IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA,

Plaintiff,

v.

ALLIED WASTE NIAGARA FALLS LANDFILL, LLC,

Defendant.

Civil Action No. 1:24-cv-36

CONSENT DECREE

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I. INTRODUCTION

A. Plaintiff United States of America, on behalf of the United States Environmental Protection Agency ("EPA"), has filed a complaint in this action concurrently with this Consent Decree, alleging that Allied Waste Niagara Falls Landfill, LLC ("Allied"), violated Sections 111, 112, and 503 of the Clean Air Act ("Act"), 42 U.S.C. § 7401, *et seq*. and its implementing regulations at the Allied Waste Niagara Falls Landfill in Niagara Falls, New York.

B. EPA's regulations issued under Sections 111 and 112 of the Act (the "Landfill NSPS," the "Landfill Emission Guidelines," and the "Landfill MACT," respectively, along with the New York State Section 111(d) Plan, require that each Municipal Solid Waste ("MSW") landfill that has a design capacity equal to or greater than 2.5 million megagrams ("Mg") and 2.5 million cubic meters must submit annual reports to EPA regarding emissions of non-methane organic compounds ("NMOCs"). Under the New York State Section 111(d) plan, if any NMOC report shows that the annual emissions of these landfill gases equal or exceed 34 Mg per year, the landfill must design, construct, and operate, according to certain deadlines, a gas collection and control system ("GCCS") that captures and controls gases generated within the landfill.

C. Allied is the owner and operator of the Allied Waste Niagara Falls Landfill ("Facility").

D. The 2016 Annual Solid Waste Report provided by Allied demonstrates that the design capacity of the Facility (including, but not limited to, industrial waste and construction debris) exceeds 2.5 million megagrams ("Mg") and 2.5 million cubic meters.

E. The United States alleges that the Facility is an MSW landfill into which "household waste" was deposited or comingled with other waste.

F. The United States alleges that the NMOC emission rate from the Facility is above the Landfill NSPS and the New York State Section 111(d) plan threshold of 34 Mg per year and above the Landfill MACT threshold of 50 Mg per year based on Allied's response to EPA's Section 114 Information Request.

G. The United States alleges that Allied failed to timely submit annual NMOC reports and failed to timely install a GCCS. The United States seeks civil penalties and injunctive relief for Allied's alleged failures to comply with the Act and its regulations.

H. Allied denies these allegations and any liability to the United States arising out of the transactions or occurrences alleged in the Complaint. In particular, Allied denies EPA's allegation that the Landfill Air Rules require the installation of a GCCS at the Facility, notwithstanding the references to the Landfill Air Rules used to identify and describe the requirements in this Decree.

I. The Parties recognize, and the Court by entering this Consent Decree finds, that implementation of this Consent Decree will fully address EPA's allegations of noncompliance with Sections 111, 112, and 503 of the Act, and its implementing regulations, and that it has been negotiated by the Parties in good faith, will avoid litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, before the taking of any testimony, without the adjudication or admission of any issue of fact or law, and with the consent of the Parties, IT IS HEREBY ADJUDGED, ORDERED, and DECREED as follows:

II. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action, pursuant to 28 U.S.C. §§ 1331, 1345, and 1355, and Section 113(b) of the Act, 42 U.S.C. § 7413(b), and over the Parties. Venue lies in this District pursuant to Section 113(b) of the Act, 42 U.S.C. § 7413(b), and 28 U.S.C. §§ 1391 and 1395(a), because Allied resides and is located in this judicial district, and the violations alleged in the Complaint are alleged to have occurred in, and Allied conducts business in, this judicial district. For purposes of this Decree, or any action to enforce this Decree, Allied consents to the Court's jurisdiction over this Decree and any such action and over Allied and consents to venue in this judicial district.

2. Notice of commencement of this action has been given to the State of New York.

III. APPLICABILITY

3. The obligations of this Consent Decree apply to and are binding upon the United States, and upon Allied and any successors, assigns, or other entities or persons otherwise bound by law.

4. No transfer of ownership or operation of the Facility, whether in compliance with the procedures of this Paragraph or otherwise, shall relieve Allied of its obligation to ensure that the terms of the Decree are implemented. At least 30 days prior to such transfer, Allied shall provide a copy of this Consent Decree to the proposed transferee and shall simultaneously provide written notice of the prospective transfer, together with a copy of the proposed written agreement, to EPA Region 2, the United States Attorney for the Western District of New York, and the United States Department of Justice, in accordance with Section XIV (Notices). Any attempt to transfer ownership or operation of the Facility without complying with this Paragraph constitutes a violation of this Decree.

5. Allied shall provide: (a) a copy of this Consent Decree to its officers, supervisors and managers whose duties include work required under this Decree; (b) a summary of applicable requirements of the Decree to its employees whose duties include work required under this Decree; and (c) notice of this Consent Decree to each agent of Allied whose duties include work required under this Decree.

6. In any action to enforce this Consent Decree, Allied shall not raise as a defense the failure by any of its officers, directors, employees, agents, or contractors to take any actions necessary to comply with the provisions of this Consent Decree.

IV. DEFINITIONS

7. Terms not otherwise defined in this Consent Decree shall have the meanings assigned in the Clean Air Act, the Landfill NSPS, the Landfill Emission Guidelines, or the

Landfill MACT. Whenever the terms set forth below are used in this Consent Decree, the following definitions shall apply:

"Allied" means Allied Waste Niagara Falls Landfill, LLC.

"Active GCCS" means a gas collection and control system that uses gas mover equipment, such as a fan, blower, or compressor, to transport landfill gas through a header system.

"Complaint" means the complaint filed by the United States in this action.

"Consent Decree" or "Decree" means this Consent Decree and all attachments.

"Day" or "day" means a calendar day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next working day.

"DOJ" means the United States Department of Justice.

"EPA" means the United States Environmental Protection Agency.

"Effective Date" means the date on which the Court's approval of this Consent Decree is recorded in the Court's docket.

"Facility" means the Allied Waste Niagara Falls Landfill, located at 5600 Niagara Falls Boulevard, Niagara Falls, New York.

"GCCS" means gas collection and control system.

"Landfill Air Rules" means the Landfill MACT, Landfill Emission Guidelines, and the New York State Section 111(d) Plan, collectively.

"Landfill Emission Guidelines" means the "Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills," promulgated at 40 C.F.R. Part 60, Subpart Cf, §§ 60.750-60.759.

"Landfill MACT" means the National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills, 40 C.F.R. Part 63, Subpart AAAA, 40 C.F.R. §§ 63.1930-63.1990, which establish national emission standards for hazardous air pollutants for new and existing MSW landfills.

"Landfill NSPS" means the "New Source Performance Standards for Municipal Solid Waste Landfills," 40 C.F.R. Part 60, Subpart WWW, which apply to MSW landfills constructed, reconstructed, or modified on or after May 30, 1991, but before July 18, 2014, 40 C.F.R. §§ 60.750-759.

"Lodging Date" means the date on which the United States lodges the Consent Decree with the Western District of New York.

"New York State Section 111(d) Plan" shall refer to the State Plan submitted by NYSDEC and approved by EPA, which incorporates by reference the Landfill Emission Guidelines. *See* 86 Fed. Reg. 46989 (Aug. 23, 2021); 40 C.F.R. § 62.8104.

"NYSDEC" means the New York State Department of Environmental Conservation.

"Paragraph" means a portion of this Decree identified by an Arabic numeral.

"Parties" means the United States and Allied.

"Passive GCCS" means a gas collection and/or control system that solely uses positive pressure within the landfill to move the gas rather than using gas mover equipment.

"Section" means a portion of this Decree identified by a roman numeral.

"State" means the State of New York.

"United States" means the United States of America, acting on behalf of EPA.

V. CIVIL PENALTY

8. Within 30 days after the Effective Date, Allied shall pay the sum of $671,000 as a civil penalty. Allied shall pay the civil penalty via FedWire Electronic Funds Transfer ("EFT") in accordance with instructions provided to Allied by the Financial Litigation Unit ("FLU") of the United States Attorney's Office for the Western District of New York after the Effective Date. The payment instructions provided by the FLU shall include a Consolidated Debt Collection System ("CDCS") number, which Allied shall use to identify the payment required under this Paragraph. The FLU will provide the payment instructions to counsel for Allied in accordance with Section XIV. At the time of payment, Allied shall send notice to EPA and DOJ, in accordance with Section XIV, that payment has been made.

9. Allied shall not deduct any penalties paid under this Decree pursuant to this Section or Section VIII (Stipulated Penalties) in calculating its federal income tax.

VI. COMPLIANCE REQUIREMENTS

10. **GCCS Installation, Operation, Maintenance, and Closure**. Within 90 days after the Effective Date, Allied shall install, operate, and maintain a GCCS for the Facility in accordance with the Landfill Air Rules as described in the GCCS Design Plan (Attachment A), which contains the GCCS installation, operation and maintenance requirements, including design, monitoring, recordkeeping, reporting, and conditions required for GCCS closure, as well as alternative parameters.

11. **Title V Operating Permit**. Within 45 days of the Effective Date, Allied shall submit to NYSDEC an application for a Title V permit modification or an amendment to the Title V permit application if still pending, that incorporates the Landfill Air Rules as applicable requirements under 40 C.F.R. § 70.3(c), including all alternatives approved by EPA as described

in Attachment A. Allied shall provide a copy of the application to EPA in accordance with Section XIV.

12. **New York State Solid Waste Management Facility Permit.** Within 45 days of the Effective Date, Allied shall submit to NYSDEC an application for a Solid Waste Management Facility Permit modification or an amendment thereto if still pending, that incorporates the requirements of this Consent Decree, including the capping of passive vents described in Section II of Attachment A. Within 15 days of receipt of the renewed permit requiring the capping of the vents, Allied shall cap the passive vents.

