E+04	3.422E+00	1.272E+02	1.018E+05	6.843E+00
1986	1.044E+02	5.703E+04	3.832E+00	1.424E+02	1.141E+05	7.664E+00
1987	1.154E+02	6.302E+04	4.234E+00	1.574E+02	1.260E+05	8.469E+00
1988	4.199E+02	2.294E+05	1.541E+01	5.729E+02	4.588E+05	3.082E+01
1989	7.184E+02	3.924E+05	2.637E+01	9.802E+02	7.849E+05	5.274E+01
1990	1.011E+03	5.523E+05	3.711E+01	1.379E+03	1.105E+06	7.421E+01
1991	1.758E+03	9.603E+05	6.453E+01	2.399E+03	1.921E+06	1.291E+02
1992	2.527E+03	1.380E+06	9.275E+01	3.448E+03	2.761E+06	1.855E+02
1993	3.265E+03	1.784E+06	1.198E+02	4.455E+03	3.567E+06	2.397E+02
1994	4.094E+03	2.237E+06	1.503E+02	5.586E+03	4.473E+06	3.005E+02
1995	4.728E+03	2.583E+06	1.735E+02	6.451E+03	5.166E+06	3.471E+02
1996	5.423E+03	2.963E+06	1.991E+02	7.400E+03	5.925E+06	3.981E+02
1997	6.373E+03	3.481E+06	2.339E+02	8.696E+03	6.963E+06	4.678E+02
1998	7.737E+03	4.227E+06	2.840E+02	1.056E+04	8.454E+06	5.680E+02
1999	9.067E+03	4.954E+06	3.328E+02	1.237E+04	9.907E+06	6.657E+02
2000	1.057E+04	5.775E+06	3.880E+02	1.442E+04	1.155E+07	7.760E+02
2001	1.208E+04	6.598E+06	4.433E+02	1.648E+04	1.320E+07	8.867E+02
2002	1.343E+04	7.337E+06	4.929E+02	1.832E+04	1.467E+07	9.859E+02
2003	1.490E+04	8.141E+06	5.470E+02	2.033E+04	1.628E+07	1.094E+03
2004	1.637E+04	8.941E+06	6.008E+02	2.233E+04	1.788E+07	1.202E+03
2005	1.792E+04	9.789E+06	6.577E+02	2.445E+04	1.958E+07	1.315E+03
2006	1.920E+04	1.049E+07	7.048E+02	2.620E+04	2.098E+07	1.410E+03
2007	2.082E+04	1.137E+07	7.643E+02	2.841E+04	2.275E+07	1.529E+03
2008	2.254E+04	1.231E+07	8.273E+02	3.075E+04	2.462E+07	1.655E+03
2009	2.403E+04	1.313E+07	8.820E+02	3.278E+04	2.625E+07	1.764E+03
2010	2.528E+04	1.381E+07	9.279E+02	3.449E+04	2.762E+07	1.856E+03
2011	2.683E+04	1.466E+07	9.849E+02	3.661E+04	2.932E+07	1.970E+03
2012	2.823E+04	1.542E+07	1.036E+03	3.851E+04	3.084E+07	2.072E+03
2013	2.935E+04	1.603E+07	1.077E+03	4.005E+04	3.207E+07	2.155E+03
2014	3.019E+04	1.649E+07	1.108E+03	4.120E+04	3.299E+07	2.217E+03
2015	3.111E+04	1.699E+07	1.142E+03	4.244E+04	3.399E+07	2.284E+03
2016	3.212E+04	1.755E+07	1.179E+03	4.383E+04	3.510E+07	2.358E+03
2017	3.300E+04	1.803E+07	1.211E+03	4.502E+04	3.605E+07	2.422E+03
2018	3.386E+04	1.850E+07	1.243E+03	4.621E+04	3.700E+07	2.486E+03
2019	3.472E+04	1.897E+07	1.274E+03	4.737E+04	3.794E+07	2.549E+03
2020	3.557E+04	1.943E+07	1.306E+03	4.853E+04	3.886E+07	2.611E+03
2021	3.641E+04	1.989E+07	1.336E+03	4.967E+04	3.978E+07	2.673E+03
2022	3.724E+04	2.034E+07	1.367E+03	5.081E+04	4.068E+07	2.734E+03
2023	3.806E+04	2.079E+07	1.397E+03	5.193E+04	4.158E+07	2.794E+03
2024	3.887E+04	2.123E+07	1.427E+03	5.303E+04	4.247E+07	2.853E+03
2025	3.967E+04	2.167E+07	1.456E+03	5.413E+04	4.335E+07	2.912E+03
2026	4.047E+04	2.211E+07	1.485E+03	5.522E+04	4.422E+07	2.971E+03

Results (Continued)

Year	Carbon dioxide			Total landfill gas		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2027	4.126E+04	2.254E+07	1.514E+03	5.629E+04	4.508E+07	3.029E+03
2028	4.204E+04	2.297E+07	1.543E+03	5.736E+04	4.593E+07	3.086E+03
2029	4.281E+04	2.339E+07	1.571E+03	5.841E+04	4.677E+07	3.143E+03
2030	4.358E+04	2.381E+07	1.600E+03	5.946E+04	4.761E+07	3.199E+03
2031	4.433E+04	2.422E+07	1.627E+03	6.049E+04	4.844E+07	3.255E+03
2032	4.509E+04	2.463E+07	1.655E+03	6.152E+04	4.926E+07	3.310E+03
2033	4.583E+04	2.504E+07	1.682E+03	6.254E+04	5.008E+07	3.365E+03
2034	4.657E+04	2.544E+07	1.709E+03	6.354E+04	5.088E+07	3.419E+03
2035	4.730E+04	2.584E+07	1.736E+03	6.454E+04	5.168E+07	3.473E+03
2036	4.803E+04	2.624E+07	1.763E+03	6.553E+04	5.248E+07	3.526E+03
2037	4.875E+04	2.663E+07	1.789E+03	6.651E+04	5.326E+07	3.579E+03
2038	4.946E+04	2.702E+07	1.816E+03	6.749E+04	5.404E+07	3.631E+03
2039	4.989E+04	2.726E+07	1.831E+03	6.807E+04	5.451E+07	3.663E+03
2040	4.890E+04	2.672E+07	1.795E+03	6.673E+04	5.343E+07	3.590E+03
2041	4.793E+04	2.619E+07	1.759E+03	6.541E+04	5.237E+07	3.519E+03
2042	4.699E+04	2.567E+07	1.725E+03	6.411E+04	5.134E+07	3.449E+03
2043	4.606E+04	2.516E+07	1.690E+03	6.284E+04	5.032E+07	3.381E+03
2044	4.514E+04	2.466E+07	1.657E+03	6.160E+04	4.932E+07	3.314E+03
2045	4.425E+04	2.417E+07	1.624E+03	6.038E+04	4.835E+07	3.248E+03
2046	4.337E+04	2.369E+07	1.592E+03	5.918E+04	4.739E+07	3.184E+03
2047	4.251E+04	2.323E+07	1.561E+03	5.801E+04	4.645E+07	3.121E+03
2048	4.167E+04	2.277E+07	1.530E+03	5.686E+04	4.553E+07	3.059E+03
2049	4.085E+04	2.231E+07	1.499E+03	5.573E+04	4.463E+07	2.999E+03
2050	4.004E+04	2.187E+07	1.470E+03	5.463E+04	4.375E+07	2.939E+03
2051	3.925E+04	2.144E+07	1.441E+03	5.355E+04	4.288E+07	2.881E+03
2052	3.847E+04	2.102E+07	1.412E+03	5.249E+04	4.203E+07	2.824E+03
2053	3.771E+04	2.060E+07	1.384E+03	5.145E+04	4.120E+07	2.768E+03
2054	3.696E+04	2.019E+07	1.357E+03	5.043E+04	4.038E+07	2.713E+03
2055	3.623E+04	1.979E+07	1.330E+03	4.943E+04	3.958E+07	2.660E+03
2056	3.551E+04	1.940E+07	1.303E+03	4.845E+04	3.880E+07	2.607E+03
2057	3.481E+04	1.902E+07	1.278E+03	4.749E+04	3.803E+07	2.555E+03
2058	3.412E+04	1.864E+07	1.252E+03	4.655E+04	3.728E+07	2.505E+03
2059	3.344E+04	1.827E+07	1.228E+03	4.563E+04	3.654E+07	2.455E+03
2060	3.278E+04	1.791E+07	1.203E+03	4.473E+04	3.582E+07	2.406E+03
2061	3.213E+04	1.755E+07	1.179E+03	4.384E+04	3.511E+07	2.359E+03
2062	3.150E+04	1.721E+07	1.156E+03	4.297E+04	3.441E+07	2.312E+03
2063	3.087E+04	1.687E+07	1.133E+03	4.212E+04	3.373E+07	2.266E+03
2064	3.026E+04	1.653E+07	1.111E+03	4.129E+04	3.306E+07	2.221E+03
2065	2.966E+04	1.620E+07	1.089E+03	4.047E+04	3.241E+07	2.177E+03
2066	2.907E+04	1.588E+07	1.067E+03	3.967E+04	3.177E+07	2.134E+03
2067	2.850E+04	1.557E+07	1.046E+03	3.888E+04	3.114E+07	2.092E+03
2068	2.793E+04	1.526E+07	1.025E+03	3.811E+04	3.052E+07	2.051E+03
2069	2.738E+04	1.496E+07	1.005E+03	3.736E+04	2.992E+07	2.010E+03
2070	2.684E+04	1.466E+07	9.851E+02	3.662E+04	2.932E+07	1.970E+03
2071	2.631E+04	1.437E+07	9.656E+02	3.590E+04	2.874E+07	1.931E+03
2072	2.579E+04	1.409E+07	9.465E+02	3.518E+04	2.817E+07	1.893E+03
2073	2.528E+04	1.381E+07	9.278E+02	3.449E+04	2.762E+07	1.856E+03
2074	2.478E+04	1.353E+07	9.094E+02	3.380E+04	2.707E+07	1.819E+03
2075	2.428E+04	1.327E+07	8.914E+02	3.314E+04	2.653E+07	1.783E+03
2076	2.380E+04	1.300E+07	8.737E+02	3.248E+04	2.601E+07	1.747E+03
2077	2.333E+04	1.275E+07	8.564E+02	3.184E+04	2.549E+07	1.713E+03

Appendix D
KYGas Modeling Results

1/8/2021

DAVID J. MEZZACAPPA
NEW MEXICO
15238
PROFESSIONAL ENGINEER

Pages D-1 through D-29

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* * * * * * * * * * * * * K Y G A S * * * * * * * * * * * * *
*                                                           *
*  Gas Network Analysis Software                            *
*                                                           *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)               *
*  Version: 8.014  01/11/2016                               *
*  Company:  SCSEnginee    Serial #:  500203                *
*  Interface:  Classic                                      *
*  Licensed for Pipe2014                                    *
*                                                           *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

INPUT DATA FILE NAME FOR THIS SIMULATION = m:\projects\WASTEC~1\CAMINO~1\16216 1~1.002\TASK4-~1\kygas\CAMINO~1.KYP\camino_r.DAT
OUTPUT DATA FILE NAME FOR THIS SIMULATION = m:\projects\WASTEC~1\CAMINO~1\16216 1~1.002\TASK4-~1\kygas\CAMINO~1.KYP\camino_r.OT2

DATE FOR THIS COMPUTER RUN   : 4-08-2017
START TIME FOR THIS COMPUTER RUN : 11:27:15:90

SUMMARY OF DISTRIBUTION SYSTEM CHARACTERISTICS:

NUMBER OF PIPES   =   257
NUMBER OF JUNCTION NODES =   251

UNITS SPECIFIED   = ENGLISH

PROPERTIES OF THE GAS FOR THIS ANALYSIS ARE:

OPERATING TEMPERATURE	= 120.000	DEGREES FAHRENHEIT
REFERENCE DENSITY (@ STD. PRESSURE)	= .71E-01	POUNDS/CUBIC FOOT
GAS MOLECULAR WEIGHT	= 30.000	
GAS SPECIFIC GRAVITY	= 1.036	
RATIO OF SPECIFIC HEATS	= 1.300	
GAS CONSTANT	= 51.512	
ABSOLUTE VISCOSITY	= .266E-06	POUND SECONDS/SQUARE FOOT

USER SPEC. FLOW UNITS (USFU)   = SCF / MIN.
USER SPEC. PRESSURE UNITS(USPU)   = INCHES OF WATER (GAUGE)

------- SUMMARY OF PIPE NETWORK GEOMETRIC AND OPERATING DATA -------

PIPE NAME	NODE #1	NODE #2	LENGTH (FT.)	DIAM. (IN.)	ROUGHNESS (MILLIFEET)	SUM-M FACT.	PUMP ID	ELEVATION CHANGE
P-1	R-1	J-28	62.8	21.1	.005	.0	0	.0

P-2	J-2	B7	221.0	5.8	.005	.0	0	.0
P-3	J-2	J-10	22.5	3.9	.005	.0	0	.0
P-4	J-3	J-8	42.4	5.8	.005	.0	0	.0
P-5	J-3	J-5	347.8	5.8	.005	.0	0	.0
P-6	J-5	J-27	303.1	5.8	.005	.0	0	.0
P-7	J-5	A3	16.4	3.9	.005	.0	0	.0
P-8	J-8	B9	335.1	5.8	.005	.0	0	.0
P-9	J-8	A5	13.1	3.9	.005	.0	0	.0
P-10	J-10	J-3	196.9	5.8	.005	.0	0	.0
P-11	J-10	B8	20.4	3.9	.005	.0	0	.0
P-12	J-12	J-2	200.4	5.8	.005	.0	0	.0
P-13	J-12	B6	171.5	3.9	.005	.0	0	.0
P-14	J-14	J-12	260.1	5.8	.005	.0	0	.0
P-15	J-14	A4	23.6	3.9	.005	.0	0	.0
P-16	J-16	J-14	291.8	5.8	.005	.0	0	.0
P-17	J-16	B5	9.1	3.9	.005	.0	0	.0
P-18	J-18	J-16	255.0	5.8	.005	.0	0	.0
P-19	J-18	B4	28.5	3.9	.005	.0	0	.0
P-20	J-20	J-18	234.1	5.8	.005	.0	0	.0
P-21	J-20	B3	82.0	3.9	.005	.0	0	.0
P-22	J-22	J-20	267.3	5.8	.005	.0	0	.0
P-23	J-22	B2	89.2	3.9	.005	.0	0	.0
P-24	J-24	J-25	105.9	21.1	.005	.0	0	.0
P-25	J-24	J-34	334.8	7.6	.005	.0	0	.0
P-26	J-25	J-22	444.1	5.8	.005	.0	0	.0
P-27	J-25	J-36	1029.6	5.8	.005	.0	0	.0
P-28	J-28	J-24	100.9	21.1	.005	.0	0	.0
P-29	J-28	J-42	1266.1	21.1	.005	.0	0	.0
P-30	J-26	B12	83.0	3.9	.005	.0	0	.0
P-31	J-26	B10	144.0	3.9	.005	.0	0	.0
P-32	J-32	J-26	233.3	5.8	.005	.0	0	.0
P-33	J-32	B11	64.1	3.9	.005	.0	0	.0
P-34	J-34	J-32	258.0	5.8	.005	.0	0	.0
P-35	J-34	B1	68.1	3.9	.005	.0	0	.0
P-36	J-36	A1	80.3	3.9	.005	.0	0	.0
P-37	J-27	J-36	384.3	5.8	.005	.0	0	.0
P-38	J-27	A2	19.5	3.9	.005	.0	0	.0
P-39	J-30	J-40	231.8	15.8	.005	.0	0	.0
P-40	J-30	C1R	29.1	3.9	.005	.0	0	.0
P-41	J-40	J-38	107.8	15.8	.005	.0	0	.0
P-42	J-40	C2R	124.5	3.9	.005	.0	0	.0
P-43	J-42	J-30	114.4	15.8	.005	.0	0	.0
P-44	J-42	J-51	137.8	15.8	.005	.0	0	.0
P-45	J-43	J-77	27.6	15.8	.005	.0	0	.0
P-46	J-43	J-226	527.3	11.2	.005	.0	0	.0
P-47	HP-7	J-188	18.6	11.2	.005	.0	0	.0
P-48	J-45	J-87	115.4	15.8	.005	.0	0	.0
P-49	J-45	J-79	168.8	11.2	.005	.0	0	.0
P-50	J-46	J-43	171.3	15.8	.005	.0	0	.0
P-51	J-47	J-171	93.8	11.2	.005	.0	0	.0
P-52	J-47	J-158	67.7	11.2	.005	.0	0	.0
P-53	J-49	CS-4	145.2	11.2	.005	.0	0	.0
P-54	J-48	HP-7	728.7	11.2	.005	.0	0	.0
P-55	J-48	J1	211.9	11.2	.005	.0	0	.0
P-56	J-50	J-219	101.2	11.2	.005	.0	0	.0