VII. REPORTING REQUIREMENTS

13. Allied shall submit semi-annual reports regarding its compliance with the Consent Decree. Each report shall cover the preceding six months and shall be due 30 days after the end of the second and fourth calendar quarters (*i.e.*, by July 30 and January 30). Such reports shall be submitted from the Effective Date until the Consent Decree is terminated, or as the Parties may otherwise agree in writing. Each report shall cover:

a. The status of any required submittals (*i.e.*, Title V Operating Permit application modification or amendment), and the issuance of any air and solid waste permits by NYSDEC;

b. The status of compliance measures, including status of operation of the GCCS, and capping of open vents, specifically: (i) whether the active and capped vent systems continue to operate as designed based on the monitoring required in the Landfill Air Rules as described in Attachment A; (ii) whether there have been any expansions of the active or capped vent system; (iii) whether capping of open vents is complete; and (iv) whether cover integrity has been maintained based on monitoring required in the Landfill Air Rules as described in Attachment A; and

c. The Facility's semi-annual reporting and deviation reporting pursuant to the Landfill Air Rules as described in Attachment A.

14. Whenever any violation of this Consent Decree occurs, or any other event affecting Allied's performance under this Consent Decree occurs, that may pose an immediate threat to the public health or welfare or the environment, Allied shall notify EPA by email as soon as possible, but no later than 24 hours after Allied first knew of the violation or event. This procedure is in addition to the requirements of Paragraph 13.

15. Each report submitted by Allied under this Section shall be electronically signed by a responsible official on behalf of the Facility and include the following certification:

> I certify under penalty of perjury that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate,

and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

16. The reporting requirements of this Decree do not relieve Allied of any reporting obligations required by the Act or implementing regulations, or by any other federal, state, or local law, regulation, permit, or other requirement. Nothing in this Section relieves Allied of its obligation to provide the notice required by Section IX (Force Majeure).

17. Any information provided pursuant to this Decree may be used by the United States in any proceeding to enforce the provisions of this Decree and as otherwise permitted by law.

VIII. STIPULATED PENALTIES

18. Allied shall be liable for stipulated penalties to the United States for violations of this Decree as specified below, unless excused under Section IX (Force Majeure). A violation includes failing to perform any obligation required by the terms of this Decree, including any work plan or schedule approved under this Decree, according to all applicable requirements of this Decree and within the specified time schedules established by or approved under this Decree.

19. **Late Payment of Civil Penalty**. If Allied fails to pay the civil penalty required to be paid under Section V(Civil Penalty) when due, Allied shall pay a stipulated penalty of $2,500 per day for each day that the payment is late.

20. **Compliance Milestones**. The following stipulated penalties shall accrue for each day of each non-compliance with a requirement of Section VI:

Penalty Per Violation Per Day	Period of Noncompliance
$2,000	1st through 30th day
$2,500	31st day and beyond

21. **Reporting Requirements**. The following stipulated penalties shall accrue for each day of each non-compliance with a reporting requirement of Section VII:

Penalty Per Violation Per Day	Period of Noncompliance
$500	1st through 14th day
$1,000	15th through 30th day
$1,500	31st day and beyond

22. Stipulated penalties under this Section shall begin to accrue on the day after performance is due or on the day a violation occurs, whichever is applicable, and shall continue to accrue until performance is satisfactorily completed or until the violation ceases. Stipulated penalties shall accrue simultaneously for separate violations of this Consent Decree.

23. Subject to Section X (Dispute Resolution), Allied shall pay any stipulated penalty within 30 days of receiving the United States' written demand. The written demand will include instructions for making this payment at https://www.pay.gov.

24. The United States may, in the unreviewable exercise of its discretion, reduce or waive stipulated penalties otherwise due under this Decree.

25. Stipulated penalties shall continue to accrue as provided in Paragraph 22, during any Dispute Resolution, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA that is not appealed to the Court, Allied shall pay accrued penalties determined to be owing, together with interest, to the United States within 30 days of the effective date of the agreement or the receipt of EPA's decision or order.

b. If the dispute is appealed to the Court and the United States prevails in whole or in part, Allied shall pay all accrued penalties determined by the Court to be owing, together with interest, within 60 days of receiving the Court's decision or order, except as provided in subparagraph 25.c.

c. If any Party appeals the Court's decision, Allied shall pay all accrued penalties determined to be owing, together with interest, within 60 days of receiving the final appellate court decision.

26. Allied shall pay all stipulated penalties owing at https://www.pay.gov in accordance with EPA's instructions. Allied shall send notices of its payments to DOJ and EPA in accordance with Paragraph 55.

27. If Allied fails to pay stipulated penalties by the deadline under Paragraph 23, subject to Section X (Dispute Resolution), Allied shall be liable for interest on such penalties, as provided for in 28 U.S.C. § 1961, accruing as of the date payment became due. Nothing in this Paragraph shall be construed to limit the United States from seeking any remedy otherwise provided by law for Allied's failure to pay any stipulated penalties.

28. Subject to the provisions of Section XII (Effect of Settlement/Reservation of Rights), the stipulated penalties provided for in this Consent Decree shall be in addition to any other rights, remedies, or sanctions available to the United States for Allied's violation of this Consent Decree or applicable law. If the Facility is subsequently determined to be in violation of the Landfill Air Rules, any stipulated penalties paid for violations of this Consent Decree shall be allowed as a credit against any statutory penalties imposed for a violation of the Landfill Air Rules.

IX. FORCE MAJEURE

29. "Force majeure," for purposes of this Consent Decree, means any event arising from causes beyond the control of Allied, of any entity controlled by Allied, or of Allied's contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Allied's best efforts to fulfill the obligation. The requirement that Allied exercise "best

efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any such event (a) as it is occurring and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. "Force Majeure" does not include Allied's financial inability to perform any obligation under this Consent Decree.

30. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a force majeure event, Allied shall provide notice by email to EPA within seven days of when Allied first knew that the event will cause a delay. Within 14 days thereafter, Allied shall send a written notice via email to EPA that includes: an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Allied's rationale for attributing such delay to a force majeure event; a statement as to whether, in the opinion of Allied, such event may cause or contribute to an endangerment to public health, welfare or the environment. Allied shall include with any notice all available documentation supporting the claim that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude Allied from asserting any claim of force majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. Allied shall be deemed to know of any circumstance of which Allied, any entity controlled by Allied, or Allied's contractors knew or should have known.

31. If EPA agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Consent Decree that are affected by the force majeure event will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. EPA will notify Allied by email of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

32. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, EPA will notify Allied by email of its decision.

33. If Allied elects to invoke the dispute resolution procedures set forth in Section X (Dispute Resolution), it shall do so no later than 30 days after receipt of EPA's notice. In any such proceeding, Allied shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Allied complied with the requirements of Paragraphs 29 and 30. If Allied carries this burden, the delay at issue shall be deemed not to be a violation by Allied of the affected obligation of this Consent Decree identified to EPA and the Court.

X. DISPUTE RESOLUTION

34. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree.

35. **Informal Dispute Resolution**. Any dispute subject to Dispute Resolution under this Consent Decree shall first be the subject of informal negotiations. The dispute shall be considered to have arisen when Allied sends DOJ and EPA a written Notice of Dispute. Such Notice of Dispute shall state clearly the matter in dispute. The period of informal negotiations shall not exceed 20 days from the date the dispute arises unless that period is modified by written agreement. If the Parties cannot resolve a dispute by informal negotiations, then the position advanced by the United States shall be considered binding unless, within 30 days after the conclusion of the informal negotiation period, Allied invokes formal dispute resolution procedures as set forth below.

36. **Formal Dispute Resolution**. Allied shall invoke formal dispute resolution procedures, within the time period provided in the preceding Paragraph, by sending DOJ and EPA via email a written Statement of Position regarding the matter in dispute. The Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting Allied's position, and any supporting documentation relied upon by Allied.

37. The United States shall serve its Statement of Position within 45 days of receipt of Allied's Statement of Position. The United States' Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States. The United States' Statement of Position shall be binding on Allied unless Allied files a motion for judicial review of the dispute in accordance with the following Paragraph.

38. Allied may seek judicial review of the dispute by filing with the Court and sending DOJ and EPA, in accordance with Section XIV (Notices), a motion requesting judicial resolution of the dispute. The motion must be filed within 20 days of receipt of the United States' Statement of Position pursuant to the preceding Paragraph. The motion shall contain a written statement of Allied's position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and shall set forth the relief requested and any schedule within which the dispute must be resolved for orderly implementation of the Consent Decree.

39. The United States shall respond to Allied's motion within the time period allowed by the Local Rules of this Court. Allied may file a reply memorandum, to the extent permitted by the Local Rules.

40. **Standard of Review.**

a. **Disputes Concerning Matters Accorded Record Review**. Except as otherwise provided in this Consent Decree, in any dispute brought under Paragraph 35 pertaining to the adequacy or appropriateness of plans, procedures to implement plans, schedules or any other items requiring approval by EPA under this Consent Decree; the adequacy of the performance of work undertaken pursuant to this Consent Decree; and all other disputes that are

accorded review on the administrative record under applicable principles of administrative law, Allied shall have the burden of demonstrating, based on the administrative record, that the position of the United States is arbitrary and capricious or otherwise not in accordance with law.

b. **Other Disputes**. Except as otherwise provided in this Consent Decree, in any other dispute brought under Paragraph 35, Allied shall bear the burden of demonstrating that its position complies with this Consent Decree and better furthers the objectives of the Consent Decree.

41. The invocation of dispute resolution procedures under this Section shall not, by itself, extend, postpone, or affect in any way any obligation of Allied under this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated penalties with respect to the disputed matter shall continue to accrue from the first day of noncompliance, but payment shall be stayed pending resolution of the dispute as provided in Paragraph 25. If Allied does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section VIII (Stipulated Penalties).

XI. INFORMATION COLLECTION AND RETENTION

42. The United States and its representatives, including attorneys, contractors, and consultants, shall have the right of entry into the Facility, at all reasonable times, upon presentation of credentials, to:

a. Monitor the progress of activities required under this Consent Decree;

b. Verify any data or information submitted to the United States in accordance with the terms of this Consent Decree;

c. Obtain samples and, upon request, splits of any samples taken by Allied or its representatives, contractors, or consultants under this Consent Decree;

d. Obtain documentary evidence, including photographs and similar data; and

e. Assess Allied's compliance with this Consent Decree.

43. Upon request, Allied shall provide EPA or its authorized representatives splits of any samples taken by Allied. Upon request, EPA shall provide Allied splits of any samples taken by EPA.

44. Allied shall retain all required records for a period of at least five years after the termination of this Consent Decree and shall instruct its contractors and agents to preserve for a period of at least five years, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its contractors' or agents' possession or control, or that come into its or its contractors' or agents' possession or control, and that relate in any manner to Allied's performance of its obligations under this Consent Decree. This information-retention requirement shall apply regardless of any contrary corporate or institutional policies or procedures. At any time during this information-

retention period, upon request by the United States, Allied shall provide, subject to Paragraph 45, copies of any documents, records, or other information required to be maintained under this Paragraph.

45. At the conclusion of the information-retention period provided in the preceding Paragraph, Allied shall notify DOJ and EPA by email at least 90 days prior to the destruction of any documents, records, or other information subject to the requirements of the preceding Paragraph and, upon request by the United States, Allied shall deliver any such documents, records, or other information to EPA. Allied may assert that certain documents, records, or other information are privileged under the attorney-client privilege, or any other privilege recognized by federal law. If Allied asserts such a privilege, it shall provide the following: (a) the title of the document, record, or information; (b) the date of the document, record, or information; (c) the name and title of each author of the document, record, or information; (d) the name and title of each addressee and recipient; (e) a description of the subject of the document, record, or information; and (f) the privilege asserted by Allied. However, no documents, records, or other information created or generated pursuant to the requirements of this Consent Decree shall be withheld on grounds of privilege.

46. Allied may also assert that information required to be provided under this Section is protected as Confidential Business Information ("CBI") under 40 C.F.R. Part 2. As to any information that Allied seeks to protect as CBI, Allied shall follow the procedures set forth in 40 C.F.R. Part 2.

47. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of Allied to maintain documents, records, or other information imposed by applicable federal or state laws, regulations, or permits.

XII. EFFECT OF SETTLEMENT/RESERVATION OF RIGHTS

48. This Consent Decree resolves the civil claims of the United States against Allied for the violations alleged in the Complaint filed in this action through the Lodging Date.

49. The United States reserves all legal and equitable remedies available to enforce the provisions of this Consent Decree, except as expressly stated in Paragraph 48. This Consent Decree shall not be construed to limit the rights of the United States to obtain penalties or injunctive relief under the Act or implementing regulations, or under other federal laws, regulations, or permit conditions, except as expressly specified in Paragraph 48. The United States further reserves all legal and equitable remedies to address any imminent and substantial endangerment to the public health or welfare or the environment arising at, or posed by, the Facility, whether related to the violations addressed in this Consent Decree or otherwise.

50. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, civil penalties, other appropriate relief relating to the Facility or Allied's violations, Allied shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion,

claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case, except with respect to claims that have been specifically resolved pursuant to Paragraph 48.

51. This Consent Decree is not a permit, or a modification of any permit, under any federal, State, or local laws or regulations. Allied is responsible for achieving and maintaining complete compliance with all applicable federal, State, and local laws, regulations, and permits; and Allied's compliance with this Consent Decree shall be no defense to any action commenced pursuant to any such laws, regulations, or permits, except as set forth herein. The United States does not, by its consent to the entry of this Consent Decree, warrant or aver in any manner that Allied's compliance with any aspect of this Consent Decree will result in compliance with provisions of the Act, 42 U.S.C. § 7401, *et seq*., or with any other provisions of federal, State, or local laws, regulations, or permits.

52. This Consent Decree does not limit or affect the rights of Allied or of the United States against any third parties, not party to this Consent Decree, nor does it limit the rights of third parties, not party to this Consent Decree, against Allied, except as otherwise provided by law.

53. This Consent Decree shall not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

XIII. COSTS

54. The Parties shall bear their own costs of this action, including attorneys' fees, except that the United States shall be entitled to collect the costs (including attorneys' fees) incurred in any action necessary to collect any portion of the civil penalty or any stipulated penalties due but not paid by Allied.

XIV. NOTICES

55. Unless otherwise specified in this Decree, whenever notifications, submissions, or communications are required by this Consent Decree, they shall be made in writing and sent via email as follows:

As to DOJ: eescasemanagement_enrd@usdoj.gov
Re: DJ # 90-5-2-1-11610

As to EPA: Amanda Prentice
Assistant Regional Counsel
U.S. EPA Region 2
prentice.amanda@epa.gov

Robert Buettner
Chief, Air Compliance Branch
U.S. EPA Region 2
buettner.robert@epa.gov

As to Allied:

Judith George
Senior Corporate Counsel
c/o Legal Department
Allied Waste Niagara Falls LLC
18500 N. Allied Way
Phoenix, AZ 85054
JGeorge4@republicservices.com

Carroll Wade McGuffey III
Troutman Pepper Hamilton Sanders LLP
600 Peachtree Street, N.E., Suite 3000
Atlanta, Georgia 30308
mack.mcguffey@troutman.com

56. Any Party may, by email notice to the other Parties, change its designated notice recipient, notice method, or notice address provided above.

57. Notices submitted pursuant to this Section shall be deemed submitted upon sending via email, unless otherwise provided in this Consent Decree or by mutual agreement of the Parties.

XV. RETENTION OF JURISDICTION

58. The Court shall retain jurisdiction over this case until termination of this Consent Decree, for the purpose of resolving disputes arising under this Decree or entering orders modifying this Decree, pursuant to Sections X and XVI, or effectuating or enforcing compliance with the terms of this Decree.

XVI. MODIFICATION

59. The terms of this Consent Decree, including any attachments, may be modified only by a subsequent written agreement signed by the Parties. Where the modification constitutes a material change to this Decree, it shall be effective only upon approval by the Court.

60. Any disputes concerning modification of this Decree shall be resolved pursuant to Section X (Dispute Resolution), provided, however, that, instead of the burden of proof provided by Paragraph 40, the Party seeking the modification bears the burden of demonstrating that it is entitled to the requested modification in accordance with Federal Rule of Civil Procedure 60(b).

XVII. TERMINATION

61. After Allied has: (a) obtained a Title V permit incorporating the requirements of Section VI or met the requirements for GCCS removal outlined in 40 C.F.R. § 60.33f(f), (subject to all alternatives approved by EPA as described in Attachment A), whichever first occurs; (b) maintained satisfactory compliance with this Decree for two years; and (c) paid the civil penalty and any accrued stipulated penalties as required by this Decree, Allied may serve upon the United States a Request for Termination, stating that Allied has satisfied those requirements, together with all necessary supporting documentation.

62. Following receipt by the United States of Allied's Request for Termination, the Parties shall confer informally concerning the Request and any disagreement that the Parties may have as to whether Allied has satisfactorily complied with the requirements for termination of this Consent Decree. If the United States agrees that the Decree may be terminated, the Parties shall submit, for the Court's approval, a joint stipulation terminating the Decree.

63. If the United States does not agree that the Decree may be terminated, Allied may invoke Dispute Resolution under Section X. However, Allied shall not seek Dispute Resolution of any dispute regarding termination until 60 days after service of its Request for Termination.

XVIII. PUBLIC PARTICIPATION

64. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations indicating that the Consent Decree is inappropriate, improper, or inadequate. Allied consents to entry of this Consent Decree without further notice and agrees not to withdraw from or oppose entry of this Consent Decree by the Court or to challenge any provision of the Decree, unless the United States has notified Allied in writing that it no longer supports entry of the Decree.

XIX. SIGNATORIES/SERVICE

65. Each undersigned representative of Allied and the Deputy Section Chief for the U.S. Department of Justice, Environment and Natural Resources Division, Environmental Enforcement Section certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind the Party he or she represents to this document.

66. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis. Allied agrees to accept service of process by mail with respect to all matters arising under or relating to this Consent Decree and to waive the formal service requirements set forth in Rules 4 and 5 of the Federal Rules of Civil Procedure and any applicable Local Rules of this Court including, but not limited to, service of a summons.

XX. INTEGRATION/ATTACHMENTS

67. This Consent Decree constitutes the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Decree and supersedes all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than deliverables that are subsequently submitted and approved pursuant to this Decree, no other document, nor any representation, inducement, agreement, understanding, or promise, constitutes any part of this Decree or the settlement it represents, nor shall it be used in construing the terms of this Decree.

68. The following documents are attached to and incorporated into this Consent Decree:

"Attachment A" is the GCCS Design, Operations and System Closure Manual.

XXI. FINAL JUDGMENT

69. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment of the Court as to the United States and Allied.