P-57	J-51	J-62	210.2	15.8	.005	.0	0	.0
P-58	J-51	C6R	135.3	7.6	.005	.0	0	.0
P-59	J-53	J-54	131.2	7.6	.005	.0	0	.0
P-60	J-53	C5R	201.3	5.8	.005	.0	0	.0
P-61	J-54	J-57	163.3	7.6	.005	.0	0	.0
P-62	J-54	C8	71.6	5.8	.005	.0	0	.0
P-63	J-57	J-59	45.0	5.8	.005	.0	0	.0
P-64	J-57	C4R	188.9	3.9	.005	.0	0	.0
P-65	J-59	C9	125.7	5.8	.005	.0	0	.0
P-66	J-59	D5R	342.4	3.9	.005	.0	0	.0
P-67	C9	D6	227.0	3.9	.005	.0	0	.0
P-68	J-62	J-68	210.1	15.8	.005	.0	0	.0
P-69	J-62	F12	48.1	7.6	.005	.0	0	.0
P-70	J-63	F16	288.7	3.9	.005	.0	0	.0
P-71	J-63	F13	179.0	3.9	.005	.0	0	.0
P-72	J-66	J-63	70.2	5.8	.005	.0	0	.0
P-73	J-66	C7R	202.1	3.9	.005	.0	0	.0
P-74	J-68	J-70	357.8	15.8	.005	.0	0	.0
P-75	J-68	F10	55.0	3.9	.005	.0	0	.0
P-76	J-70	HP-1	75.7	15.8	.005	.0	0	.0
P-77	J-70	F11	49.2	3.9	.005	.0	0	.0
P-78	J-72	CS-1	108.6	15.8	.005	.0	0	.0
P-79	J-72	F9	120.3	3.9	.005	.0	0	.0
P-80	J-74	J-45	127.9	15.8	.005	.0	0	.0
P-81	J-74	F14	116.6	3.9	.005	.0	0	.0
P-82	J-76a	HP-2	112.5	15.8	.005	.0	0	.0
P-83	J-76a	D1R	185.5	3.9	.005	.0	0	.0
P-84	J-76	CS-2	102.7	15.8	.005	.0	0	.0
P-85	J-76	D2R	72.4	5.8	.005	.0	0	.0
P-86	D2R	D3R	268.0	3.9	.005	.0	0	.0
P-87	J-77	J-76	261.7	15.8	.005	.0	0	.0
P-88	J-77	D7R	54.2	3.9	.005	.0	0	.0
P-89	J-79	J-81	114.1	11.2	.005	.0	0	.0
P-90	J-79	F15	334.7	3.9	.005	.0	0	.0
P-91	J-81	J-89	151.1	11.2	.005	.0	0	.0
P-92	J-81	F8R	52.3	3.9	.005	.0	0	.0
P-93	J-83	J-91	205.4	11.2	.005	.0	0	.0
P-94	J-83	F17	106.4	3.9	.005	.0	0	.0
P-95	J-85	J-98	65.5	11.2	.005	.0	0	.0
P-96	J-85	D4R	102.0	3.9	.005	.0	0	.0
P-97	J-87	J-103	241.8	15.8	.005	.0	0	.0
P-98	J-87	F7R	78.1	3.9	.005	.0	0	.0
P-99	J-89	J-83	84.8	11.2	.005	.0	0	.0
P-100	J-89	F18	204.5	3.9	.005	.0	0	.0
P-101	J-91	J-93	238.6	11.2	.005	.0	0	.0
P-102	J-91	D9R	143.8	3.9	.005	.0	0	.0
P-103	J-93	J-96	274.3	11.2	.005	.0	0	.0
P-104	J-93	D10	91.9	5.8	.005	.0	0	.0
P-105	D10	E2R	238.6	3.9	.005	.0	0	.0
P-106	J-96	HP-5	45.7	11.2	.005	.0	0	.0
P-107	J-96	D11	33.9	3.9	.005	.0	0	.0
P-108	J-98	J-46	127.8	11.2	.005	.0	0	.0
P-109	J-98	D12	252.0	5.8	.005	.0	0	.0
P-110	D12	G4	297.1	3.9	.005	.0	0	.0
P-111	J-101	J-46	103.1	15.8	.005	.0	0	.0

P-112	J-101	D8R	37.4	3.9	.005	.0	0	.0
P-113	J-103	J-105	57.4	15.8	.005	.0	0	.0
P-114	J-103	F6	18.3	3.9	.005	.0	0	.0
P-115	J-105	J-119	240.3	15.8	.005	.0	0	.0
P-116	J-105	J-106	137.6	7.6	.005	.0	0	.0
P-117	J-106	J-109	38.9	7.6	.005	.0	0	.0
P-118	J-106	F5	228.6	3.9	.005	.0	0	.0
P-119	J-109	J-111	291.9	7.6	.005	.0	0	.0
P-120	J-109	F4R	88.9	5.8	.005	.0	0	.0
P-121	J-111	J-115	119.4	7.6	.005	.0	0	.0
P-122	J-111	F19	36.8	3.9	.005	.0	0	.0
P-123	J-113	E3R	295.9	5.8	.005	.0	0	.0
P-124	J-113	E1R	168.9	3.9	.005	.0	0	.0
P-125	J-115	J-113	26.2	5.8	.005	.0	0	.0
P-126	J-115	E4R	170.6	5.8	.005	.0	0	.0
P-127	E4R	E9R	215.9	3.9	.005	.0	0	.0
P-128	E3R	G10	298.7	3.9	.005	.0	0	.0
P-129	J-119	J-123	360.6	15.8	.005	.0	0	.0
P-130	J-119	F3R	74.5	3.9	.005	.0	0	.0
P-131	F4R	F1	263.4	5.8	.005	.0	0	.0
P-132	F1	E5R	211.3	3.9	.005	.0	0	.0
P-133	J-123	J-125	185.1	15.8	.005	.0	0	.0
P-134	J-123	F2	85.0	3.9	.005	.0	0	.0
P-135	J-125	HP-3	61.6	11.2	.005	.0	0	.0
P-136	J-125	E10	141.3	3.9	.005	.0	0	.0
P-137	HP-3	J-129	278.5	11.2	.005	.0	0	.0
P-138	HP-1	J-72	218.9	15.8	.005	.0	0	.0
P-139	J-129	CS-3	72.6	11.2	.005	.0	0	.0
P-140	J-129	E11	103.2	3.9	.005	.0	0	.0
P-141	J-131	J-139	81.1	11.2	.005	.0	0	.0
P-142	J-131	J-137	234.9	7.6	.005	.0	0	.0
P-143	J-133	G9	297.4	3.9	.005	.0	0	.0
P-144	J-133	E6R	210.4	3.9	.005	.0	0	.0
P-145	J-135	J-133	31.8	5.8	.005	.0	0	.0
P-146	J-135	G8	140.3	3.9	.005	.0	0	.0
P-147	J-137	E12	76.3	7.6	.005	.0	0	.0
P-148	J-137	E7R	248.5	3.9	.005	.0	0	.0
P-149	J-139	J-47	285.2	11.2	.005	.0	0	.0
P-150	J-139	E8R	76.8	3.9	.005	.0	0	.0
P-151	J-141	J-101	252.8	15.8	.005	.0	0	.0
P-152	J-141	G1	82.9	7.6	.005	.0	0	.0
P-153	J-142	G5	305.4	3.9	.005	.0	0	.0
P-154	J-142	G6	328.9	3.9	.005	.0	0	.0
P-155	G1	G2	258.4	5.8	.005	.0	0	.0
P-156	G2	J-142	30.0	3.9	.005	.0	0	.0
P-157	J-147	J-141	261.8	15.8	.005	.0	0	.0
P-158	J-147	G3	138.5	3.9	.005	.0	0	.0
P-159	J-149	HP-4	210.0	11.2	.005	.0	0	.0
P-160	J-149	H1	33.1	3.9	.005	.0	0	.0
P-161	H1	H2	230.5	3.9	.005	.0	0	.0
P-162	J-152	J-49	90.1	11.2	.005	.0	0	.0
P-163	J-152	I14	83.9	3.9	.005	.0	0	.0
P-164	J-154	J-169	20.9	11.2	.005	.0	0	.0
P-165	J-154	H7	229.1	3.9	.005	.0	0	.0
P-166	J-156	J-167	16.2	11.2	.005	.0	0	.0

P-167	J-156	H6	23.1	3.9	.005	.0	0	.0
P-168	J-158	J-164	210.0	11.2	.005	.0	0	.0
P-169	J-158	G7	112.3	3.9	.005	.0	0	.0
P-170	J-160	J-156	386.0	11.2	.005	.0	0	.0
P-171	J-160	H4	85.9	5.8	.005	.0	0	.0
P-172	G11	G12	272.3	3.9	.005	.0	0	.0
P-173	H4	G11	258.5	5.8	.005	.0	0	.0
P-174	J-164	J-160	21.7	7.6	.005	.0	0	.0
P-175	J-164	H5	206.1	5.8	.005	.0	0	.0
P-176	H5	I4	246.2	3.9	.005	.0	0	.0
P-177	J-167	HP-6	275.8	11.2	.005	.0	0	.0
P-178	J-167	I5	260.9	3.9	.005	.0	0	.0
P-179	J-169	J-152	177.8	11.2	.005	.0	0	.0
P-180	J-169	I15	203.5	3.9	.005	.0	0	.0
P-181	J-171	J-173	194.4	11.2	.005	.0	0	.0
P-182	J-171	H3	116.4	3.9	.005	.0	0	.0
P-183	J-173	J-174	400.5	11.2	.005	.0	0	.0
P-184	J-173	I1	170.4	5.8	.005	.0	0	.0
P-185	J-174	J-177	336.3	11.2	.005	.0	0	.0
P-186	J-174	I2	24.0	3.9	.005	.0	0	.0
P-187	J-177	J-179	280.3	11.2	.005	.0	0	.0
P-188	J-177	I6	49.1	3.9	.005	.0	0	.0
P-189	J-179	J-183	251.0	11.2	.005	.0	0	.0
P-190	J-179	I7	22.3	5.8	.005	.0	0	.0
P-191	I7	I8	186.1	3.9	.005	.0	0	.0
P-192	I1	I3	238.8	3.9	.005	.0	0	.0
P-193	J-183	J-186	260.2	11.2	.005	.0	0	.0
P-194	J-183	I9	66.6	5.8	.005	.0	0	.0
P-195	I9	I10	212.8	3.9	.005	.0	0	.0
P-196	J-186	HP-7	303.6	11.2	.005	.0	0	.0
P-197	J-186	I11	87.2	3.9	.005	.0	0	.0
P-198	J-188	J-190	274.3	11.2	.005	.0	0	.0
P-199	J-188	I12	57.9	3.9	.005	.0	0	.0
P-200	J-190	J-49	144.2	11.2	.005	.0	0	.0
P-201	J-190	I13	105.8	3.9	.005	.0	0	.0
P-202	J1	J20	250.9	11.2	.005	.0	0	.0
P-203	J20	J-221	426.7	11.2	.005	.0	0	.0
P-204	J17	J-50	270.3	11.2	.005	.0	0	.0
P-205	J-195	J-48	206.5	11.2	.005	.0	0	.0
P-206	J-195	J3	130.0	3.9	.005	.0	0	.0
P-207	J-197	J-195	174.1	11.2	.005	.0	0	.0
P-208	J-197	J2	36.4	3.9	.005	.0	0	.0
P-209	J-199	CS-6	141.4	11.2	.005	.0	0	.0
P-210	J-199	J4	31.9	5.8	.005	.0	0	.0
P-211	J4	J5	230.6	3.9	.005	.0	0	.0
P-212	J-202	HP-8	78.9	11.2	.005	.0	0	.0
P-213	J-202	J6	24.7	3.9	.005	.0	0	.0
P-214	J-204	J-202	282.8	11.2	.005	.0	0	.0
P-215	J-204	J8	21.4	3.9	.005	.0	0	.0
P-216	J-206	J-204	284.2	11.2	.005	.0	0	.0
P-217	J-206	J9	19.7	3.9	.005	.0	0	.0
P-218	J-208	J-206	402.9	11.2	.005	.0	0	.0
P-219	J-208	J10	25.1	3.9	.005	.0	0	.0
P-220	J-210	J-208	328.7	11.2	.005	.0	0	.0
P-221	J-210	J11	24.0	5.8	.005	.0	0	.0

P-222	J11	J12	192.4	3.9	.005	.0	0	.0
P-223	J-213	CS-7	20.0	11.2	.005	.0	0	.0
P-224	J-213	J13	58.7	5.8	.005	.0	0	.0
P-225	J13	J14	213.4	3.9	.005	.0	0	.0
P-226	J-216	J-213	246.8	11.2	.005	.0	0	.0
P-227	J-216	J15	69.1	5.8	.005	.0	0	.0
P-228	J15	J7	245.6	3.9	.005	.0	0	.0
P-229	J-219	J-216	232.9	11.2	.005	.0	0	.0
P-230	J-219	J16	110.2	3.9	.005	.0	0	.0
P-231	J-221	J-223	46.4	11.2	.005	.0	0	.0
P-232	J-221	J19	140.2	3.9	.005	.0	0	.0
P-233	J-223	J17	91.1	11.2	.005	.0	0	.0
P-234	J-223	J18	212.6	3.9	.005	.0	0	.0
P-235	J-225	J-50	98.0	11.2	.005	.0	0	.0
P-236	J-225	K1	39.7	5.8	.005	.0	0	.0
P-237	J-226	J-225	283.3	11.2	.005	.0	0	.0
P-238	J-226	K2	49.6	3.9	.005	.0	0	.0
P-239	F12	J-66	92.0	5.8	.005	.0	0	.0
P-240	C6R	J-53	107.1	7.6	.005	.0	0	.0
P-241	C5R	C3R	270.4	3.9	.005	.0	0	.0
P-242	C8	C10	244.8	5.8	.005	.0	0	.0
P-243	C10	C11	234.3	3.9	.005	.0	0	.0
P-244	CS-2	J-76a	111.8	15.8	.005	.0	0	.0
P-245	HP-2	J-38	478.4	15.8	.005	.0	0	.0
P-246	CS-1	J-74	142.8	15.8	.005	.0	0	.0
P-247	HP-5	J-85	307.1	11.2	.005	.0	0	.0
P-248	E12	J-135	84.3	5.8	.005	.0	0	.0
P-249	CS-3	J-131	88.9	11.2	.005	.0	0	.0
P-250	HP-4	J-147	54.7	15.8	.005	.0	0	.0
P-251	CS-4	J-149	139.7	11.2	.005	.0	0	.0
P-252	HP-6	J-154	247.2	11.2	.005	.0	0	.0
P-253	CS-6	J-197	190.4	11.2	.005	.0	0	.0
P-254	HP-8	J-199	188.3	11.2	.005	.0	0	.0
P-255	CS-7	J-210	238.2	11.2	.005	.0	0	.0
P-256	K1	K3	238.9	3.9	.005	.0	0	.0