Entered this ___ day of _____, 2024

_____

UNITED STATES DISTRICT JUDGE

Signature page for Consent Decree in *U.S. v. Allied Waste Landfill Niagara Falls, LLC*

FOR THE UNITED STATES OF AMERICA:

ELLEN M. MAHAN
Deputy Section Chief
U.S. Department of Justice
Environment and Natural Resources Division
Environmental Enforcement Section

January 9, 2024
Date

/s/ Mark Gallagher
MARK GALLAGHER
Senior Attorney
U.S. Department of Justice
Environment and Natural Resources Division
Environmental Enforcement Section
Washington, DC 20044-7611

TRINI E. ROSS
United States Attorney
Western District of New York

MARY K. ROACH
Office of the U.S. Attorney
Western District of New York
138 Delaware Ave.
Buffalo, NY 14202

Signature page for Consent Decree in *U.S. v. Allied Waste Landfill Niagara Falls, LLC*

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY:

PATRICIA HICK Digitally signed by PATRICIA HICK Date: 2023.12.21 19:31:02 -05'00' for

PAUL SIMON
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Signature page for Consent Decree in *U.S. v. Allied Waste Landfill Niagara Falls, LLC*

FOR ALLIED WASTE NIAGARA FALLS LANDFILL, LLC:

12/21/2023
Date

Kevin M. Cross
Vice President

Allied Waste Niagara Falls Landfill

Landfill Gas Collection and Control System Design Plan

Niagara Falls, New York

December 2023

Prepared By:

Environmental Information Logistics
130 E. Main Street
Caledonia, MI 49316

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SECTION I

INTRODUCTION AND GENERAL SITE CHARACTERISTICS

INTRODUCTION AND GENERAL SITE CHARACTERISTICS

Purpose

The purpose of this document is to provide a Gas Collection and Control System (GCCS) Design Plan for the Allied Waste Niagara Falls Landfill (Allied Niagara) located in Niagara Falls, New York. The plan has been prepared in accordance with both the requirements of the Federal National Emission Standards for Hazardous Air Pollutants (NESHAP) for Municipal Solid Waste Landfills, 40 C.F.R. Part 63 Subpart AAAA, and the Section 111(d) New York State Plan implementing 40 C.F.R. Part 60 Subpart Cf. To simplify the plan's language, relevant citations will reference the NESHAP and not the State Plan except where the provisions of the two rules may differ.

Site Description

Allied Niagara is comprised of multiple units (hereinafter, for historical purposes, to be referred to as "Landfills"), which were developed under several different solid waste management permits issued by the New York State Department of Environmental Conservation (NYSDEC). Initial solid waste disposal operations began in 1971 and as solid waste management regulations and technologies evolved, the design and construction of subsequent Landfills became increasingly sophisticated. Some of the Landfills, as described below, are contiguous and have "piggyback liners" to separate the waste. Other Landfills are separated by roads or ditches. However, all of the Landfills together comprise a single stationary source under the Clean Air Act.

The construction and start-up of the nearby Niagara Resource Recovery Facility (Covanta Niagara) in 1980 had a major impact on waste disposal operations at Allied Niagara. Covanta Niagara was an early pioneer in the waste-to-energy industry and incinerated municipal solid waste (MSW) for production of renewable energy. After the startup of the waste-to-energy facility in 1980, all locally generated MSW was preferentially directed to the incinerator. The ash from the combusted waste was disposed of at Allied Niagara in all of the Landfills. When the incinerator was shut down for repairs or maintenance, MSW waste was temporarily diverted to Allied Niagara until the incinerator resumed operations. This disposal practice continued until the promulgation of the Federal Subtitle D in the early 1990's.

Subtitle D resulted in a major solid waste permit change for Allied Niagara. Specifically, the Facility was no longer permitted to accept putrescible or bird-attracting waste, including some MSW, due to proximity of the Niagara Falls International Airport within 10,000 feet of the solid waste limits. However, Allied Niagara continued to receive industrial wastes, incinerator ash, construction and demolition (C&D) waste, sludges and asbestos, as well as other non-bird-attracting waste.

A description of each Landfill is provided below:

Landfill I: This Landfill began operation in 1971 and ceased waste acceptance in 1984. Final closure was in 1987. The landfill accepted MSW, commercial waste, construction & demolition (C&D) waste, sewage sludge, incinerator ash and non-hazardous industrial waste. Landfill I is contiguous to and located between Landfills II and III.

Landfill II: Waste acceptance commenced in 1972 and ceased in 1984. Final closure was in 1987. The landfill accepted MSW waste, commercial waste, C&D waste, sewage sludge, incinerator ash and non-hazardous industrial waste. Landfill II is located between Landfills I and IV.

Landfill III: This Landfill began accepting waste in 1984 and waste acceptance ceased in 1987. Final closure occurred in 1994. The January 5, 1983 Permit to Construct stated that disposal was for non-putrescible wastes only. This landfill primarily accepted C&D waste, incinerator ash, sewage sludge and non-hazardous industrial waste. Landfill III is contiguous to Landfill I.

Landfill IV: The Landfill began accepting waste in 1983. Waste acceptance ceased in 1993 and final closure occurred in 1994. The landfill accepted MSW waste, commercial waste, C&D waste, sewage sludge, incinerator ash and non-hazardous industrial waste. Landfill IV is contiguous to Landfill II. The combined Landfill I – IV area is 47 acres.

Old V Landfill: The 5-acre triangular-shaped disposal area began accepting waste in 1984. Waste disposal operations ceased in 1987 and final closure occurred in 1989. The landfill accepted MSW waste, commercial waste, C&D waste, sewage sludge, incinerator ash and non-hazardous industrial waste. The landfill is not contiguous to the other disposal areas. In Section II, calculations are provided to demonstrate that Old Landfill V can be excluded from control pursuant to 40 C.F.R. § 63.1962(a)(3)(ii) for nonproductivity.

Landfill V: Waste placement at this Landfill began in 1999 and ceased in 2011. Waste types accepted primarily included C&D, commercial solid waste, segregated waste, ash, non-hazardous industrial waste, industrial and sewage sludges, asbestos, and petroleum contaminated soil. The landfill was not permitted to accept bird-attracting waste due to the proximity of the airport. Landfill V is contiguous to active Landfill VIII and has been partially closed on the outer side slopes. The Landfill's footprint is approximately 44 acres.

Landfill VI: The Landfill began accepting waste in 1988 and final waste placement was in 1999. Final closure activities occurred in 2000. The Landfill accepted primarily C&D waste, commercial solid waste, segregated waste, incinerator ash, non-hazardous industrial waste, industrial sludges, asbestos, and petroleum-contaminated soil. Bird-attracting wastes were prohibited from disposal. Landfill VI is contiguous to Landfill VIII. A piggyback overlay liner over the south side slope of Landfill VI separates the two disposal areas. Landfill VI is 42 acres in size.

Landfill VII: This 21-acre closed Landfill is a stand-alone mono-fill which only accepted industrial lime. It operated from 1987 to 1992 and was finally closed in 1993. Since Landfill VII did not accept gas-generating material, it can be excluded from control pursuant to 40 C.F.R. § 63.1962(a)(3)(i) as a segregated area of nondegradable material, and is not covered by this GCCS Design Plan.

Landfill VIII: The Landfill began accepting waste in 2007 and is still active. The site is nearing final closure. This Landfill accepts primarily C&D waste, commercial solid waste, segregated waste, incinerator ash, non-hazardous industrial waste, industrial sludges, asbestos, and petroleum-contaminated soil. The Landfill is not permitted to accept bird-attracting waste due to the proximity of the airport. Landfill VIII is contiguous to Landfills V and VI and is 91 acres in size.

Landfill Gas Control History

An active GCCS was installed in Landfills I, II and IV and began operation in 1995. No wells were placed in adjacent Landfill III. Collected gas was sent to an enclosed flare for combustion. The active GCCS terminated operations in June 1999 due to declining gas flow rates. The 22 active gas extraction wells in Landfills I, II and IV were converted to passive vents with the permission of NYSDEC in a letter dated June 16, 1999.

Old Landfill V contains 5 passive vents that were installed as part of final closure activities. The vents were connected to a series of perforated horizontal gas collection pipes that were laid on the top slopes of the waste, below the final cover.

Landfill V originally had 37 passive vents installed on side slopes that were at permitted waste grades and had undergone final closure. In December 2019, several of these vents measuring methane over 20% were voluntarily connected to the active GCCS in Landfill VIII, described further below. The vents in Landfill V not connected to the active GCCS were capped in order to prevent air intrusion into the active GCCS. Three additional vents in the Landfill were later connected to the active GCCS.

Landfill VI originally had 47 passive vents installed at final closure. During construction of the Valley Fill area for Landfill VIII (piggyback slope liner), 11 of these passive vents were removed. 36 passive vents remain in total. As described later in Section II, a small portion of Landfill VI underneath Landfill VIII's Valley Fill liner has a perforated gas collection pipe installed that is connected to the active GCCS in Landfill VIII.

In Landfill VIII, several passive gas vents and leachate cleanout risers were connected to solar flares for odor control in 2016. An active GCCS was then installed and began operation on November 29, 2017. The GCCS is expanded periodically and consists of multiple connections to passive vents and horizontal gas collection lines. Collected gas is sent to an open (utility) flare.

Other Engineering Information

Subpart AAAA, 40 C.F.R. § 63.1962(a)(1), states that several additional items must be addressed in the GCCS Design Plan, such as depths of refuse, 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 in order to provide a design plan which contains all NESHAP elements.

Depths of Waste & Final Cover Properties

The average waste thickness and final cover properties varies by Landfill based on the solid waste regulations in place at the time of permitting. Table 1 provides a summary of this information.