JUNCTION NAME	NODE TITLE	ELEV	DEMAND (USFU)	FPN PRESSURE
A1		.00	-15.67	
A2		.00	-15.67	
A3		.00	-18.33	
A4		.00	-9.03	
A5		.00	-9.30	
B1		.00	-5.84	
B10		.00	-11.69	
B11		.00	-6.11	
B12		.00	-6.11	
B2		.00	-5.84	
B3		.00	-7.70	
B4		.00	-6.37	
B5		.00	-7.70	
B6		.00	-6.11	
B7		.00	-6.64	

B8	.00	-9.03
B9	.00	-8.23
C10	.00	-31.61
C11	.00	-37.19
C1R	.00	-14.87
C2R	.00	-28.69
C3R	.00	-29.75
C4R	.00	-31.08
C5R	.00	-24.97
C6R	.00	-14.61
C7R	.00	-18.59
C8	.00	-27.36
C9	.00	-32.94
D10	.00	-37.19
D11	.00	-36.65
D12	.00	-29.22
D1R	.00	-28.69
D2R	.00	-9.03
D3R	.00	-28.69
D4R	.00	-26.56
D5R	.00	-35.06
D6	.00	-35.06
D7R	.00	-7.97
D8R	.00	-10.89
D9R	.00	-37.19
E10	.00	-30.55
E11	.00	-19.39
E12	.00	-29.22
E1R	.00	-37.19
E2R	.00	-37.19
E3R	.00	-37.19
E4R	.00	-37.19
E5R	.00	-37.19
E6R	.00	-37.19
E7R	.00	-37.19
E8R	.00	-17.00
E9R	.00	-37.19
F1	.00	-37.19
F10	.00	-13.02
F11	.00	-9.56
F12	.00	-11.95
F13	.00	-27.09
F14	.00	-12.48
F15	.00	-31.08
F16	.00	-31.34
F17	.00	-37.19
F18	.00	-37.19
F19	.00	-37.19
F2	.00	-19.12
F3R	.00	-18.06
F4R	.00	-27.36
F5	.00	-30.55
F6	.00	-22.84
F7R	.00	-12.22
F8R	.00	-29.75

F9	.00	-11.95
G1	.00	-17.00
G10	.00	-37.19
G11	.00	-37.19
G12	.00	-37.19
G2	.00	-32.94
G3	.00	-24.70
G4	.00	-37.19
G5	.00	-37.19
G6	.00	-37.19
G7	.00	-15.94
G8	.00	-31.08
G9	.00	-37.19
H1	.00	-15.41
H2	.00	-30.55
H3	.00	-16.20
H4	.00	-27.62
H5	.00	-28.95
H6	.00	-37.19
H7	.00	-37.19
I1	.00	-17.27
I10	.00	-35.59
I11	.00	-24.17
I12	.00	-22.31
I13	.00	-22.84
I14	.00	-22.58
I15	.00	-37.19
I2	.00	-17.53
I3	.00	-34.00
I4	.00	-37.19
I5	.00	-37.19
I6	.00	-23.64
I7	.00	-12.22
I8	.00	-33.73
I9	.00	-16.73
J1	.00	-11.95
J10	.00	-36.65
J11	.00	-27.09
J12	.00	-37.19
J13	.00	-20.19
J14	.00	-37.19
J15	.00	-16.47
J16	.00	-19.66
J17	.00	-19.66
J18	.00	-16.20
J19	.00	-24.44
J2	.00	-14.34
J20	.00	-11.42
J3	.00	-17.53
J4	.00	-22.84
J5	.00	-30.55
J6	.00	-34.00
J7	.00	-35.59
J8	.00	-26.56
J9	.00	-22.84

K1	.00	-12.48
K2	.00	-10.36
K3	.00	-19.12
CS-1	.00	.00
CS-2	.00	.00
CS-3	.00	.00
CS-4	.00	.00
CS-6	.00	.00
CS-7	.00	.00
HP-1	.00	.00
HP-2	.00	.00
HP-3	.00	.00
HP-4	.00	.00
HP-5	.00	.00
HP-6	.00	.00
HP-7	.00	.00
HP-8	.00	.00
J-2	.00	.00
J-3	.00	.00
J-5	.00	.00
J-8	.00	.00
J-10	.00	.00
J-12	.00	.00
J-14	.00	.00
J-16	.00	.00
J-18	.00	.00
J-20	.00	.00
J-22	.00	.00
J-24	.00	.00
J-25	.00	.00
J-26	.00	.00
J-27	.00	.00
J-28	.00	.00
J-30	.00	.00
J-32	.00	.00
J-34	.00	.00
J-36	.00	.00
J-38	.00	.00
J-40	.00	.00
J-42	.00	.00
J-43	.00	.00
J-45	.00	.00
J-46	.00	.00
J-47	.00	.00
J-48	.00	.00
J-49	.00	.00
J-50	.00	.00
J-51	.00	.00
J-53	.00	.00
J-54	.00	.00
J-57	.00	.00
J-59	.00	.00
J-62	.00	.00
J-63	.00	.00
J-66	.00	.00

J-68	.00	.00
J-70	.00	.00
J-72	.00	.00
J-74	.00	.00
J-76	.00	.00
J-77	.00	.00
J-79	.00	.00
J-81	.00	.00
J-83	.00	.00
J-85	.00	.00
J-87	.00	.00
J-89	.00	.00
J-91	.00	.00
J-93	.00	.00
J-96	.00	.00
J-98	.00	.00
J-101	.00	.00
J-103	.00	.00
J-105	.00	.00
J-106	.00	.00
J-109	.00	.00
J-111	.00	.00
J-113	.00	.00
J-115	.00	.00
J-119	.00	.00
J-123	.00	.00
J-125	.00	.00
J-129	.00	.00
J-131	.00	.00
J-133	.00	.00
J-135	.00	.00
J-137	.00	.00
J-139	.00	.00
J-141	.00	.00
J-142	.00	.00
J-147	.00	.00
J-149	.00	.00
J-152	.00	.00
J-154	.00	.00
J-156	.00	.00
J-158	.00	.00
J-160	.00	.00
J-164	.00	.00
J-167	.00	.00
J-169	.00	.00
J-171	.00	.00
J-173	.00	.00
J-174	.00	.00
J-177	.00	.00
J-179	.00	.00
J-183	.00	.00
J-186	.00	.00
J-188	.00	.00
J-190	.00	.00
J-195	.00	.00

J-197	.00	.00	
J-199	.00	.00	
J-202	.00	.00	
J-204	.00	.00	
J-206	.00	.00	
J-208	.00	.00	
J-210	.00	.00	
J-213	.00	.00	
J-216	.00	.00	
J-219	.00	.00	
J-221	.00	.00	
J-223	.00	.00	
J-225	.00	.00	
J-226	.00	.00	
J-76a	.00	.00	
R-1	.00	.00	-40.00

==

Set = 0

==================== RESULTS FOR THIS SIMULATION FOLLOW =================

Solution was obtained in 14 trials
Flow Accuracy = .6343E-04[< .500E-02]
RV Accuracy = .0000E+00[< .100E-02]

PIPE NO.	NODE #1	NODE #2	FLOW (USFU)	LOSS (USPU)	VELOCITY (FT/S)	DENSITY (#/CF)	FRICTION FACTOR	AREA RATIO
P-1	R-1	J-28	-3113.640	.07	26.58	.064	.0140	.041
P-2	J-2	B7	-6.640	.00	.74	.064	.0461	.001
P-3	J-2	J-10	-15.902	.01	3.85	.064	.0314	.006
P-4	J-3	J-8	-17.530	.00	1.96	.064	.0341	.003
P-5	J-3	J-5	10.658	.01	1.19	.064	.0396	.002
P-6	J-5	J-27	28.988	.04	3.24	.064	.0297	.005
P-7	J-5	A3	-18.330	.01	4.44	.064	.0302	.007
P-8	J-8	B9	-8.230	.00	.92	.064	.0430	.001
P-9	J-8	A5	-9.300	.00	2.25	.064	.0367	.003
P-10	J-10	J-3	-6.872	.00	.77	.064	.0456	.001
P-11	J-10	B8	-9.030	.00	2.19	.064	.0370	.003
P-12	J-12	J-2	-22.542	.02	2.52	.064	.0318	.004
P-13	J-12	B6	-6.110	.01	1.48	.064	.0418	.002
P-14	J-14	J-12	-28.652	.03	3.20	.064	.0298	.005
P-15	J-14	A4	-9.030	.00	2.19	.064	.0370	.003
P-16	J-16	J-14	-37.682	.06	4.21	.064	.0277	.006
P-17	J-16	B5	-7.700	.00	1.87	.064	.0389	.003
P-18	J-18	J-16	-45.382	.07	5.08	.064	.0264	.008

P-19	J-18	B4	-6.370	.00	1.54	.064	.0412	.002
P-20	J-20	J-18	-51.752	.08	5.79	.064	.0255	.009
P-21	J-20	B3	-7.700	.01	1.87	.064	.0389	.003
P-22	J-22	J-20	-59.452	.12	6.65	.064	.0247	.010
P-23	J-22	B2	-5.840	.00	1.42	.064	.0424	.002
P-24	J-24	J-25	-125.620	.00	1.07	.064	.0283	.002
P-25	J-24	J-34	-29.750	.01	1.97	.064	.0316	.003
P-26	J-25	J-22	-65.292	.23	7.31	.064	.0241	.011
P-27	J-25	J-36	-60.328	.46	6.75	.064	.0246	.010
P-28	J-28	J-24	-155.370	.00	1.33	.064	.0268	.002
P-29	J-28	J-42	-2958.270	1.24	25.21	.064	.0141	.038
P-30	J-26	B12	-6.110	.00	1.48	.064	.0418	.002
P-31	J-26	B10	-11.690	.02	2.84	.064	.0343	.004
P-32	J-32	J-26	-17.800	.01	1.99	.064	.0340	.003
P-33	J-32	B11	-6.110	.00	1.48	.064	.0418	.002
P-34	J-34	J-32	-23.910	.02	2.68	.064	.0313	.004
P-35	J-34	B1	-5.840	.00	1.42	.064	.0424	.002
P-36	J-36	A1	-15.670	.02	3.80	.064	.0316	.006
P-37	J-27	J-36	44.658	.10	4.99	.064	.0265	.008
P-38	J-27	A2	-15.670	.01	3.80	.064	.0316	.006
P-39	J-30	J-40	-1337.240	.21	20.21	.064	.0156	.031
P-40	J-30	C1R	-14.870	.01	3.60	.064	.0320	.005
P-41	J-40	J-38	-1308.550	.10	19.77	.064	.0156	.030
P-42	J-40	C2R	-28.690	.09	6.93	.064	.0269	.011
P-43	J-42	J-30	-1352.110	.11	20.44	.064	.0155	.031
P-44	J-42	J-51	-1606.160	.18	24.28	.064	.0150	.037
P-45	J-43	J-77	1234.170	.02	18.59	.064	.0158	.028
P-46	J-43	J-226	-453.568	.36	13.61	.064	.0181	.021
P-47	HP-7	J-188	183.904	.00	5.51	.064	.0220	.008
P-48	J-45	J-87	-908.142	.05	13.68	.064	.0168	.021
P-49	J-45	J-79	-262.408	.04	7.88	.064	.0203	.012
P-50	J-46	J-43	780.602	.06	11.76	.064	.0173	.018
P-51	J-47	J-171	-117.928	.01	3.53	.064	.0245	.005
P-52	J-47	J-158	-123.734	.00	3.71	.064	.0242	.006
P-53	J-49	CS-4	460.740	.10	13.81	.064	.0180	.021
P-54	J-48	HP-7	70.752	.02	2.12	.064	.0278	.003
P-55	J-48	J1	74.974	.01	2.25	.064	.0274	.003
P-56	J-50	J-219	-252.964	.02	7.58	.064	.0205	.012
P-57	J-51	J-62	-1306.530	.19	19.74	.064	.0156	.030
P-58	J-51	C6R	-299.630	.29	19.71	.064	.0182	.030
P-59	J-53	J-54	-230.300	.18	15.13	.064	.0192	.023
P-60	J-53	C5R	-54.720	.07	6.10	.064	.0252	.009
P-61	J-54	J-57	-134.140	.08	8.81	.064	.0217	.013
P-62	J-54	C8	-96.160	.07	10.71	.064	.0220	.016
P-63	J-57	J-59	-103.060	.05	11.47	.064	.0217	.017
P-64	J-57	C4R	-31.080	.16	7.50	.064	.0263	.011
P-65	J-59	C9	-68.000	.07	7.57	.064	.0239	.012
P-66	J-59	D5R	-35.060	.37	8.46	.064	.0256	.013
P-67	C9	D6	-35.060	.24	8.46	.064	.0256	.013
P-68	J-62	J-68	-1217.560	.16	18.39	.064	.0159	.028
P-69	J-62	F12	-88.970	.01	5.85	.064	.0238	.009
P-70	J-63	F16	-31.340	.25	7.57	.064	.0263	.012
P-71	J-63	F13	-27.090	.12	6.54	.064	.0273	.010
P-72	J-66	J-63	-58.430	.03	6.51	.064	.0248	.010
P-73	J-66	C7R	-18.590	.07	4.49	.064	.0301	.007

P-74	J-68	J-70	-1204.540	.27	18.18	.064	.0159	.028
P-75	J-68	F10	-13.020	.01	3.15	.064	.0333	.005
P-76	J-70	HP-1	-1194.980	.06	18.03	.064	.0159	.027
P-77	J-70	F11	-9.560	.01	2.31	.064	.0364	.004
P-78	J-72	CS-1	-1183.030	.08	17.84	.064	.0159	.027
P-79	J-72	F9	-11.950	.02	2.88	.064	.0341	.004
P-80	J-74	J-45	-1170.550	.09	17.64	.064	.0160	.027
P-81	J-74	F14	-12.480	.02	3.01	.064	.0337	.005
P-82	J-76a	HP-2	1308.550	.10	19.74	.064	.0156	.030
P-83	J-76a	D1R	-28.690	.14	6.92	.064	.0269	.011
P-84	J-76	CS-2	1279.860	.09	19.30	.064	.0157	.029
P-85	J-76	D2R	-37.720	.01	4.20	.064	.0277	.006
P-86	D2R	D3R	-28.690	.20	6.92	.064	.0269	.011
P-87	J-77	J-76	1242.140	.21	18.72	.064	.0158	.029
P-88	J-77	D7R	-7.970	.00	1.92	.064	.0384	.003
P-89	J-79	J-81	-231.328	.02	6.94	.064	.0209	.011
P-90	J-79	F15	-31.080	.29	7.49	.064	.0263	.011
P-91	J-81	J-89	-201.578	.02	6.05	.064	.0216	.009
P-92	J-81	F8R	-29.750	.04	7.17	.064	.0266	.011
P-93	J-83	J-91	-127.198	.01	3.82	.064	.0240	.006
P-94	J-83	F17	-37.190	.13	8.96	.064	.0252	.014
P-95	J-85	J-98	47.582	.00	1.43	.064	.0310	.002
P-96	J-85	D4R	-26.560	.07	6.40	.064	.0274	.010
P-97	J-87	J-103	-895.922	.11	13.49	.064	.0169	.021
P-98	J-87	F7R	-12.220	.01	2.95	.064	.0339	.004
P-99	J-89	J-83	-164.388	.01	4.93	.064	.0226	.008
P-100	J-89	F18	-37.190	.24	8.96	.064	.0252	.014
P-101	J-91	J-93	-90.008	.01	2.70	.064	.0262	.004
P-102	J-91	D9R	-37.190	.17	8.96	.064	.0252	.014
P-103	J-93	J-96	-15.628	.00	.47	.064	.0432	.001
P-104	J-93	D10	-74.380	.06	8.27	.064	.0234	.013
P-105	D10	E2R	-37.190	.28	8.96	.064	.0252	.014
P-106	J-96	HP-5	21.022	.00	.63	.064	.0393	.001
P-107	J-96	D11	-36.650	.04	8.83	.064	.0253	.013
P-108	J-98	J-46	113.992	.01	3.42	.064	.0247	.005
P-109	J-98	D12	-66.410	.13	7.38	.064	.0240	.011
P-110	D12	G4	-37.190	.35	8.96	.064	.0252	.014
P-111	J-101	J-46	666.611	.03	10.04	.064	.0179	.015
P-112	J-101	D8R	-10.890	.01	2.62	.064	.0350	.004
P-113	J-103	J-105	-873.082	.02	13.15	.064	.0169	.020
P-114	J-103	F6	-22.840	.01	5.50	.064	.0285	.008
P-115	J-105	J-119	-517.652	.04	7.79	.064	.0189	.012
P-116	J-105	J-106	-355.430	.40	23.30	.064	.0175	.036
P-117	J-106	J-109	-324.880	.10	21.28	.064	.0179	.032
P-118	J-106	F5	-30.550	.19	7.35	.064	.0265	.011
P-119	J-109	J-111	-223.140	.37	14.61	.065	.0193	.022
P-120	J-109	F4R	-101.740	.10	11.29	.064	.0217	.017
P-121	J-111	J-115	-185.950	.11	12.16	.065	.0201	.019
P-122	J-111	F19	-37.190	.04	8.94	.065	.0252	.014
P-123	J-113	E3R	-74.380	.19	8.24	.065	.0234	.013
P-124	J-113	E1R	-37.190	.20	8.93	.065	.0252	.014
P-125	J-115	J-113	-111.570	.03	12.37	.065	.0213	.019
P-126	J-115	E4R	-74.380	.11	8.25	.065	.0234	.013
P-127	E4R	E9R	-37.190	.25	8.93	.065	.0252	.014
P-128	E3R	G10	-37.190	.35	8.93	.065	.0252	.014

P-129	J-119	J-123	-499.592	.06	7.52	.064	.0190	.011
P-130	J-119	F3R	-18.060	.03	4.35	.064	.0304	.007
P-131	F4R	F1	-74.380	.17	8.25	.065	.0234	.013
P-132	F1	E5R	-37.190	.25	8.94	.065	.0252	.014
P-133	J-123	J-125	-480.472	.03	7.23	.064	.0192	.011
P-134	J-123	F2	-19.120	.03	4.61	.064	.0299	.007
P-135	J-125	HP-3	-449.922	.04	13.50	.064	.0181	.021
P-136	J-125	E10	-30.550	.12	7.36	.064	.0265	.011
P-137	HP-3	J-129	-449.922	.19	13.49	.064	.0181	.021
P-138	HP-1	J-72	-1194.980	.17	18.02	.064	.0159	.027
P-139	J-129	CS-3	-430.532	.05	12.91	.064	.0183	.020
P-140	J-129	E11	-19.390	.04	4.67	.064	.0298	.007
P-141	J-131	J-139	-258.662	.02	7.75	.064	.0204	.012
P-142	J-131	J-137	-171.870	.19	11.25	.064	.0205	.017
P-143	J-133	G9	-37.190	.35	8.94	.065	.0252	.014
P-144	J-133	E6R	-37.190	.25	8.94	.065	.0252	.014
P-145	J-135	J-133	-74.380	.02	8.25	.065	.0234	.013
P-146	J-135	G8	-31.080	.12	7.47	.065	.0263	.011
P-147	J-137	E12	-134.680	.04	8.82	.065	.0216	.013
P-148	J-137	E7R	-37.190	.29	8.94	.065	.0252	.014
P-149	J-139	J-47	-241.662	.06	7.24	.064	.0207	.011
P-150	J-139	E8R	-17.000	.02	4.09	.064	.0309	.006
P-151	J-141	J-101	655.721	.06	9.87	.064	.0180	.015
P-152	J-141	G1	-124.320	.04	8.15	.064	.0220	.012
P-153	J-142	G5	-37.190	.36	8.95	.065	.0252	.014
P-154	J-142	G6	-37.190	.39	8.94	.065	.0252	.014
P-155	G1	G2	-107.320	.31	11.92	.064	.0215	.018
P-156	G2	J-142	-74.380	.12	17.90	.064	.0214	.027
P-157	J-147	J-141	531.401	.05	8.00	.064	.0188	.012
P-158	J-147	G3	-24.700	.08	5.95	.064	.0279	.009
P-159	J-149	HP-4	506.701	.18	15.20	.064	.0177	.023
P-160	J-149	H1	-45.960	.06	11.07	.064	.0239	.017
P-161	H1	H2	-30.550	.19	7.35	.064	.0265	.011
P-162	J-152	J-49	231.686	.02	6.94	.064	.0209	.011
P-163	J-152	I14	-22.580	.04	5.43	.064	.0286	.008
P-164	J-154	J-169	171.916	.00	5.15	.064	.0224	.008
P-165	J-154	H7	-37.190	.27	8.95	.065	.0252	.014
P-166	J-156	J-167	97.536	.00	2.92	.064	.0257	.004
P-167	J-156	H6	-37.190	.03	8.95	.064	.0252	.014
P-168	J-158	J-164	-107.794	.01	3.23	.064	.0250	.005
P-169	J-158	G7	-15.940	.03	3.84	.064	.0314	.006
P-170	J-160	J-156	60.346	.01	1.81	.064	.0290	.003
P-171	J-160	H4	-102.000	.10	11.32	.065	.0217	.017
P-172	G11	G12	-37.190	.32	8.94	.065	.0252	.014
P-173	H4	G11	-74.380	.16	8.25	.065	.0234	.013
P-174	J-164	J-160	-41.654	.00	2.73	.064	.0289	.004
P-175	J-164	H5	-66.140	.11	7.34	.065	.0240	.011
P-176	H5	I4	-37.190	.29	8.94	.065	.0252	.014
P-177	J-167	HP-6	134.726	.02	4.04	.064	.0237	.006
P-178	J-167	I5	-37.190	.31	8.94	.065	.0252	.014
P-179	J-169	J-152	209.106	.03	6.27	.064	.0214	.010
P-180	J-169	I15	-37.190	.24	8.95	.065	.0252	.014
P-181	J-171	J-173	-101.728	.01	3.05	.064	.0254	.005
P-182	J-171	H3	-16.200	.03	3.90	.064	.0313	.006
P-183	J-173	J-174	-50.458	.01	1.51	.064	.0305	.002

P-184	J-173	I1	-51.270	.06	5.69	.065	.0256	.009
P-185	J-174	J-177	-32.928	.00	.99	.064	.0344	.002
P-186	J-174	I2	-17.530	.01	4.22	.064	.0306	.006
P-187	J-177	J-179	-9.288	.00	.28	.064	.0074	.000
P-188	J-177	I6	-23.640	.03	5.69	.064	.0283	.009
P-189	J-179	J-183	36.662	.00	1.10	.064	.0333	.002
P-190	J-179	I7	-45.950	.01	5.10	.064	.0263	.008
P-191	I7	I8	-33.730	.19	8.11	.065	.0258	.012
P-192	I1	I3	-34.000	.24	8.18	.065	.0258	.012
P-193	J-183	J-186	88.982	.01	2.67	.064	.0263	.004
P-194	J-183	I9	-52.320	.02	5.81	.064	.0255	.009
P-195	I9	I10	-35.590	.23	8.56	.065	.0255	.013
P-196	J-186	HP-7	113.152	.02	3.39	.064	.0247	.005
P-197	J-186	I11	-24.170	.05	5.81	.064	.0281	.009
P-198	J-188	J-190	206.214	.05	6.18	.064	.0215	.009
P-199	J-188	I12	-22.310	.03	5.37	.064	.0287	.008
P-200	J-190	J-49	229.054	.03	6.87	.064	.0210	.010
P-201	J-190	I13	-22.840	.05	5.50	.064	.0285	.008
P-202	J1	J20	86.924	.01	2.60	.064	.0264	.004
P-203	J20	J-221	98.344	.02	2.95	.064	.0256	.004
P-204	J17	J-50	158.644	.03	4.75	.064	.0228	.007
P-205	J-195	J-48	145.726	.02	4.37	.064	.0233	.007
P-206	J-195	J3	-17.530	.04	4.22	.065	.0306	.006
P-207	J-197	J-195	128.196	.01	3.84	.065	.0240	.006
P-208	J-197	J2	-14.340	.01	3.45	.065	.0324	.005
P-209	J-199	CS-6	113.856	.01	3.41	.065	.0247	.005
P-210	J-199	J4	-53.390	.01	5.93	.065	.0253	.009
P-211	J4	J5	-30.550	.19	7.35	.065	.0265	.011
P-212	J-202	HP-8	60.466	.00	1.81	.065	.0290	.003
P-213	J-202	J6	-34.000	.02	8.18	.065	.0258	.012
P-214	J-204	J-202	26.466	.00	.79	.065	.0366	.001
P-215	J-204	J8	-26.560	.01	6.39	.065	.0274	.010
P-216	J-206	J-204	-.094	.00	.00	.065	.0059	.000
P-217	J-206	J9	-22.840	.01	5.49	.065	.0285	.008
P-218	J-208	J-206	-22.934	.00	.69	.065	.0382	.001
P-219	J-208	J10	-36.650	.03	8.82	.065	.0253	.013
P-220	J-210	J-208	-59.584	.01	1.79	.065	.0291	.003
P-221	J-210	J11	-64.280	.01	7.13	.065	.0242	.011
P-222	J11	J12	-37.190	.23	8.94	.065	.0252	.014
P-223	J-213	CS-7	-123.864	.00	3.71	.065	.0242	.006
P-224	J-213	J13	-57.380	.02	6.37	.065	.0249	.010
P-225	J13	J14	-37.190	.25	8.94	.065	.0252	.014
P-226	J-216	J-213	-181.244	.03	5.43	.064	.0221	.008
P-227	J-216	J15	-52.060	.02	5.78	.064	.0255	.009
P-228	J15	J7	-35.590	.27	8.56	.065	.0255	.013
P-229	J-219	J-216	-233.304	.05	6.99	.064	.0209	.011
P-230	J-219	J16	-19.660	.04	4.73	.064	.0297	.007
P-231	J-221	J-223	122.784	.00	3.68	.064	.0242	.006
P-232	J-221	J19	-24.440	.08	5.88	.064	.0280	.009
P-233	J-223	J17	138.984	.01	4.17	.064	.0235	.006
P-234	J-223	J18	-16.200	.06	3.90	.064	.0313	.006
P-235	J-225	J-50	-411.608	.06	12.34	.064	.0184	.019
P-236	J-225	K1	-31.600	.01	3.51	.064	.0290	.005
P-237	J-226	J-225	-443.208	.19	13.29	.064	.0182	.020
P-238	J-226	K2	-10.360	.01	2.49	.064	.0355	.004

P-239	F12	J-66	-77.020	.06	8.59	.064	.0232	.013
P-240	C6R	J-53	-285.020	.21	18.74	.064	.0184	.029
P-241	C5R	C3R	-29.750	.22	7.18	.064	.0266	.011
P-242	C8	C10	-68.800	.14	7.66	.064	.0238	.012
P-243	C10	C11	-37.190	.28	8.97	.064	.0252	.014
P-244	CS-2	J-76a	1279.860	.10	19.30	.064	.0157	.029
P-245	HP-2	J-38	1308.550	.43	19.75	.064	.0156	.030
P-246	CS-1	J-74	-1183.030	.11	17.83	.064	.0159	.027
P-247	HP-5	J-85	21.022	.00	.63	.064	.0393	.001
P-248	E12	J-135	-105.460	.10	11.70	.065	.0216	.018
P-249	CS-3	J-131	-430.532	.06	12.91	.064	.0183	.020
P-250	HP-4	J-147	506.701	.01	7.63	.064	.0190	.012
P-251	CS-4	J-149	460.740	.10	13.82	.064	.0180	.021
P-252	HP-6	J-154	134.726	.02	4.04	.064	.0237	.006
P-253	CS-6	J-197	113.856	.01	3.41	.065	.0247	.005
P-254	HP-8	J-199	60.466	.00	1.81	.065	.0290	.003
P-255	CS-7	J-210	-123.864	.02	3.71	.065	.0242	.006
P-256	K1	K3	-19.120	.09	4.60	.064	.0299	.007
R-1	R-1	R-1	-3113.640	.00	.01	.064	.0338	.000

JUNCTION NAME	NODE TITLE	DEMAND (USFU)	PRESSURE (USPU)	PRESSURE (PSIA)	PRESSURE (PSIG)	DENSITY #/CF
A1		-15.67	-39.45	13.27	-1.42	.064
A2		-15.67	-39.37	13.28	-1.42	.064
A3		-18.33	-39.33	13.28	-1.42	.064
A4		-9.03	-39.38	13.28	-1.42	.064
A5		-9.30	-39.33	13.28	-1.42	.064
B1		-5.84	-39.92	13.26	-1.44	.064
B10		-11.69	-39.86	13.26	-1.44	.064
B11		-6.11	-39.89	13.26	-1.44	.064
B12		-6.11	-39.88	13.26	-1.44	.064
B2		-5.84	-39.70	13.26	-1.43	.064
B3		-7.70	-39.58	13.27	-1.43	.064
B4		-6.37	-39.51	13.27	-1.43	.064
B5		-7.70	-39.44	13.27	-1.42	.064
B6		-6.11	-39.35	13.28	-1.42	.064
B7		-6.64	-39.34	13.28	-1.42	.064
B8		-9.03	-39.33	13.28	-1.42	.064
B9		-8.23	-39.32	13.28	-1.42	.064
C10		-31.61	-37.63	13.34	-1.36	.064
C11		-37.19	-37.35	13.35	-1.35	.064
C1R		-14.87	-38.58	13.30	-1.39	.064
C2R		-28.69	-38.27	13.32	-1.38	.064
C3R		-29.75	-37.72	13.34	-1.36	.064
C4R		-31.08	-37.59	13.34	-1.36	.064
C5R		-24.97	-37.94	13.33	-1.37	.064
C6R		-14.61	-38.22	13.32	-1.38	.064
C7R		-18.59	-38.18	13.32	-1.38	.064
C8		-27.36	-37.76	13.33	-1.36	.064
C9		-32.94	-37.63	13.34	-1.36	.064
D10		-37.19	-37.20	13.35	-1.34	.064