Table 1: Depths of Waste & Final Cover Properties By Landfill		
Landfill Number	**Average Waste Thickness (feet)**	**Final Cover Properties (from top of waste to landfill surface)**
I – IV	80	• 2 foot clay cap • 6 inch topsoil layer
Old V	30	• 2 foot clay cap • 6 inch topsoil layer
V	100	• 6 inch grading layer • Gas venting geocomposite layer • Geosynthetic clay liner (top of LF only) • LLDPE geomembrane • Cushion geotextile (top of LF only) • Drainage layer geocomposite (LF sideslopes only) • 2 foot barrier protective layer • Six inch topsoil layer
VI	70	• One foot gas venting layer • Geotextile • Two foot low permeability barrier soil cover (on sideslopes only) • 1.5 foot low permeability barrier soil cover (top of LF only) • Geomembrane (top of LF only) • 2 foot barrier protective layer • Six inch topsoil layer
VIII	100	• 6 inch grading layer • Gas venting geocomposite layer • Geosynthetic clay liner (top of LF only) • LLDPE geomembrane • Cushion geotextile (top of LF only) • Drainage layer geocomposite (LF sideslopes only) • 2 foot barrier protective layer • Six inch topsoil layer

Leachate Management

Leachate is collected from the base of Landfills V, VI and VIII in a series of collection pipes overlaying the liner system. Leachate is discharged off-site to the local publicly owned treatment works (POTW) via a direct discharge connection. Per a 1981 engineering report for Landfills I – IV and Old V, these landfills were designed to have leachate collection systems over the soil liner, which drain to perimeter manholes for removal and disposal.

Compatibility with Filling Operations

The existing passive gas vents in place on Landfills I, II, IV, VI and the side-slopes of Landfill V do not need special precautions from active filling operations since they are in a final closed area. When new elements of the gas collection system are installed in Landfill VIII, the placement will take into consideration the stage of filling operations occurring in the area in order to minimize damage to the collection system from landfill traffic.

Integration with Closure End Use

The end use plan of Allied Niagara shall comply with NYSDEC regulations and will not disturb the integrity of the gas control system, final cover system, or any other components of the containment or monitoring system.

Minimization of Off-Site Migration

Subsurface gas monitoring was never required at Allied Niagara because waste placement at each of the Landfills was at surface grade with the liner system constructed above. Subsurface gas migration is therefore not possible since landfill gas is lighter than air and moves upwards.

SECTION II

ENGINEERING CALCULATIONS

1. ACTIVE SYSTEM FOR LANDFILLS V & VIII

NYSDEC and Allied Niagara entered into an Order on Consent on October 10, 2017 to address alleged releases of landfill gas. Schedule A of the Order on Consent included a list of Corrective Actions and a due date for completion of each action. Corrective Action Item 3 required submittal of a work plan for the development and installation of a gas collection and control system (GCCS) for Sanitary Landfill VIII, Subarea C and D and future subareas.

A workplan for a conceptual GCCS was submitted to NYSDEC for Landfill VIII's Subareas C and D, and future Subareas E and F in 2018. The workplan was prepared by SCS Engineers and was entitled "Landfill VIII, Subarea C – F Conceptual Gas Management System" (referred to hereafter as the "SCS Workplan"). SCS's active GCCS design for Landfill VIII is incorporated by reference into this GCCS Design Plan.

The GCCS design for Subareas C and D consisted of connecting existing cleanout risers and vents in areas at final grades with new horizontal collection pipes in areas that were not yet at final grades. The GCCS design for Subareas E and F consisted of several layers of horizontal gas collection pipes, to be installed in phases when the waste reached three predetermined elevations (650 msl, 670 msl and 690 msl).

The solid waste permit drawings for Landfill VIII originally contained a gas venting geo-composite layer in the final cover with exits for collected gas via passive vents. The site has instead elected to connect these passive vents to the active GCCS for additional gas control. Because this connection was not originally shown on the SCS Workplan drawings, a new drawing has been prepared for this GCCS Design Plan which shows these vents connected to the GCCS as active gas extraction locations. This drawing is provided in **Appendix B**.

The initial GCCS in Landfill VIII began operating on November 29, 2017. The system was then expanded in accordance with the SCS Workplan. As stated in Section I, Allied Niagara also voluntarily connected several passive vents in Landfill V to the active GCCS as pledged in its September 2019 meeting with EPA. The criteria for connection was measurement of methane of greater than 20% in the vents. In subsequent years, horizontal gas collection trenches were installed in Landfill VIII's Subareas E and F in accordance with the SCS Workplan, as these subareas were brought to the target waste elevations described previously. Three additional passive vents in Landfill V were connected to the active GCCS. The remaining passive vents in Landfill V have been capped to prevent air intrusion into the waste.

Engineering calculations for the active system design are discussed later in this section. Some calculations were excerpted from the SCS Workplan and other calculations have been developed for inclusion in this plan. Alternative procedures are provided in Section III of the GCCS Design Plan. A surface emissions monitoring plan is provided in Section IV. An as-built drawing of the current active gas extraction system is provided in **Appendix A**. The final build-out drawing of the active GCCS upon closure, with all future GCCS components (including connections to gas vents yet to be installed), is provided in **Appendix B**. The remaining appendices contain calculations, drawings, equipment technical information and the Initial Performance Test conducted on the permanent open flare.

2. CAPPED PASSIVE VENTS FOR LANDFILLS I, II, IV, PORTION OF V, & VI

As indicated in Section I, an active GCCS was originally installed in Landfills I, II and IV. The system terminated operations after only a few years due to declining gas flow rates and NYSDEC approved the site's request to convert the gas extraction wells to passive vents. Landfills V and VI were designed with passive vents, which were installed in accordance with the site's permitted closure plans.

Several studies of gas quality within the vents have been conducted as shown in **Attachment 1** (Landfill VI) and **Attachment 2** (Landfills I – IV and Old V). Specifically, EPA measured gas quality at selected vent locations in October, 2016. Landfill VI underwent two separate methane studies by a third party (Monitoring, Control and Compliance or MCC) in May and June of 2019 and a site-directed flow study in the summer of 2019, pursuant to an EPA-approved workplan prepared by Allied Niagara. After EPA determined in March 2023 that Landfills I – IV and Old V should be included in an updated GCCS Design Plan, Allied-Niagara collected additional information on the passive vents (methane and flow) in these Landfills in May 2023. As demonstrated later in this section, Landfill Old V can be excluded from control on the basis of non-productivity.

After a review of the gas quality and flow information, Allied Niagara has concluded that these remaining landfills are unsuitable for active gas collection and control because the average methane quality is insufficient to sustain a flame at a flare (*i.e.*, less than 20%) and flows are negligible. EPA has requested that these passive vents be capped. The capping of these vents is contingent upon approval from NYSDEC's Department of Solid Waste, since passive venting is part of the approved post-closure care plans for these Landfills. Pursuant to the Consent Decree, Allied shall apply for a revised NYSDEC Solid Waste Management Facility Permit to require the capping of these passive vents. Allied shall cap the passive vents within 15 days of receiving its permit requiring it to cap these passive vents.

An as-built drawing of the passive vent locations before the active GCCS was installed, without the vents removed as part of the Landfill VIII Valley Fill, is provided in **Appendix A**. Note that the vents in Landfills V and VIII depicted in these as-builts have either been connected to the active GCCS or have been capped to prevent air intrusion. Vent details (by Landfill) are also included in **Appendix A**. A plan for monitoring the capped vents is included in Section III of this GCCS Design Plan, along with action levels and corrective measures for build-up of pressure or surface emissions monitoring (SEM) methane exceedances. With the exception of time periods for temporary corrective actions, the caps will remain in place on the vents until Allied Niagara meets the criteria for gas system shutdown and equipment removal. Note that Landfill Old V's vents will not be capped because, as demonstrated later in this section, the area is non-productive and can be excluded from control.

Attachment 1a
EPA Sample Results (Methane)
Sampled October, 2016

Vent Name:	Landfill No.	Methane (ppmv)	Methane (%)
Vent 63	VI	85,000	8.50%
Vent 61	VI	2,100	0.21%
Vent 48	VI	6,600	0.66%
Vent 44	VI	15,000	1.50%
Vent 65	VI	3,200	0.32%
Vent 62	VI	220	0.02%
Vent 57	VI	83,000	8.30%
Vent 49	VI	55,000	5.50%
Vent 57 (Duplicate)	VI	120,000	12.00%
Vent 84	VI	7,100	0.71%
Vent 72	VI	60,000	6.00%

Average EPA Measured Methane Quality for Landfill VI: 3.97%

Attachment 1b
Niagara MCC Methane Measurements (Phase 1 Summary)
for Landfill VI Vents