D11	-36.65	-37.22	13.35	-1.34	.064
D12	-29.22	-37.13	13.36	-1.34	.064
D1R	-28.69	-37.61	13.34	-1.36	.064
D2R	-9.03	-37.55	13.34	-1.35	.064
D3R	-28.69	-37.35	13.35	-1.35	.064
D4R	-26.56	-37.19	13.35	-1.34	.064
D5R	-35.06	-37.34	13.35	-1.35	.064
D6	-35.06	-37.39	13.35	-1.35	.064
D7R	-7.97	-37.35	13.35	-1.35	.064
D8R	-10.89	-37.24	13.35	-1.34	.064
D9R	-37.19	-37.10	13.36	-1.34	.064
E10	-30.55	-36.96	13.36	-1.33	.064
E11	-19.39	-36.80	13.37	-1.33	.064
E12	-29.22	-36.52	13.38	-1.32	.065
E1R	-37.19	-35.99	13.40	-1.30	.065
E2R	-37.19	-36.92	13.36	-1.33	.064
E3R	-37.19	-36.01	13.40	-1.30	.065
E4R	-37.19	-36.12	13.39	-1.30	.065
E5R	-37.19	-36.19	13.39	-1.31	.065
E6R	-37.19	-36.15	13.39	-1.30	.065
E7R	-37.19	-36.26	13.39	-1.31	.065
E8R	-17.00	-36.70	13.37	-1.32	.064
E9R	-37.19	-35.86	13.40	-1.29	.065
F1	-37.19	-36.44	13.38	-1.31	.065
F10	-13.02	-38.15	13.32	-1.38	.064
F11	-9.56	-37.88	13.33	-1.37	.064
F12	-11.95	-38.31	13.31	-1.38	.064
F13	-27.09	-38.10	13.32	-1.37	.064
F14	-12.48	-37.46	13.34	-1.35	.064
F15	-31.08	-37.05	13.36	-1.34	.064
F16	-31.34	-37.97	13.33	-1.37	.064
F17	-37.19	-37.16	13.36	-1.34	.064
F18	-37.19	-37.05	13.36	-1.34	.064
F19	-37.19	-36.29	13.39	-1.31	.065
F2	-19.12	-37.07	13.36	-1.34	.064
F3R	-18.06	-37.13	13.36	-1.34	.064
F4R	-27.36	-36.61	13.38	-1.32	.065
F5	-30.55	-36.61	13.38	-1.32	.065
F6	-22.84	-37.22	13.35	-1.34	.064
F7R	-12.22	-37.32	13.35	-1.35	.064
F8R	-29.75	-37.28	13.35	-1.34	.064
F9	-11.95	-37.65	13.34	-1.36	.064
G1	-17.00	-37.14	13.36	-1.34	.064
G10	-37.19	-35.65	13.41	-1.29	.065
G11	-37.19	-36.38	13.38	-1.31	.065
G12	-37.19	-36.06	13.40	-1.30	.065
G2	-32.94	-36.83	13.37	-1.33	.064
G3	-24.70	-37.05	13.36	-1.34	.064
G4	-37.19	-36.78	13.37	-1.33	.064
G5	-37.19	-36.35	13.38	-1.31	.065
G6	-37.19	-36.32	13.39	-1.31	.065
G7	-15.94	-36.62	13.37	-1.32	.065
G8	-31.08	-36.30	13.39	-1.31	.065
G9	-37.19	-36.05	13.40	-1.30	.065
H1	-15.41	-36.89	13.37	-1.33	.064

H2	-30.55	-36.70	13.37	-1.32	.064
H3	-16.20	-36.62	13.37	-1.32	.065
H4	-27.62	-36.55	13.38	-1.32	.065
H5	-28.95	-36.54	13.38	-1.32	.065
H6	-37.19	-36.62	13.37	-1.32	.065
H7	-37.19	-36.42	13.38	-1.31	.065
I1	-17.27	-36.59	13.38	-1.32	.065
I10	-35.59	-36.38	13.38	-1.31	.065
I11	-24.17	-36.60	13.38	-1.32	.065
I12	-22.31	-36.64	13.37	-1.32	.064
I13	-22.84	-36.66	13.37	-1.32	.064
I14	-22.58	-36.68	13.37	-1.32	.064
I15	-37.19	-36.45	13.38	-1.32	.065
I2	-17.53	-36.63	13.37	-1.32	.064
I3	-34.00	-36.35	13.38	-1.31	.065
I4	-37.19	-36.24	13.39	-1.31	.065
I5	-37.19	-36.34	13.38	-1.31	.065
I6	-23.64	-36.61	13.38	-1.32	.065
I7	-12.22	-36.63	13.37	-1.32	.064
I8	-33.73	-36.44	13.38	-1.31	.065
I9	-16.73	-36.61	13.38	-1.32	.065
J1	-11.95	-36.65	13.37	-1.32	.064
J10	-36.65	-36.56	13.38	-1.32	.065
J11	-27.09	-36.58	13.38	-1.32	.065
J12	-37.19	-36.36	13.38	-1.31	.065
J13	-20.19	-36.59	13.38	-1.32	.065
J14	-37.19	-36.34	13.39	-1.31	.065
J15	-16.47	-36.62	13.37	-1.32	.065
J16	-19.66	-36.65	13.37	-1.32	.064
J17	-19.66	-36.69	13.37	-1.32	.064
J18	-16.20	-36.62	13.37	-1.32	.064
J19	-24.44	-36.60	13.38	-1.32	.065
J2	-14.34	-36.61	13.38	-1.32	.065
J20	-11.42	-36.66	13.37	-1.32	.064
J3	-17.53	-36.58	13.38	-1.32	.065
J4	-22.84	-36.58	13.38	-1.32	.065
J5	-30.55	-36.39	13.38	-1.31	.065
J6	-34.00	-36.56	13.38	-1.32	.065
J7	-35.59	-36.35	13.38	-1.31	.065
J8	-26.56	-36.57	13.38	-1.32	.065
J9	-22.84	-36.58	13.38	-1.32	.065
K1	-12.48	-36.77	13.37	-1.33	.064
K2	-10.36	-36.96	13.36	-1.33	.064
K3	-19.12	-36.68	13.37	-1.32	.064
CS-1	.00	-37.58	13.34	-1.36	.064
CS-2	.00	-37.65	13.34	-1.36	.064
CS-3	.00	-36.80	13.37	-1.33	.064
CS-4	.00	-36.85	13.37	-1.33	.064
CS-6	.00	-36.60	13.38	-1.32	.065
CS-7	.00	-36.61	13.38	-1.32	.065
HP-1	.00	-37.83	13.33	-1.36	.064
HP-2	.00	-37.85	13.33	-1.37	.064
HP-3	.00	-37.03	13.36	-1.34	.064
HP-4	.00	-37.12	13.36	-1.34	.064
HP-5	.00	-37.26	13.35	-1.34	.064

HP-6	.00	-36.67	13.37	-1.32	.064
HP-7	.00	-36.66	13.37	-1.32	.064
HP-8	.00	-36.59	13.38	-1.32	.065
J-2	.00	-39.34	13.28	-1.42	.064
J-3	.00	-39.33	13.28	-1.42	.064
J-5	.00	-39.34	13.28	-1.42	.064
J-8	.00	-39.33	13.28	-1.42	.064
J-10	.00	-39.33	13.28	-1.42	.064
J-12	.00	-39.35	13.28	-1.42	.064
J-14	.00	-39.39	13.27	-1.42	.064
J-16	.00	-39.44	13.27	-1.42	.064
J-18	.00	-39.51	13.27	-1.43	.064
J-20	.00	-39.59	13.27	-1.43	.064
J-22	.00	-39.71	13.26	-1.43	.064
J-24	.00	-39.93	13.26	-1.44	.064
J-25	.00	-39.93	13.26	-1.44	.064
J-26	.00	-39.88	13.26	-1.44	.064
J-27	.00	-39.38	13.28	-1.42	.064
J-28	.00	-39.93	13.26	-1.44	.064
J-30	.00	-38.58	13.30	-1.39	.064
J-32	.00	-39.90	13.26	-1.44	.064
J-34	.00	-39.92	13.26	-1.44	.064
J-36	.00	-39.48	13.27	-1.42	.064
J-38	.00	-38.27	13.32	-1.38	.064
J-40	.00	-38.37	13.31	-1.38	.064
J-42	.00	-38.69	13.30	-1.40	.064
J-43	.00	-37.33	13.35	-1.35	.064
J-45	.00	-37.39	13.35	-1.35	.064
J-46	.00	-37.27	13.35	-1.34	.064
J-47	.00	-36.66	13.37	-1.32	.064
J-48	.00	-36.65	13.37	-1.32	.064
J-49	.00	-36.74	13.37	-1.33	.064
J-50	.00	-36.72	13.37	-1.32	.064
J-51	.00	-38.51	13.31	-1.39	.064
J-53	.00	-38.01	13.32	-1.37	.064
J-54	.00	-37.84	13.33	-1.37	.064
J-57	.00	-37.75	13.33	-1.36	.064
J-59	.00	-37.70	13.34	-1.36	.064
J-62	.00	-38.33	13.31	-1.38	.064
J-63	.00	-38.22	13.32	-1.38	.064
J-66	.00	-38.25	13.32	-1.38	.064
J-68	.00	-38.16	13.32	-1.38	.064
J-70	.00	-37.89	13.33	-1.37	.064
J-72	.00	-37.67	13.34	-1.36	.064
J-74	.00	-37.48	13.34	-1.35	.064
J-76	.00	-37.56	13.34	-1.36	.064
J-77	.00	-37.35	13.35	-1.35	.064
J-79	.00	-37.34	13.35	-1.35	.064
J-81	.00	-37.32	13.35	-1.35	.064
J-83	.00	-37.28	13.35	-1.35	.064
J-85	.00	-37.26	13.35	-1.34	.064
J-87	.00	-37.33	13.35	-1.35	.064
J-89	.00	-37.29	13.35	-1.35	.064
J-91	.00	-37.27	13.35	-1.34	.064
J-93	.00	-37.26	13.35	-1.34	.064

J-96	.00	-37.26	13.35	-1.34	.064
J-98	.00	-37.26	13.35	-1.34	.064
J-101	.00	-37.24	13.35	-1.34	.064
J-103	.00	-37.22	13.35	-1.34	.064
J-105	.00	-37.20	13.35	-1.34	.064
J-106	.00	-36.80	13.37	-1.33	.064
J-109	.00	-36.70	13.37	-1.32	.064
J-111	.00	-36.34	13.39	-1.31	.065
J-113	.00	-36.19	13.39	-1.31	.065
J-115	.00	-36.23	13.39	-1.31	.065
J-119	.00	-37.16	13.36	-1.34	.064
J-123	.00	-37.10	13.36	-1.34	.064
J-125	.00	-37.08	13.36	-1.34	.064
J-129	.00	-36.84	13.37	-1.33	.064
J-131	.00	-36.74	13.37	-1.33	.064
J-133	.00	-36.40	13.38	-1.31	.065
J-135	.00	-36.42	13.38	-1.31	.065
J-137	.00	-36.56	13.38	-1.32	.065
J-139	.00	-36.72	13.37	-1.32	.064
J-141	.00	-37.18	13.35	-1.34	.064
J-142	.00	-36.71	13.37	-1.32	.064
J-147	.00	-37.13	13.36	-1.34	.064
J-149	.00	-36.94	13.36	-1.33	.064
J-152	.00	-36.72	13.37	-1.32	.064
J-154	.00	-36.69	13.37	-1.32	.064
J-156	.00	-36.65	13.37	-1.32	.064
J-158	.00	-36.65	13.37	-1.32	.064
J-160	.00	-36.64	13.37	-1.32	.064
J-164	.00	-36.64	13.37	-1.32	.064
J-167	.00	-36.65	13.37	-1.32	.064
J-169	.00	-36.69	13.37	-1.32	.064
J-171	.00	-36.65	13.37	-1.32	.064
J-173	.00	-36.64	13.37	-1.32	.064
J-174	.00	-36.64	13.37	-1.32	.064
J-177	.00	-36.63	13.37	-1.32	.064
J-179	.00	-36.63	13.37	-1.32	.064
J-183	.00	-36.64	13.37	-1.32	.064
J-186	.00	-36.65	13.37	-1.32	.064
J-188	.00	-36.67	13.37	-1.32	.064
J-190	.00	-36.71	13.37	-1.32	.064
J-195	.00	-36.63	13.37	-1.32	.064
J-197	.00	-36.61	13.38	-1.32	.065
J-199	.00	-36.59	13.38	-1.32	.065
J-202	.00	-36.59	13.38	-1.32	.065
J-204	.00	-36.59	13.38	-1.32	.065
J-206	.00	-36.59	13.38	-1.32	.065
J-208	.00	-36.59	13.38	-1.32	.065
J-210	.00	-36.60	13.38	-1.32	.065
J-213	.00	-36.61	13.38	-1.32	.065
J-216	.00	-36.65	13.37	-1.32	.064
J-219	.00	-36.70	13.37	-1.32	.064
J-221	.00	-36.68	13.37	-1.32	.064
J-223	.00	-36.68	13.37	-1.32	.064
J-225	.00	-36.78	13.37	-1.33	.064
J-226	.00	-36.96	13.36	-1.33	.064

J-76a	.00	-37.75	13.33	-1.36	.064
R-1	.00	-40.00	13.25	-1.44	.064

* This designates the use of default density in a low pressure region

THE NET SYSTEM DEMAND (USFU) = -3113.639

SUMMARY OF INFLOWS(+).AND.OUTFLOWS(-) :

NAME	FLOW (USFU)	FPN TITLE
R-1	-3113.6	R-1

MAXIMUM MACH NUMBER = .03 IN LINE NO. P-1

SUMMARY OF MINIMUM.AND.MAXIMUM VELOCITIES (FT/S)

MINIMUM		MAXIMUM	
P-216	.00	P-1	26.58
R-1	.01	P-29	25.21
P-187	.28	P-44	24.28
P-103	.47	P-116	23.30
P-106	.63	P-117	21.28

SUMMARY OF MINIMUM.AND.MAXIMUM LOSS/1000. (PSI)

MINIMUM		MAXIMUM	
P-216	.00	P-156	.14
R-1	.00	P-116	.11
P-187	.00	P-117	.09
P-103	.00	P-58	.08
P-106	.00	P-240	.07

SUMMARY OF MINIMUM.AND.MAXIMUM PRESSURES (USPU)

MINIMUM		MAXIMUM	
R-1	-40.00	G10	-35.65
J-28	-39.93	E9R	-35.86
J-24	-39.93	E1R	-35.99
J-25	-39.93	E3R	-36.01
J-34	-39.92	G9	-36.05

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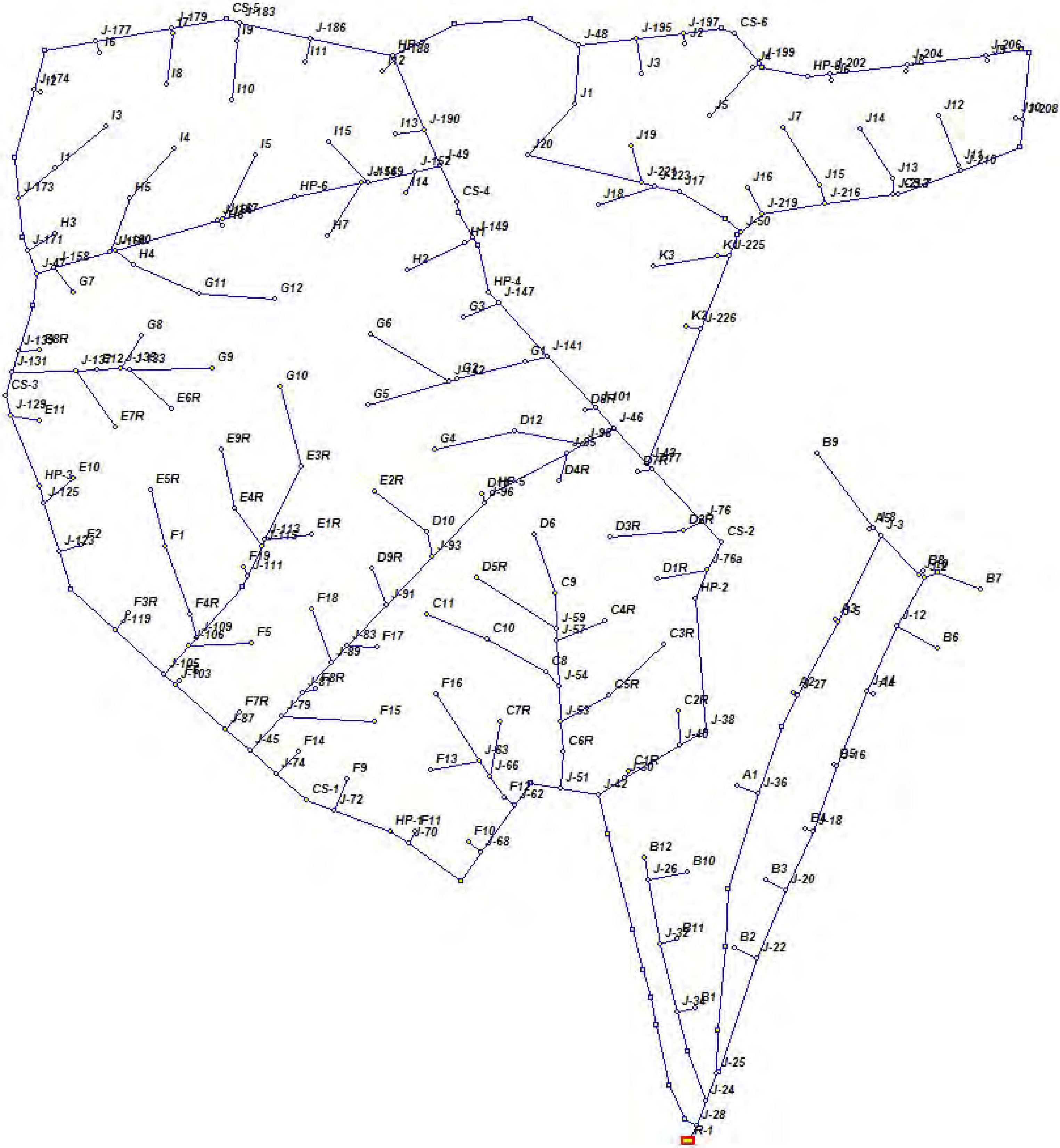
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J-171
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J-46
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HP-5
J-96
E3R
E9R
E4R
E5R
F1
E2R
D10
J-93
J-113
E1R
F19
J-111
D9R
J-91
F18
F3R
J-119
F4R
J-109
J-106
F5
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J-87
J-79
F15
J-45
F14
J-74
F9
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J-72
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J-76
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C9
D5R
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C10
C8
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C5R
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F16
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F13
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B9
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J-36
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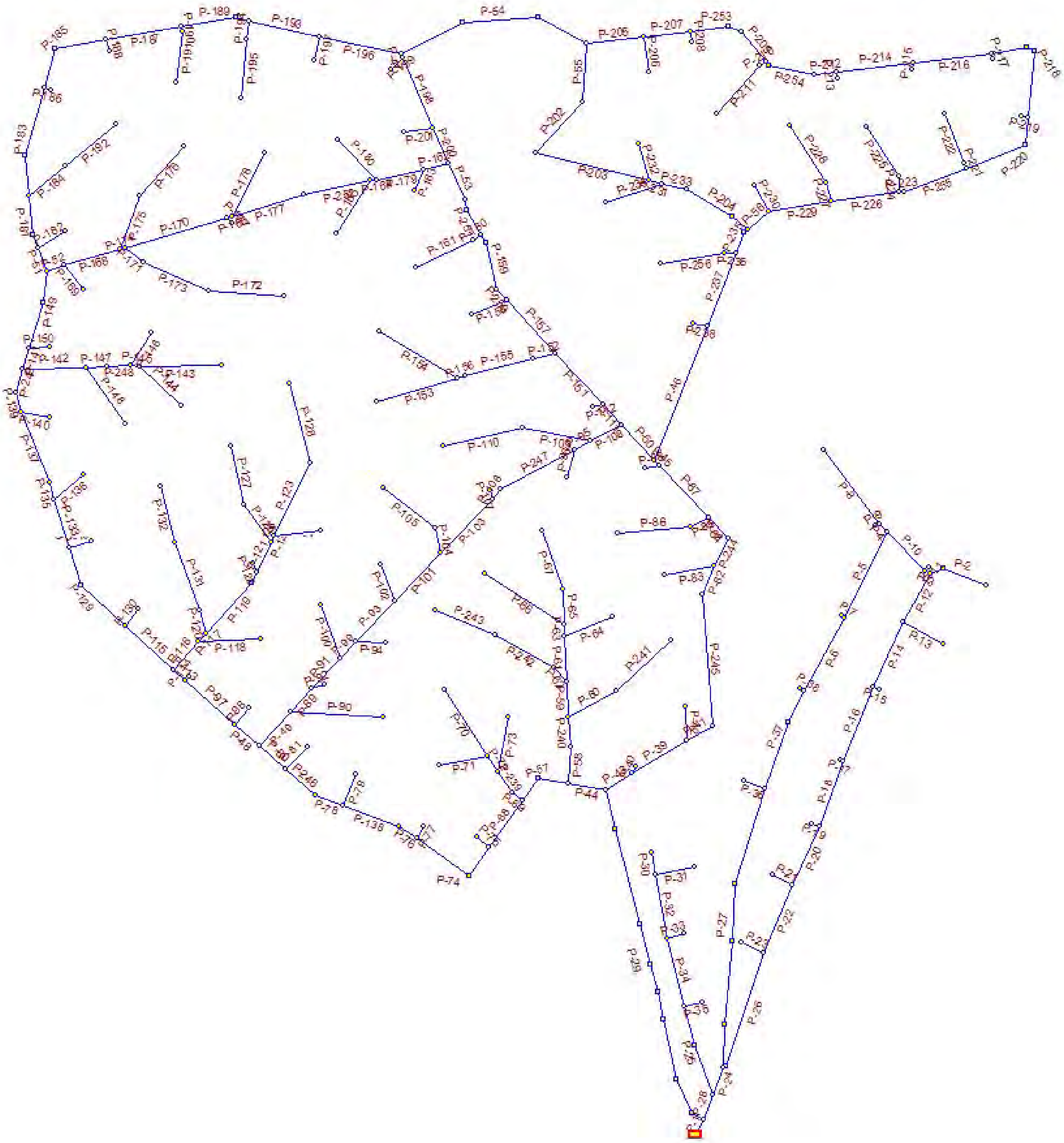
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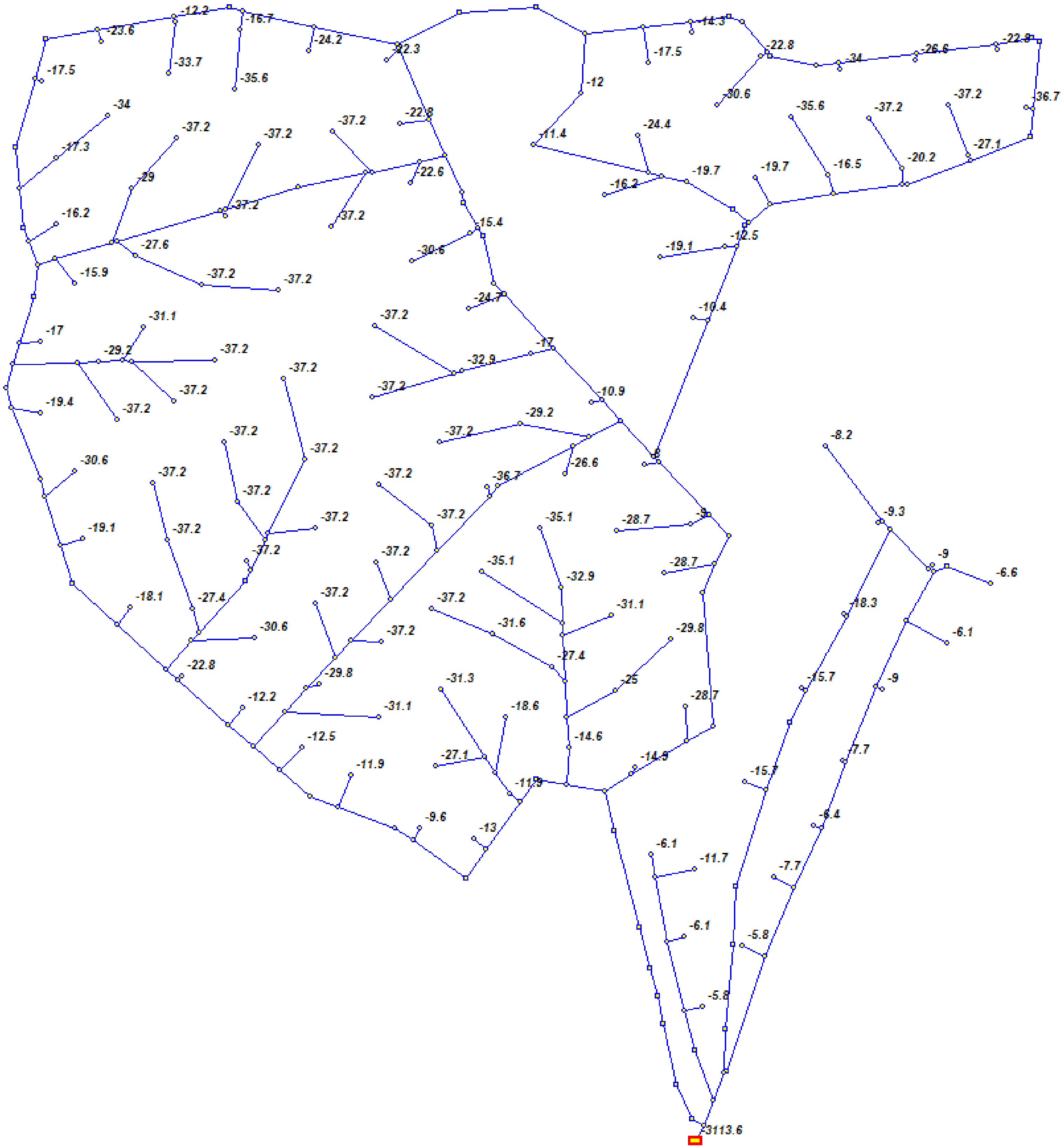