Vent No.	Measurement Date	Methane %	Measurement Date	Methane %
NFLGV038	5/30/2019 14:10	0	6/17/2019 12:10	0
NFLGV039	5/30/2019 14:21	0	6/17/2019 12:16	0
NFLGV040	5/30/2019 14:49	0	6/17/2019 13:24	0
NFLGV041	5/30/2019 14:57	0	6/17/2019 13:29	0
NFLGV042	5/30/2019 15:10	0	6/17/2019 13:34	0
NFLGV043	5/30/2019 18:51	3.6	6/17/2019 13:19	0
NFLGV044	5/30/2019 18:56	2.4	6/17/2019 13:14	0
NFLGV045	5/30/2019 19:01	8.8	6/17/2019 12:54	8.6
NFLGV046	5/30/2019 19:06	14.3	6/17/2019 13:01	12.2
NFLGV047	5/30/2019 19:11	14.3	6/17/2019 12:48	12.4
NFLGV048	5/30/2019 18:45	0	6/17/2019 13:09	0
NFLGV049	5/30/2019 18:40	6.2	6/17/2019 12:43	21.6
NFLGV050	5/30/2019 14:36	0	6/17/2019 12:31	0
NFLGV054	5/30/2019 18:34	13	6/17/2019 12:37	0
NFLGV057	5/30/2019 18:23	32.3	6/17/2019 16:04	0
NFLGV060	5/30/2019 16:54	11	6/17/2019 14:57	9.6
NFLGV061	5/30/2019 18:28	26.7	6/17/2019 16:00	10.2
NFLGV062	5/30/2019 18:17	39.5	6/17/2019 15:56	28.4
NFLGV063	5/30/2019 17:55	34.6	6/17/2019 15:48	17.5
NFLGV064	5/30/2019 17:50	26.5	6/17/2019 15:52	22.3
NFLGV065	5/30/2019 17:44	11	6/17/2019 15:06	3.9
NFLGV066	5/30/2019 17:36	14.1	6/17/2019 15:02	9.9
NFLGV067	5/30/2019 17:01	0	6/17/2019 14:44	0.1
NFLGV068	5/30/2019 17:06	3	6/17/2019 14:32	0
NFLGV069	5/30/2019 15:45	0	6/17/2019 13:52	0
NFLGV070	5/30/2019 18:00	26.8	6/17/2019 15:45	23
NFLGV071	5/30/2019 17:29	0	6/17/2019 15:12	0
NFLGV072	5/30/2019 17:13	8.8	6/17/2019 14:40	0
NFLGV073	5/30/2019 18:06	12.6	6/17/2019 15:42	2.4
NFLGV074	5/30/2019 17:24	0	6/17/2019 15:37	0
NFLGV075	5/30/2019 17:18	1.2	6/17/2019 14:36	2.6
NFLGV076	5/30/2019 15:53	0	6/17/2019 13:58	0
NFLGV077	5/30/2019 16:02	0	6/17/2019 14:04	0
NFLGV078	5/30/2019 16:09	0	6/17/2019 14:12	0
NFLGV079	5/30/2019 16:17	0	6/17/2019 14:17	0
NFLGV080	5/30/2019 16:34	0	6/17/2019 14:22	0
NFLGV081	5/30/2019 14:29	0	6/17/2019 12:22	0
NFLGV082	5/30/2019 15:22	0	6/17/2019 13:42	0
NFLGV083	5/30/2019 15:31	0	6/17/2019 13:47	0
NFLGV084	5/30/2019 16:44	14.2	6/17/2019 14:27	13
AVERAGE LF VI METHANE:		**8.12%**		**4.94%**

Attachment 2a
EPA Sample Results (Methane)
Sampled October, 2016

Vent Name:	Landfill No.	Methane (ppmv)	Methane (%)
Vent EW-16	I - IV	28,000	2.80%
Vent EW-17	I - IV	32,000	3.20%
Vent FEW-04	I - IV	100,000	10.00%
Vent EW-08	I - IV	160,000	16.00%
Vent EW-13	I - IV	140,000	14.00%
Vent EW-15	I - IV	84,000	8.40%
Vent EW-13 (Duplicate)	I - IV	160,000	16.00%

Average EPA Measured Methane Quality for Landfills I - IV: 10.06%

Attachment 2b
Methane Quality and Pressure Measurements in Landfills I, II, IV & Old V
May 2023

Vent No.	Landfill No.	Date Measured	Entity	Method	ppm CH4	%CH4	Static Pressure Inches w.c.	Flow cfm
EW-1	IV	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0000%**		**0.00**
EW-2	IV	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.01	4.47
					AVERAGE	**0.0000%**		**4.47**
EW-3	IV	5/10/2023	Allied	GEM 5000		1.50%		
		5/18/2023	Allied	GEM 5000		0.30%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		1.50%	0.00	0.00
					AVERAGE	**0.8250%**		**0.00**
EW-4	IV	5/10/2023	Allied	GEM 5000		10.90%		
		5/18/2023	Allied	GEM 5000		4.90%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		15.60%	0.02	6.32
		5/26/2023	Allied	GEM 5000		5.40%		
					AVERAGE	**7.36%**		**6.32**
EW-5	IV	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.10%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.02	6.32
					AVERAGE	**0.0250%**		**6.32**
EW-6	IV	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0000%**		**0.00**
EW-7	II	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.01	4.47
					AVERAGE	**0.0000%**		**4.47**
EW-8	II	5/10/2023	Allied	GEM 5000		1.00%		
		5/18/2023	Allied	GEM 5000		0.40%		
		5/24/2023	Allied	GEM 5000		0.00%		
								N/A - See
		5/25/2023	Allied	GEM 5000		0.80%	-0.02	Note 1
					AVERAGE	**0.55%**		**0.00**

Attachment 1 Cont.

Vent No.	Landfill No.	Date Measured	Entity	Method	ppm CH4	%CH4	Static Pressure Inches w.c.	Flow cfm
EW-9	II	5/10/2023	Allied	GEM 5000		17.80%		
		5/18/2023	Allied	GEM 5000		14.60%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		11.10%	0.00	0.00
					AVERAGE	**10.8750%**		**0.00**
EW-10	I	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	-0.01	N/A - See Note 1
					AVERAGE	**0.0000%**		**0.00**
EW-11	I	5/10/2023	Allied	GEM 5000		15.20%		
		5/18/2023	Allied	GEM 5000		4.90%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		29.30%	0.00	0.00
		5/26/2023	Allied	GEM 5000		0.00%		
					AVERAGE	**9.88%**		**0.00**
EW-12	I	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0000%**		**0.00**
EW-13	I	5/10/2023	Allied	GEM 5000		7.40%		
		5/18/2023	Allied	GEM 5000		3.30%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		12.20%	0.02	6.32
					AVERAGE	**5.73%**		**6.32**
EW-14	I	5/10/2023	Allied	GEM 5000		3.40%		
		5/18/2023	Allied	GEM 5000		4.10%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		3.40%	0.02	6.32
					AVERAGE	**2.73%**		**6.32**
EW-15	I	5/10/2023	Allied	GEM 5000		16.40%		
		5/18/2023	Allied	GEM 5000		7.30%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	-0.01	N/A - See Note 1
					AVERAGE	**5.93%**		**0.00**
EW-16	I	5/10/2023	Allied	GEM 5000		8.00%		
		5/18/2023	Allied	GEM 5000		4.20%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		7.20%	0.00	0.00
					AVERAGE	**4.85%**		**0.00**

Attachment 1 Cont.

Vent No.	Landfill No.	Date Measured	Entity	Method	ppm CH4	%CH4	Static Pressure Inches w.c.	Flow cfm
EW-17	I	5/10/2023	Allied	GEM 5000		9.60%		
		5/18/2023	Allied	GEM 5000		5.40%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		20.20%	0.00	0.00
		5/26/2023	Allied	GEM 5000		0.50%		
					AVERAGE	**7.14%**		**0.00**
EW-18	I	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0000%**		**0.00**
EW-19	I	5/10/2023	Allied	GEM 5000		14.90%		
		5/18/2023	Allied	GEM 5000		4.10%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		22.50%	0.01	4.47
		5/26/2023	Allied	GEM 5000		0.00%		
					AVERAGE	**8.30%**		**4.47**
EW-20	I	5/10/2023	Allied	GEM 5000		0.30%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0750%**		**0.00**
EW-21	II	5/10/2023	Allied	GEM 5000		10.50%		
		5/18/2023	Allied	GEM 5000		6.90%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		17.70%	0.00	0.00
		5/26/2023	Allied	GEM 5000		0.00%		
					AVERAGE	**7.0200%**		**0.00**
EW-22	IV	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.00	0.00
					AVERAGE	**0.0000%**		**0.00**

Average Methane Quality for Landfills I - IV in 2023: **3.2398%**

Attachment 1 Cont.

Vent No.	Landfill No.	Date Measured	Entity	Method	ppm CH4	%CH4	Static Pressure Inches w.c.	Flow cfm
SAN 5-1	Old V	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/19/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.00%	0.01	4.47
					AVERAGE	**0.0000%**		**4.47**
SAN 5-2	Old V	5/10/2023	Allied	GEM 5000		0.00%		
		5/18/2023	Allied	GEM 5000		0.00%		
		5/19/2023	Allied	GEM 5000		1.20%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.10%	0.01	4.47
					AVERAGE	**0.2600%**		**4.47**
SAN 5-3	Old V	5/19/2023	Allied	GEM 5000		0.20%		
		5/24/2023	Allied	GEM 5000		0.00%		
		5/25/2023	Allied	GEM 5000		0.30%	0.00	0.00
					AVERAGE	**0.1667%**		**0.00**
SAN 5-4	Old V	5/19/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
								N/A - See
		5/25/2023	Allied	GEM 5000		0.00%	-0.01	Note 1
					AVERAGE	**0.0000%**		**0.00**
SAN 5-5	Old V	5/19/2023	Allied	GEM 5000		0.00%		
		5/24/2023	Allied	GEM 5000		0.00%		
								N/A - See
		5/25/2023	Allied	GEM 5000		0.00%	-0.01	Note 1
					AVERAGE	**0.0000%**		**0.00**

Notes:

1. Negative values suggest air movement into the landfill versus gas flow out of the landfill.

3. CALCULATION OF MAXIMUM GAS FLOW RATE (ACTIVE SYSTEM)

Introduction

The NESHAP states that a gas system should "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 or treatment system equipment" (40 C.F.R. § 63.1959(b)(2)(ii)(B)(1)). A calculation of the maximum gas flow rate from the facility is therefore included as an element of this design plan. No calculations of maximum gas flow are required for the Landfills that will have capped vents since no header pipes, gas mover equipment or control devices need to be sized for these Landfills using this information.