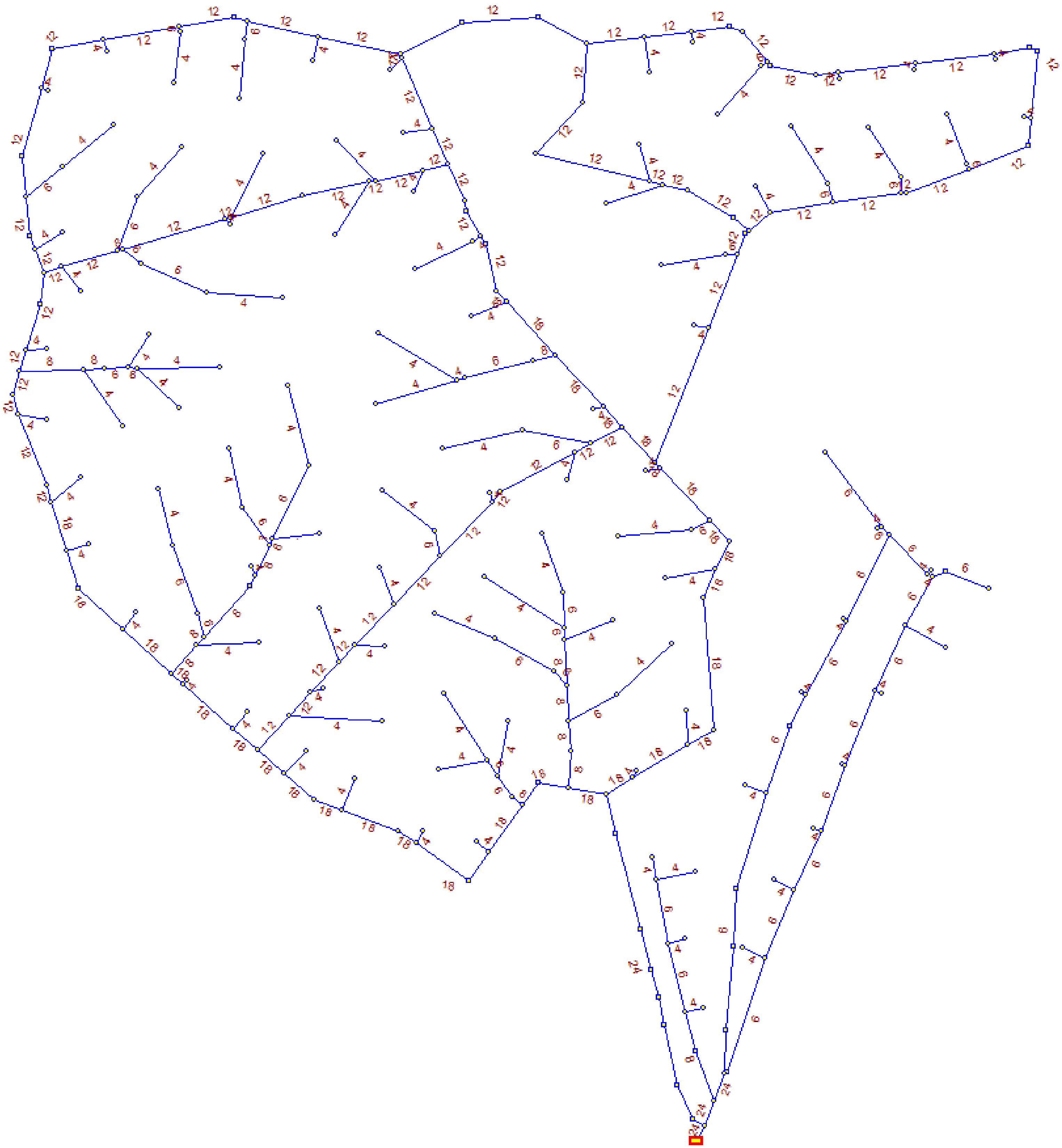

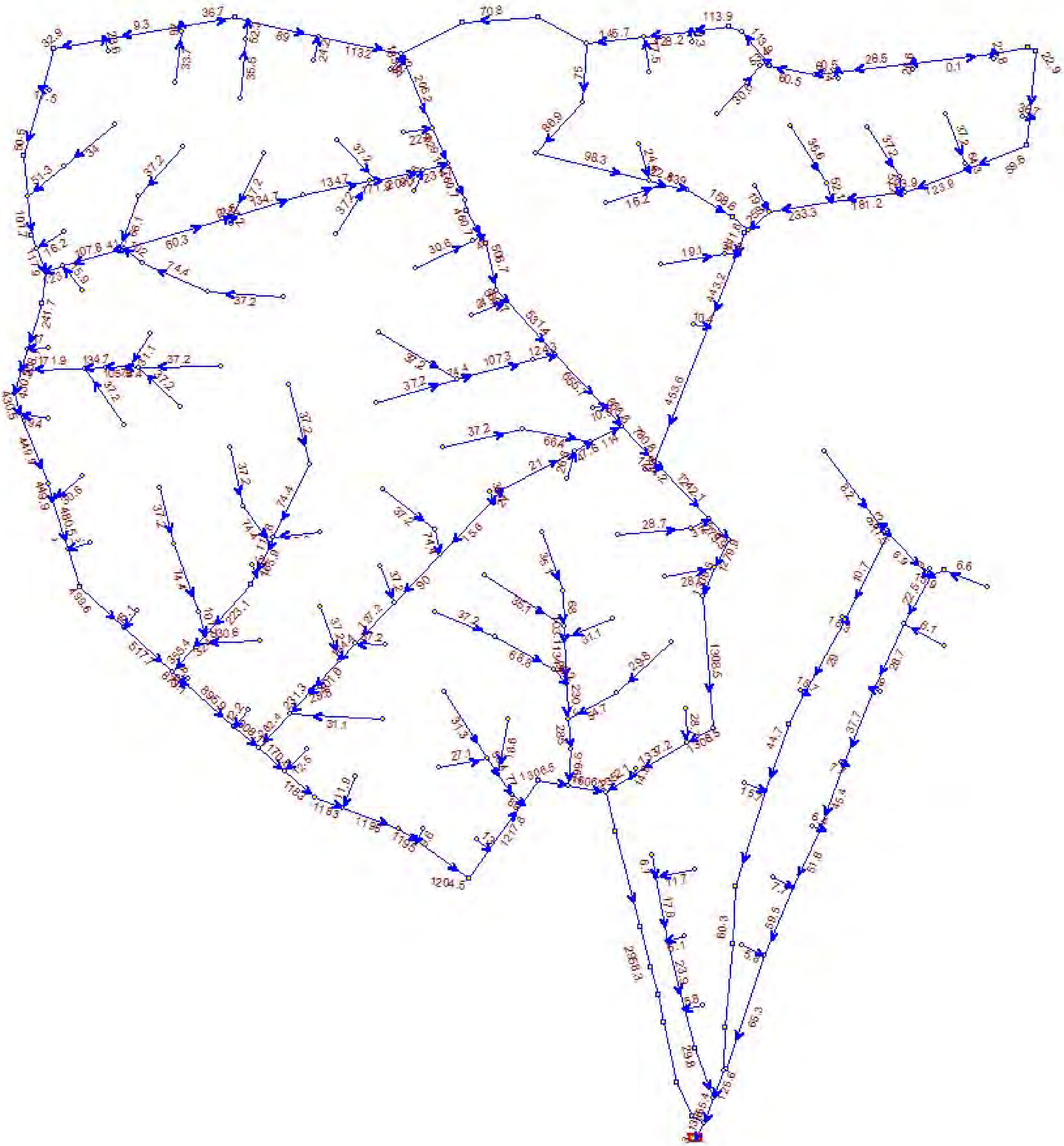

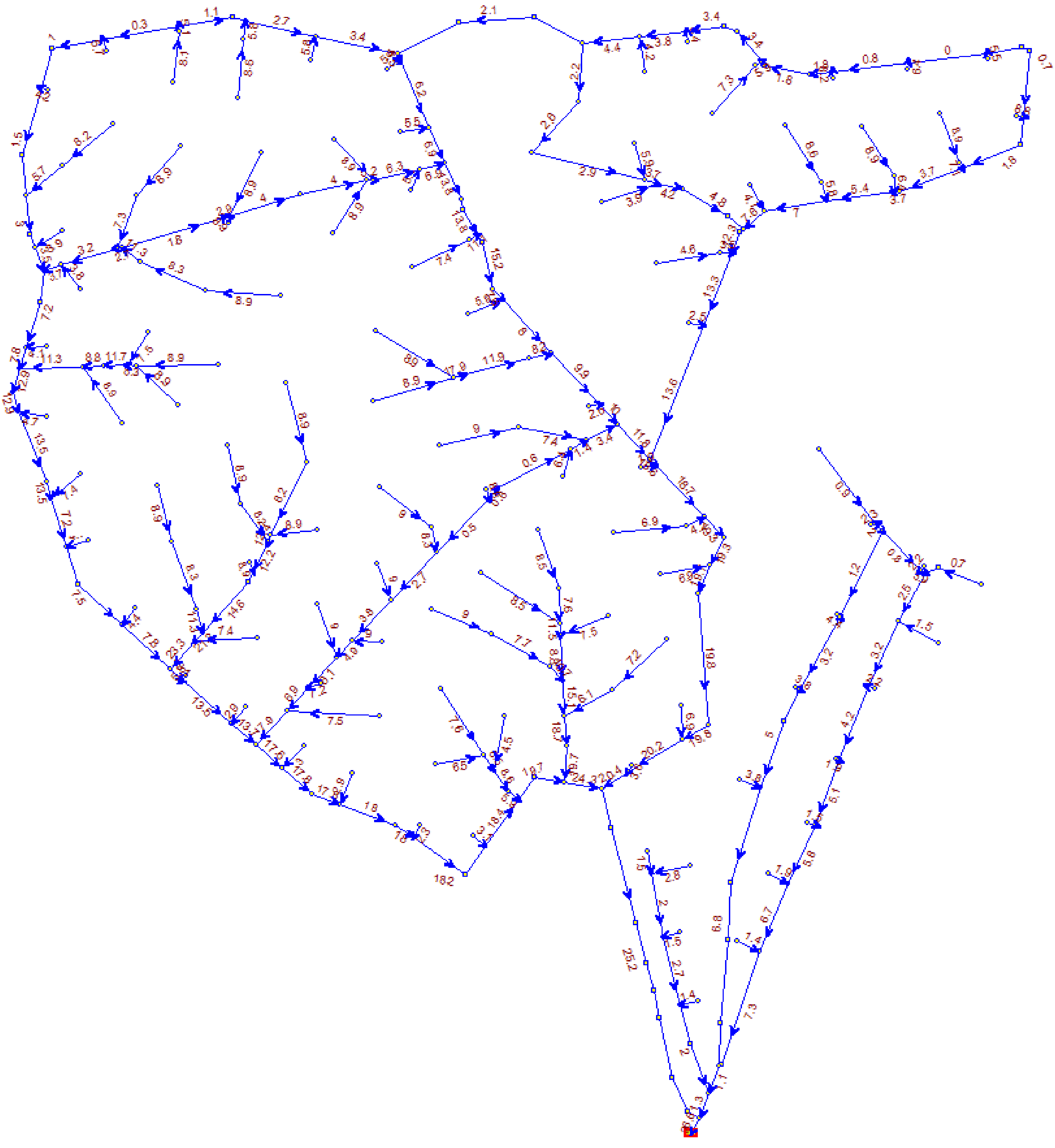

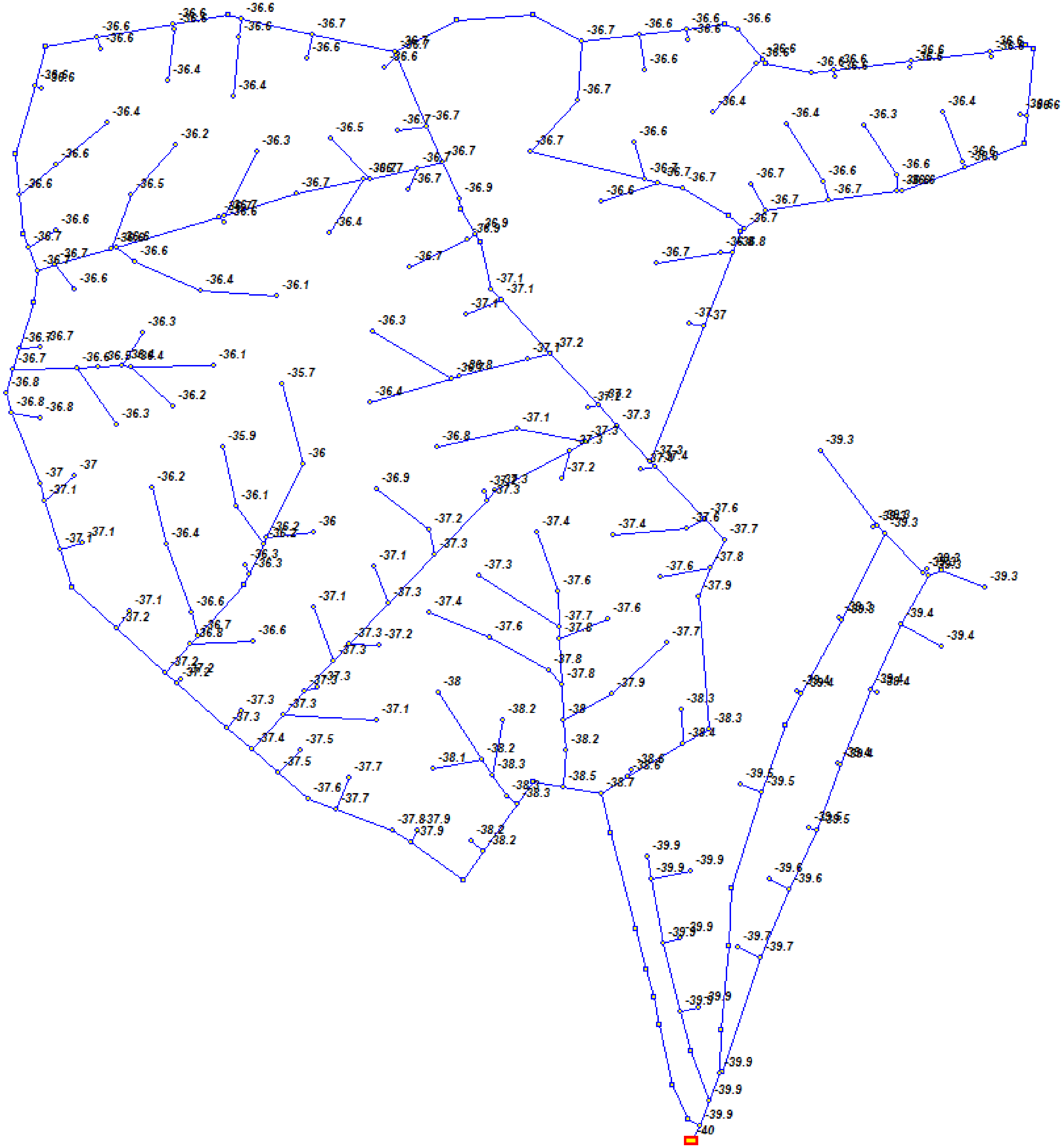

Section 22: Certification

Company Name: Camino Real Environmental Center, Inc.

I, Dr. Juan Carlos Tomas, hereby certify that the information and data submitted in this application are true and as accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 11 day of May, 2021, upon my oath or affirmation, before a notary of the State of

Texas.

Dr. Juan Carlos Tomas
*Signature

5-11-21
Date

Dr. Juan Carlos Tomas
Printed Name

District Manager
Title

Scribed and sworn before me on this 11 day of May, 2021.

My authorization as a notary of the State of Texas expires on the

2 day of October, 2022.

Gracie Silva
Notary's Signature

5/11/21
Date

Gracie Silva
Notary's Printed Name

*For Title V applications, the signature must be of the Responsible Official as defined in 20.2.70.7.AE NMAC.

NOTARY PUBLIC STATE OF TEXAS
GRACIE SILVA
Notary Public, State of Texas
Comm. Expires 10-02-2022
Notary ID 11371561

Universal Application 4

Air Dispersion Modeling Report

Refer to and complete Section 16 of the Universal Application form (UA3) to assist your determination as to whether modeling is required. If, after filling out Section 16, you are still unsure if modeling is required, e-mail the completed Section 16 to the AQB Modeling Manager for assistance in making this determination. If modeling is required, a modeling protocol would be submitted and approved prior to an application submittal. The protocol should be emailed to the modeling manager. A protocol is recommended but optional for minor sources and is required for new PSD sources or PSD major modifications. Fill out and submit this portion of the Universal Application form (UA4), the "Air Dispersion Modeling Report", only if air dispersion modeling is required for this application submittal. This serves as your modeling report submittal and should contain all the information needed to describe the modeling. No other modeling report or modeling protocol should be submitted with this permit application.

16-A: Identification

1	Name of facility:	**Camino Real Landfill**
2	Name of company:	**Camino Real Environmental Center, Inc.**
3	Current Permit number:	**7592**
4	Name of applicant's modeler:	**Jeff Leadford, SCS Engineers**
5	Phone number of modeler:	**(720)-272-0172**
6	E-mail of modeler:	**jleadford@scsengineers.com**

16-B: Brief

1	Was a modeling protocol submitted and approved?	Yes☒	No☐
2	Why is the modeling being done?	Other (describe below)	
3	Describe the permit changes relevant to the modeling.		
	Modeling done after the New Mexico Environment Department Air Quality Bureau requested the addition of portable diesel engines to the air dispersion modeling to compare to ambient air quality standards. The same modeling as done previously for the NSR process in July 2018 but with the addition of five diesel engines.		
4	What geodetic datum was used in the modeling?	NAD83	
5	How long will the facility be at this location?	Permanent	
6	Is the facility a major source with respect to Prevention of Significant Deterioration (PSD)?	Yes☐	No☒

7	Identify the Air Quality Control Region (AQCR) in which the facility is located	153
8	List the PSD baseline dates for this region (minor or major, as appropriate). **Minor**	
	NO2	**8/2/1995**
	SO2	**not yet established**
	PM10	**6/16/2020**
	PM2.5	**not yet established**
9	Provide the name and distance to Class I areas within 50 km of the facility (300 km for PSD permits).	
	None within 50 km	
10	Is the facility located in a non-attainment area? If so describe below	Yes☒ No☐
	Sunland Park Ozone Maintenance Area	
11	Describe any special modeling requirements, such as streamline permit requirements.	
	None	

16-C: Modeling History of Facility

1

Describe the modeling history of the facility, including the air permit numbers, the pollutants modeled, the National Ambient Air Quality Standards (NAAQS), New Mexico AAQS (NMAAQS), and PSD increments modeled. (Do not include modeling waivers).

The facility was modeled in 2011 for its Title V Permit Renewal. Using the methods and standards at that time, the site demonstrated compliance with air quality standards. However, modeling standards now require inclusion of background concentrations for PM, and the facility cannot demonstrate compliance with current requirements and modeling was required to be performed to current standards in 2016. NMED has added modeling requirements for H2S to since the original modeling as well.

In 2021, NMED requested the 2016 modeling include all portable diesel engines on-site to be included in the air modeling, and this modeling shows compliance with those standards.

This modeling is for the NSR permit significant revision.

Pollutant	Latest permit and modification number that modeled the pollutant facility-wide.	Date of Permit	Comments
CO	7592-R0	March 2019	
NO_2	7592-R0	March 2019	
SO_2	7592-R0	March 2019	
H_2S	7592-R0	March 2019	
PM2.5	7592-R0	March 2019	
PM10	7592-R0	March 2019	
Lead	7592-R0	March 2019	
Ozone (PSD only)	None		Not a source of lead
NM Toxic Air Pollutants (20.2.72.402 NMAC)	None		Not a PSD source (modeling not required)

16-D: Modeling performed for this application

1 For each pollutant, indicate the modeling performed and submitted with this application.
Choose the most complicated modeling applicable for that pollutant, i.e., culpability analysis assumes ROI and cumulative analysis were also performed.

Pollutant	ROI	Cumulative analysis	Culpability analysis	Waiver approved	Pollutant not emitted or not changed.
CO	☒	☐	☐	☐	☐
NO_2	☐	☒	☐	☐	☐
SO_2	☐	☒	☒	☐	☐
H_2S	☐	☐	☐	☐	☒
PM2.5	☒	☐	☐	☐	☐
PM10	☒	☐	☐	☐	☐
Lead	☐	☐	☐	☐	☒
Ozone	☐	☐	☐	☐	☒
State air toxic(s) (20.2.72.402 NMAC)	☐	☐	☐	☐	☒

16-E: New Mexico toxic air pollutants modeling

1 List any New Mexico toxic air pollutants (NMTAPs) from Tables A and B in 20.2.72.502 NMAC that are modeled for this application.

No toxics included in this modeling. Toxic emissions do not exceed limits in Tables A and B 20.2.72.502.

2 List any NMTAPs that are emitted but not modeled because stack height correction factor. Add additional rows to the table below, if required.

Pollutant	Emission Rate (pounds/hour)	Emission Rate Screening Level (pounds/hour)	Stack Height (meters)	Correction Factor	Emission Rate/ Correction Factor

16-F: Modeling options

1	Was the latest version of AERMOD used with regulatory default options? If not explain below.	Yes☒	No☐
	Regulatory default; PM modeling included dry plume depletion		

16-G: Surrounding source modeling

1	Date of surrounding source retrieval	7/10/17

2 If the surrounding source inventory provided by the Air Quality Bureau was believed to be inaccurate, describe how the sources modeled differ from the inventory provided. If changes to the surrounding source inventory were made, use the table below to describe them. Add rows as needed.

AQB Source ID	Description of Corrections

16-H: Building and structure downwash

1	How many buildings are present at the facility?	5		
2	How many above ground storage tanks are present at the facility?	0		
3	Was building downwash modeled for all buildings and tanks? If not explain why below.		Yes☐	No☒
4	Building comments	Only point sources at the facility are the portable engines on the far west edge of the property where active cells are located. No buildings exist in this area, and the nearest buildings are way outside the downwash applicable zone.		