There are two methods provided in the NESHAP for the calculation of maximum gas flow rate. The first method utilizes equations from either 40 C.F.R. § 63.1960(a)(1)(i) or (ii), depending on whether the site has records on the year-by-year waste acceptance rate. The second method listed in § 63.1960(a)(1)(iii) states:

> *If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, Equation 5 or Equation 6 in paragraphs (a)(1)(i) and (ii) of this section. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using Equation 5 or Equation 6 in paragraph (a)(1)(i) or (ii) of this section or other methods must be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.*

Allied Niagara will use the second method (predicted maximum gas generation rate based on actual flow data) since a GCCS has been installed and the facility is within a few years of final closure.

Calculation of Maximum Gas Flow Rate

The prediction of a maximum expected gas generation flow rate for Allied Niagara is based on actual landfill surface area covered by the GCCS each year. When the surface area in acres is correlated with measured gas flow data for that year, a site-specific "cfm of gas per acre" value can be developed for that year. This gas generation value can then be applied to the future areas of Landfill VIII, which are not currently covered by the active GCCS in order to project a final maximum expected gas generation flow rate. To provide a conservative estimate of maximum gas flow rate, the highest calculated cfm/acre value will be utilized.

Year Of Operation	Measured GCCS Flow (cfm)	No. of Acres Covered by GCCS	Calculated GCCS Flow per acre (cfm/acre)
2017	365	28.5	12.8
2018	768	39.9	19.2
2019	1,168	95.6	12.2
2020	**1,381**	**95.6**	**14.4**
2021	869	98.9	8.8
2022	753	104	7.2
2023	742	104	7.1

In 2023, 17.6 acres of Landfill VIII do not currently have active GCCS coverage. This future area would therefore have the following projected flow rate once connected:

17.6 acres x 14.4 cfm/acre = 253 cfm

When added to the current measured flow rate in 2023 for landfill areas covered by the active GCCS (742 cfm), a flow volume of 995 cfm at closure is projected for Landfill VIII.

Note that this flow at closure is less than the average measured gas flow rate of 1,381 cfm in 2020. Since Landfill VIII does not contain putrescible (bird attracting) waste, sustainable generation over long periods of time is expected to be different than typically projected for a MSW landfill. Once initial built-up volumes of gas were removed from the landfilled waste (known in industry as the "gas bubble"), much lower rates of recovery have been documented in later years of system operation. Based on the calculations above, the maximum gas generation flow rate has already occurred.

Therefore, 1,381 cfm will be used throughout this GCCS Design Plan as the maximum gas flow rate for design purposes. This is very close to the maximum gas flow rate of 1,350 cfm calculated for Landfill VIII in the 2018 SCS Workplan.

4. WELL PLACEMENT (ACTIVE SYSTEM)

Introduction

Well spacing is the first design element listed under 40 C.F.R. § 63.1962(a): Specifications for Active Collection Systems. Specifically, § 63.1959(b)(2)(i) states that collection wells, horizontal collectors, surface collectors, or other extraction devices must be sited at a sufficient density throughout all gas-producing areas. As stated in Section I, the original active GCCS in Landfill VIII was established by connecting existing passive gas vents in areas at final grade to headers and laterals, which conveyed the collected gas to an open flare for combustion. Select vents in Landfill V were also connected to the active GCCS. To supplement the passive vents in areas not yet at final grades, the workplan developed by SCS Engineers also included the construction and installation of horizontal gas collectors. Lastly, select leachate cleanout risers were connected to the active GCCS to provide additional gas management.

The Facility has been conducting monthly surface emissions monitoring (SEM) in landfill areas that are uncapped since 2018, in accordance with a consent order with the State of New York. These scans demonstrate that the spacing of these vent wells and horizontal trenches are adequate to control surface emissions in these areas. Therefore, no calculations for the radius of influence (ROI's) have been provided for the existing vents and horizontal trenches connected to the active GCCS.

If the spacing is not adequate to control a SEM exceedance, the site will expand the system or request approval of an alternative remedy as allowed by 40 C.F.R. § 63.1960(c)(4)(v).

Vent Construction

Description of Vertical Gas Vents:

The gas vents installed in Landfill VIII consist of 4-inch SDR-17 HDPE pipe. The pipe was installed in one-foot-diameter boreholes and the boreholes were backfilled with stone. Each vent connected to the active system is now equipped with a wellhead that allows for adjustment of vacuum, measurement of flow, and sample ports for gas quality and temperature measurements. Vent depths vary below grade from 5.5 feet to 7 feet and vent details are included in **Appendix A**.

Future vents will also be constructed at closure in accordance with this design. Additionally, as described in Section I (final cover details for Landfill VIII), the entire final cover system at closure will be underlain by a gas vent geocomposite membrane, which provides 100% coverage of the landfilled area.

Vents in Landfill V were either 4-inch or 6-inch SDR-17 HDPE pipe and range in depth from 6 to 20 feet below grade. Stone backfill was placed around the perforated pipe. When select vents were voluntarily connected to the active GCCS in 2019, wellheads were installed that allowed for measurement of flow, gas quality, and adjustment of vacuum.

Description of Horizontal Trenches:

The horizontal gas collection trenches in Subareas E and F of Landfill VIII were designed to be installed at three different vertical waste elevations: 650 msl, 670 msl and 690 msl. Horizontal spacing of the gas collection trenches does not exceed 100 feet. The trenches are/will be connected to the main header line installed on the northern perimeter of Landfill VIII.

Horizontal gas collection piping consists of perforated four-inch SDR-17 HDPE or equivalent. The pipes are placed in a bedding of coarse aggregate (2-inch diameter) and non-woven geotextile. The collectors terminate 100 feet from the edge of the waste mass to prevent air intrusion. Each horizontal collector is equipped with a wellhead for gas quality sample collection and valves to regulate the amount of applied vacuum.

Subareas E & F Landfill VI Valley Fill Overlay

The design for the Valley Fill liner system for Landfill VIII, Subareas E & F, included provisions to actively collect any gas generated in Landfill VI in the waste that lies directly beneath the liner system. There is a one-foot gas venting layer incorporated into Landfill VI's final cover system, which lies below the Valley Fill's geosynthetic liner. A perforated gas collection pipe was installed in this gas venting layer, at the top edge of the Valley Fill's liner. The perforated pipe was connected to the active gas collection system and is under a vacuum. Any gas generated in the waste in Landfill VI below the Valley Fill liner system, which is collected by the gas venting layer, will travel to and be collected by the active gas system via the perforated collection pipe.

Specifications for Active GCCS:

The existing and future gas vent wells/horizontal trenches meet the following specifications listed in 40 C.F.R. § 63.1962(a)(1):

- Minimization of air intrusion
- Waste depths and sampling valves
- Required materials of construction and gravel dimensions
- Corrosion resistance
- Sufficient density of extraction devices
- Avoidance of damage to underlying liners (N/A – vents and horizontal trenches are well above the liner)
- Occurrence of water within the landfill (N/A – vents are at the surface and will not encounter water)

5. HEADER PIPE SIZING (ACTIVE SYSTEM)

Introduction

The next step in designing a gas collection system is to lay out a routing for the header line and laterals to connect each of the gas extraction locations into the system, and convey the collected gas to a central location for destruction.

After the design engineer has routed the most efficient header system for collecting gas from the extraction devices, the header pipe must be of suitable dimensions to convey projected amounts of gas, consistent with the provisions of 40 C.F.R. § 63.1962(b)(1). Typical design criteria and header construction methods are generally discussed in the following subsections.

Design Criteria

The 2018 SCS Workplan for Landfill VIII contained the following criteria for header pipe sizing and layout:

- Select header pipe size so that the LFG velocity does not exceed 20 feet per second with countercurrent flow of gas and condensate.
- Keep friction loss to approximately 1 inch of water column per 100 feet of pipe or less.
- Minimum header size: 6 inches. Minimum lateral size: 4 inches.
- Place header pipe at a minimum 3 percent grade in landfill areas to allow gravity drainage of condensate.
- Drain condensate to the main header. Drain condensate in the Subareas C and D main headers to the blower/flare station. Drain condensate in the Subareas E and F main header to condensate pump stations.
- Minimize low points.

Calculations for header pipe sizing excerpted from the SCS Workplan are provided in **Appendix C** of this GCCS Design Plan.

Header Construction

Description of Header Collection Pipe Network

All header and lateral piping is SDR 17 high density polyethylene (HDPE) pipe. HDPE pipe is ideal due to its compatibility with landfill gas and waste, its flexibility (if settlement occurs), its long-term stability and its excellent chemical resistance. The pipe is set in a trench, and is surrounded by compatible bedding media. Header pipe is installed in corrugated metal or polyethylene pipe at road crossings. The depth of the trench, the bedding material and the road crossing protection ensure protection of the header pipe from landfill truck traffic.

Control valves are located throughout the collection header network. The valves can manually shut off the applied vacuum to a particular section of header pipe. This allows portions of the well field to be isolated for monitoring and maintenance purposes. Blind flanges have been incorporated into the design in order to allow for future gas system expansions.

Specifications for Active GCCS:

The header system as described in this section will meet the following elements listed in 40 C.F.R. § 63.1962(b)(1):

- Gas system expandability & accessibility
- Withstand installation, static, and settlement forces
- Corrosion resistance
- Fill settlement
- Required materials of construction
- Ability to withstand planned overburden or traffic loads

6. GAS MOVER EQUIPMENT SIZING (ACTIVE SYSTEM)

Introduction

The next step in designing a gas collection system is to size and select gas mover equipment which meets the specifications of 40 C.F.R. § 63.1962(c). The gas mover equipment (blower) must be sized to handle the maximum gas generation flow rate expected over the intended use period of the equipment.