16-I: Receptors and modeled property boundary

1	"Restricted Area" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with a steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area. A Restricted Area is required in order to exclude receptors from the facility property. If the facility does not have a Restricted Area, then receptors shall be placed within the property boundaries of the facility. Describe the fence or other physical barrier at the facility that defines the restricted area.		
	CRLF is surrounded by at least a 3-strand barbed wire fence with access is controlled by a locking gate and other physical barriers. The southern boundary of the landfill is delineated by the USA/Mexico border fence, and is patrolled 24-hours per day, 365-days per year by US Border Patrol Personnel.		
2	Receptors must be placed along publicly accessible roads in the restricted area. Are there public roads passing through the restricted area?	Yes☐	No☒
3	Are restricted area boundary coordinates included in the modeling files?	Yes☒	No☐

4 Describe the receptor grids and their spacing. The table below may be used, adding rows as needed.

Grid Type	Shape	Spacing	Start distance from restricted area or center of facility	End distance from restricted area or center of facility	Comments
Multi-Tier	Square	250 m	0 km	3 km	
Multi-Tier	Square	1,000 m	3 km	10 km	

5	Describe receptor spacing along the fence line.
	25 meter receptor spacing on the fenceline
6	Describe the PSD Class I area receptors.
	N/A

16-J: Sensitive areas

1	Are there schools or hospitals or other sensitive areas near the facility? If so describe below. This information is optional (and purposely undefined) but may help determine issues related to public notice.	Yes☒	No☐
	Desert View and Sunland Park Elementary Schools are northeast of the landfill.		
3	The modeling review process may need to be accelerated if there is a public hearing. Are there likely to be public comments opposing the permit application?	Yes☒	No☐

16-K: Modeling Scenarios

1	Identify, define, and describe all modeling scenarios. Examples of modeling scenarios include using different production rates, times of day, times of year, simultaneous or alternate operation of old and new equipment during transition periods, etc. Alternative operating scenarios should correspond to all parts of the Universal Application and should be fully described in Section 15 of the Universal Application (UA3).		
	Only one modeling scenario used for hours of operation of the portable engines.		
2	Which scenario produces the highest concentrations? Why?		
	N/A		
3	Were emission factor sets used to limit emission rates or hours of operation? (This question pertains to the "SEASON", "MONTH", "HROFDY" and related factor sets, not to the factors used for calculating the maximum emission rate.)	Yes☒	No☐
4	If so, describe factors for each group of sources. List the sources in each group before the factor table for that group. (Modify or duplicate table as necessary. It's ok to put the table below section 16-K if it makes formatting easier.) Sources: **diesel engines (operational only during landfill operating hours)**		

	Hour of Day	Light Tower Factor (ENG1, ENG2, ENG5)	Maintenance Engine Factor (ENG3, ENG4)					
5	1	0	0					
	2	0	0					
	3	0	0					
	4	0	0					
	5	.5	0					
	6	1	0					
	7	1	0					
	8	.5	0					
	9	0	0					
	10	0	0					
	11	0	0.5					
	12	0	1					
	13	0	1					
	14	0	1					
	15	0	1					

	16	0	1						
	17	0	1						
	18	.5	0						
	19	1	0						
	20	.5	0						
	21	0	0						
	22	0	0						
	23	0	0						
	24	0	0						
	If hourly, variable emission rates were used that were not described above, describe them below.								
	Maintenance engines are only used on weekdays and Saturdays.								
6	Were different emission rates used for short-term and annual modeling? If so describe below.							Yes☐	No☒

16-L: NO_2 Modeling

1	Which types of NO_2 modeling were used? Check all that apply.			
	☒	ARM2		
	☐	100% NO_X to NO_2 conversion		
	☐	PVMRM		
	☐	OLM		
	☐	Other:		
2	Describe the NO_2 modeling.			
	Cumulative/ PSD Increment			
3	Were default NO_2/NO_X ratios (0.5 minimum, 0.9 maximum or equilibrium) used? If not describe and justify the ratios used below.		Yes☒	No☐
4	Describe the design value used for each averaging period modeled.			
	1-hour: High eighth high Annual: Highest Annual Average of Three Years			

16-M: Particulate Matter Modeling

1	Select the pollutants for which plume depletion modeling was used.	
	☒	PM2.5
	☒	PM10
	☐	None
	Describe the particle size distributions used. Include the source of information.	

2	**PM10:** **2.5 um** — **5%** **10 um** — **15%** **PM2.5:** **2.5 um** — **100%** **Fractions obtained from NMED guidance for haul roads.**

3	Does the facility emit at least 40 tons per year of NO_X or at least 40 tons per year of SO_2? Sources that emit at least 40 tons per year of NO_X or at least 40 tons per year of SO_2 are considered to emit significant amounts of precursors and must account for secondary formation of PM2.5.	Yes☐	No☒
4	Was secondary PM modeled for PM2.5?	Yes☐	No☒

5	If MERPs were used to account for secondary PM2.5 fill out the information below. If another method was used describe below.			
	NO_X (ton/yr)	SO_2 (ton/yr)	$[PM2.5]_{annual}$	$[PM2.5]_{24\text{-hour}}$

16-N: Setback Distances

1	Portable sources or sources that need flexibility in their site configuration requires that setback distances be determined between the emission sources and the restricted area boundary (e.g. fence line) for both the initial location and future locations. Describe the setback distances for the initial location.
	45 meters from the property boundary was the setback distance for the portable diesel engines. This was based on where Cells 3.1, 3.2, and 3.3 are. The location for the model spread the engines over cells 3.1 and 3.2 as these are the closest to the property boundary. 45 meters from the boundary is where the slope levels off in the CAD drawings both when the cell is empty as well as full. This is the closest expected location an engine will be to the property boundary.
2	Describe the requested, modeled, setback distances for future locations, if this permit is for a portable stationary source. Include a haul road in the relocation modeling.
	N/A

16-O: PSD Increment and Source IDs

1	The unit numbers in the Tables 2-A, 2-B, 2-C, 2-E, 2-F, and 2-I should match the ones in the modeling files. Do these match? If not, provide a cross-reference table between unit numbers if they do not match below.	Yes☐	No☐

	Unit Number in UA-2	Unit Number in Modeling Files
1	001 (not modeled)	L00000##
	002 (not modeled)	ERTHMOVE, EARTHSOUTH, EARTHEAST (3 scenarios)
	003 (not modeled)	Landfill
	005	Flare
	No UA-2 Unit Numbers, new modeling sources	ENG1-ENG5

2	The emission rates in the Tables 2-E and 2-F should match the ones in the modeling files. Do these match? If not, explain why below.	Yes☒	No☐
3	Have the minor NSR exempt sources or Title V Insignificant Activities" (Table 2-B) sources been modeled?	Yes☐	No☒

4	Which units consume increment for which pollutants?				
	Unit ID	NO_2	SO_2	PM10	PM2.5
	FLARE	X			
	ENG1-ENG5	X			

5	PSD increment description for sources. (for unusual cases, i.e., baseline unit expanded emissions after baseline date).	The significance level was exceeded for NO2 and SO2, though a PSD baseline has not been set for SO2 yet, so an increment analysis was only required for NO2. Sources included in analysis are the flare and all five portable engines.

6	Are all the actual installation dates included in Table 2A of the application form, as required? This is necessary to verify the accuracy of PSD increment modeling. If not please explain how increment consumption status is determined for the missing installation dates below.	Yes☒	No☐
	The flare was installed May 2000.		

16-P: Flare Modeling

1	For each flare or flaring scenario, complete the following			
	Flare ID (and scenario)	Average Molecular Weight	Gross Heat Release (cal/s)	Effective Flare Diameter (m)
	Flare	30	4748660	1.87

16-Q: Volume and Related Sources

1	Were the dimensions of volume sources different from standard dimensions in the Air Quality Bureau (AQB) Modeling Guidelines? If not please explain how increment consumption status is determined for the missing installation dates below.	Yes☐	No☐
	NA – No guidelines provided for landfills or earthmoving dust as a volume source		
2	Describe the determination of sigma-Y and sigma-Z for fugitive sources.		
	Not modeled		
3	Describe how the volume sources are related to unit numbers. Or say they are the same.		
	Describe any open pits.		

4	None
5	Describe emission units included in each open pit.
	None

16-R: Background Concentrations

1	Were NMED provided background concentrations used? Identify the background station used below. If non-NMED provided background concentrations were used describe the data that was used.	Yes☒	No☐
	CO: N/A		
	NO_2: Sunland Park (350130021)		
	PM2.5: N/A		
	PM10: N/A		
	SO_2: Bloomfield(350450009)		
	Other:		
	Comments:		
2	Were background concentrations refined to monthly or hourly values? If so describe below.	Yes☐	No☒

16-S: Meteorological Data

1	Was NMED provided meteorological data used? If so select the station used. Sunland Park (Desert View)	Yes☒	No☐
2	If NMED provided meteorological data was not used describe the data set(s) used below. Discuss how missing data were handled, how stability class was determined, and how the data were processed.		
	Desert View Meteorological data was used for the entire year of 2016.		

16-T: Terrain

1	Was complex terrain used in the modeling? If not, describe why below.	Yes☒	No☐
2	What was the source of the terrain data?		
	USGS NED		

16-U: Modeling Files

1	Describe the modeling files:		
	File name (or folder and file name)	Pollutant(s)	Purpose (ROI/SIA, cumulative, culpability analysis, other)
	Engines Only PM10	**PM10**	**ROI/SIA determination**
	Engines Only PM2	**PM2.5**	**ROI/SIA determination**
	Engines Only CO	**CO**	**ROI/SIA determination**
	NOX Modeling Cumulative	**NOX**	**Cumulative**
	SOX Cumulative Culpability	**SOX**	**Culpability Analysis**
	NOX Modeling PSD Increment	**NOX**	**PSD Increment**

16-V: PSD New or Major Modification Applications – NOT APPLICABLE

1	A new PSD major source or a major modification to an existing PSD major source requires additional analysis. Was preconstruction monitoring done (see 20.2.74.306 NMAC and PSD Preapplication Guidance on the AQB website)?	Yes☐	No☐
2	If not, did AQB approve an exemption from preconstruction monitoring?	Yes☐	No☐
3	Describe how preconstruction monitoring has been addressed or attach the approved preconstruction monitoring or monitoring exemption.		
4	Describe the additional impacts analysis required at 20.2.74.304 NMAC.		
5	If required, have ozone and secondary PM2.5 ambient impacts analyses been completed? If so describe below.	Yes☐	No☐

16-W: Modeling Results

1	If ambient standards are exceeded because of surrounding sources, a culpability analysis is required for the source to show that the contribution from this source is less than the significance levels for the specific pollutant. Was culpability analysis performed? If so describe below.	Yes☐	No☐
	A PSD increment analysis was required, but no ambient standards were exceeded to required a culpability analysis.		
2	Identify the maximum concentrations from the modeling analysis. Rows may be modified, added and removed from the table below as necessary.		

Pollutant, Time Period and Standard	Modeled Facility Concentration (µg/m3)	Modeled Concentration with Surrounding Sources (µg/m3)	Secondary PM (µg/m3)	Background Concentration (µg/m3)	Cumulative Concentration (µg/m3)	Value of Standard (µg/m3)	Percent of Standard	Location		
								UTM E (m)	UTM N (m)	Elevation (m)
Significance Level CO 8hr	35.2	35.2		NA	35.2	500	7.04%	348527.80	3518527.54	1261.00
Significance Level CO 1hr	105.8	105.8		NA	105.8	2,000	5.29%	348527.80	3518527.54	1261.00
Significance Level NOx annual	2.11	2.11		NA	2.11	1	OVER	348526.11	3518427.71	1261.00
Significance Level NOx 24hr	12.8	12.8		NA	12.8	5	OVER	348527.80	3518527.54	1261.00
Significance Level NOx 1hr	74.6	74.6		NA	74.6	7.52	OVER	348527.80	3518527.54	1261.00
NAAQS NO2 Annual	2.14	2.14		85.7	87.84	99.66	88.14%	348526.11	3518427.71	1261.00
NMAAQS NO2 24hr	12.8	12.8			12.8	188.03	6.81%	348527.80	3518527.54	1261.00
NAAQS NO2 1hr	74.6	74.6		12.5	87.1	188.03	46.32%	348527.80	3518527.54	1261.00

Pollutant, Time Period and Standard	Modeled Facility Concentration (µg/m3)	Modeled Concentration with Surrounding Sources (µg/m3)	Secondary PM (µg/m3)	Background Concentration (µg/m3)	Cumulative Concentration (µg/m3)	Value of Standard (µg/m3)	Percent of Standard	Location		
								UTM E (m)	UTM N (m)	Elevation (m)
PSD Class II Increment NO2 Annual	2.14	3.20		NA	3.20	25	12.8%	348526.11	3518427.71	1257.82
Significance Level SOx Annual	0.62	0.62		NA	0.62	1	62.00%	348526.11	3518427.71	1261.00
Significance Level SOx 24hr	3.78	3.78		NA	3.78	5	75.60%	348527.80	3518527.54	1261.00
Significance Level SOx 3hr	12.5	12.5		NA	12.5	25	50.00%	348527.80	3518527.54	1261.00
Significance Level SOx 1hr	23.3	23.3		NA	23.3	7.8	OVER	348527.80	3518527.54	1261.00
NAAQS SO2 1hr	23.3	543.56		8.84	716.64	196.4	OVER	348528.22	3518552.50	1260.72
SO2 1hr Culpability Analysis	0.0234	174 (See SOXMAXD CONT.TXT)		8.84	182.84	196.4	93.10%	348549.50	3518597.50	1260.72
Significance Level PM10 Annual	0.20	0.20		NA	0.20	0.2	95.00%	348524.41	3518327.87	1261.00
Significance Level PM10 24-hr	0.87	0.87		NA	0.87	1.2	72.50%	348527.80	3518527.54	1261.00
Significance Level PM2.5 Annual	0.20	0.20		NA	0.20	0.2	95.00%	348524.41	3518327.87	1261.00
Significance Level PM2.5 24hr	0.87	0.87		NA	0.87	1.2	72.50%	348527.80	3518527.54	1261.00

16-X: Summary/conclusions

	A statement that modeling requirements have been satisfied and that the permit can be issued.
1	Modeling demonstrates that the facility will not contribute significantly to an exceedance of the NAAQS or NMAAQS outside the facility boundary. The addition of 5 portable generators at the facility only exceeded the significance levels for NO2 and SOX. The SO2 minor source baseline date has not been established in this area, so the SO2 increment analysis was not required. The cumulative analysis for SO2 1-hour showed exceedance from the NAAQS only when adding in the surrounding sources from both New Mexico and Texas. This required a culpability analysis. The threshold for this analysis was set at 174 ug/m3, which is 93% of the standard when taking background concentration into consideration. The results of the culpability analysis can be found in SOXMAXDCONT.TXT in the modeling files, showing a roughly 0.0234% contribution from this facility to the overall SO2 1-hour emissions in the El Paso metro area. The NO2 cumulative analysis was performed on 1-hour, 24-hour, and annual periods using a background NO2 dataset that is 1,000 ft Northeast of the property boundary. This allows surrounding sources to be excluded from the model, as they are further then the background monitoring station. The NO2 Class II PSD Increment is 25 ug/m3 for NO2 annual, so even though the NO2 annual from this facility is only 2.0 ug/m3, the addition of NO2 background exceeds the increment. In this case, all PSD facilities in the region, both in New Mexico and Texas, were ran in a separate model to show compliance. This analysis showed the maximum modeled increment of less than the 25 ug/m3 threshold, and passes all model requirements. Modeling requirements have been met and the permit can be issued.