Design Criteria

Flow Volumes: The blower must provide a uniform source of vacuum over a range of flow rates, since gas flow volumes will vary over the life of the gas extraction system. Minimum system flows are those expected when only the initial phases of the system have been installed. The maximum gas flow is 1,381 cfm.

Pressure Requirements: The blower must be capable of supplying sufficient negative pressure to overcome pressure drops and resistance through piping and equipment at the calculated maximum gas flow rate, as well as supplying sufficient positive pressure for delivery of the collected gas to the flare for combustion. In the SCS Workplan, the following head losses and system demands were calculated:

- Desired vacuum at each collector: 20 in-w.c.
- Estimated Piping losses: 12 in-w.c.
- Blower Station valves and fittings: 10 in-w.c.
- Flare back pressure: 10 in-w.c.

The total pressure head required for the active GCCS in Landfill VIII was calculated by SCS to be 52 in-w.c. with 42 in-w.c. of vacuum. The permanent flare skid blowers at the facility are designed to provide 80 in-w.c. of vacuum at a flow of 1,500 cfm, leaving approximately 38 in-w.c. contingency. The design value of 1,500 cfm is also greater than the maximum gas generation rate of 1,381 cfm established earlier in the GCCS Design Plan. The existing blowers therefore meet both flow and pressure specifications of the active system in Landfill VIII, consistent with the NESHAP.

7. CONTROL DEVICE SIZING (ACTIVE SYSTEM)

Introduction

The last step in designing a gas collection system is to size and select a control device meeting the specifications of § 63.1959(b)(2)(iii). The control device selected must be capable of combusting a range of flow volumes.

General Design Criteria

Section 63.1959(b)(2)(iii)(A) states that non-enclosed (open) flares used for control should be designed and operated in accordance with 40 C.F.R. § 63.11. The open flare installed at the facility was manufactured by John Zink and is guaranteed to meet the federal air standards for landfills. An Initial Performance Test was conducted at the flare on April 30, 2019. A copy of the test report is provided in **Appendix D**. The test report demonstrated that the flare was able to meet the visible emissions, exit velocity and fuel heat value specifications of 40 C.F.R. § 60.18, which has equivalent corresponding provisions in § 63.11.

Control Device Sizing

Based on the calculations for gas system flow provided in this section, combustion capacity is needed for approximately 1,381 cfm of landfill gas. The existing flare is sized at 3,000 cfm. Therefore, the existing flare is more than sufficient to combust the maximum gas flow rate from the active GCCS in Landfill VIII.

8. LANDFILL GAS GENERATION CALCULATIONS FOR CLOSED LANDFILLS

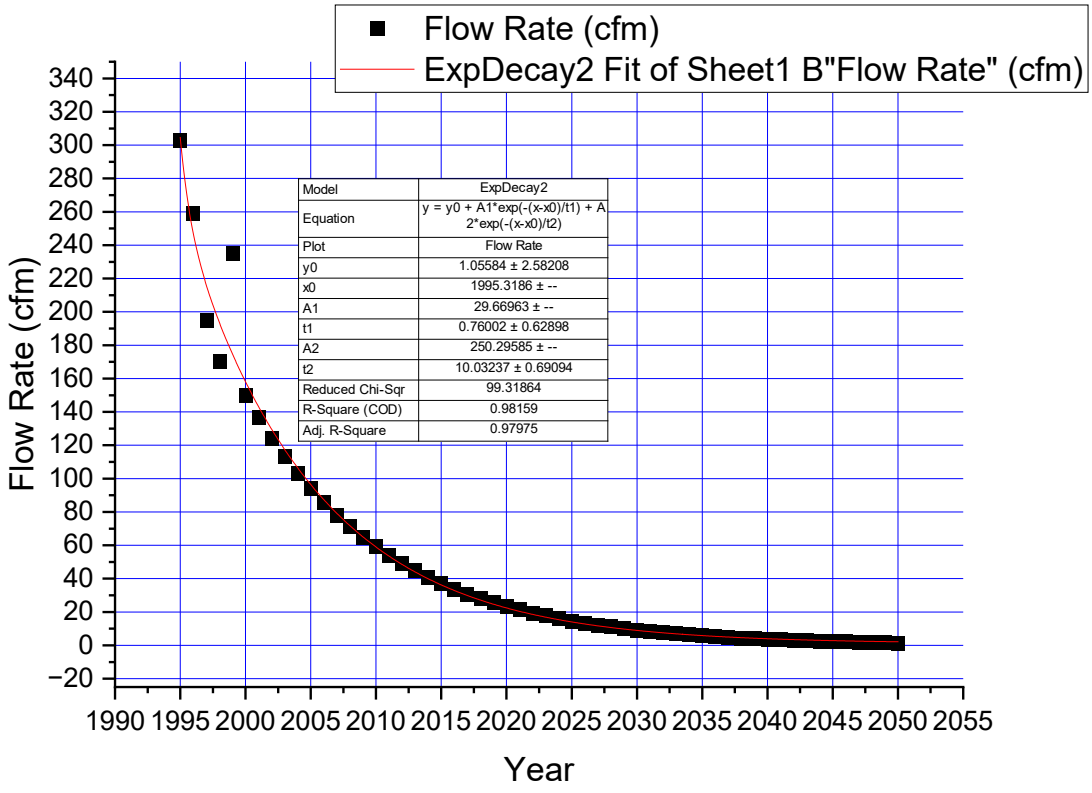
Introduction

Several methodologies are provided in this section for calculating landfill gas generation from the closed Landfills at Allied Niagara. These calculations are needed to apply the equation provided in 40 C.F.R. § 63.1959(c) after closure of Landfill VIII to determine when NMOC emission rates from the facility are below the agreed upon threshold that indicates gas generation can no longer support an active GCCS and it should be removed. These calculations are also used to support determinations of non-productivity.

Flow Calculation Methodology (By Landfill)

Landfills I, II and IV

As stated in Section I, an active GCCS operated in these three Landfills in the 1990s. Section 63.1960(a)(1)(iii) allows calculation of future gas generation flow rates using actual measured flows. Although the GCCS is no longer in place, the collected flows from the 1990s were graphed and curve-fit to project flow rates into the future. As shown on the curve below, flow is essentially exhausted by the year 2040. At that time, the in-place waste will be more than a half-century old.



When the gas flows decrease in Landfill VIII's GCCS after permanent site closure and the site begins collection of the three rounds of NMOC samples to calculate NMOC emission rates, Allied Niagara will use the gas flow value in the graph above, in the corresponding year, to calculate an NMOC emissions rate for Landfills I, II and IV. This emissions rate will be added to the Landfill V & VIII emission rate (calculated in accordance with 40 C.F.R. § 63.1959(c)) to determine if

NMOC emissions from the facility are below the agreed-upon threshold for GCCS removal.

Landfill III

As stated in Section I, no gas management system was ever installed in this Landfill because it only accepted non-putrescible waste, including C&D, incinerator ash, sewage sludge and industrial waste. Therefore, the EPA's LandGEM Model (Version 3.03) will be used to model LFG generation flow rates for NMOC emission rate calculations.

Per the July 29, 2015 Section 114 response submitted to USEPA, the design capacity of Landfill III is 420,060 bcy. This equates to 252,036 tons using a density of 1,200 lbs/bcy. Landfill III operated from 1984 – 1987 and an average waste volume of 63,009 tons/year was estimated for use in the LandGEM model because actual annual disposal rates were not available.

To select appropriate inputs for the LandGEM model, Allied Niagara conservatively assumed that all waste was C&D even though much of the waste landfilled during those years was inert incinerator ash (site records show that inert wastes were primarily sent to Landfill III in order to preserve airspace in Landfill IV for putrescible waste disposal).

EPA has established emission factors for limited gas generation from C&D in the Mandatory Greenhouse Gas Reporting Rules (40 C.F.R. Part 98). EPA's DOC and k values from Table HH-1 to Subpart HH of Part 98 were utilized to establish the following values for use in the LandGEM model:

k = 0.057 $year^{-1}$ (appropriate for locations with annual precipitation > 40 inches/year)

Lo = 59 m^3 methane/metric ton waste (derived from C&D DOC value - see **Attachment 3**)

The LandGEM model output provided in **Attachment 4** predicts a value of 12.63 cfm gas generation in the current year (2023). The appropriate gas generation flow value will be selected from the model output for the year that Allied Niagara performs the NMOC emissions rate calculation for GCCS removal.

Landfills Old V & VI

A methodology was developed and submitted to EPA in July 2021 for calculating gas generation flow rates from Landfill VI using pressure data measured at the passive gas vents that also evidenced localized gas production based on detectable methane levels. This methodology was re-submitted to EPA in July 2023 at EPA's request.

It is appropriate for use in calculating gas generation flow values for Landfill VI since the existing passive vents, which cover the entire Landfill footprint, are the most likely place for localized pockets of gas generation to be detected and measured.

Consistent with the September 14, 2018 plan approved by the EPA in April 2019 ("Proposed Conceptual Plan for Designing a Gas Collection System Expansion"), Allied conducted a two-phased evaluation of the gas quality and flow for the passive vents in Landfills V & VI. The gas quality and pressure measurements in the first phase of the investigation occurred on two different dates, May 30, 2019 and June 17, 2019. The measurements were performed using a Landtec SEM

5000 field meter.

Per a review of the data from each event, the static pressure measured at each vent was usually positive when there was an associated detection of methane and/or carbon dioxide. Otherwise, the static pressure was slightly negative, which indicates an inward gradient of flow into the Landfill versus an outward gradient (*i.e.*, insufficient gas was being generated within the industrial waste at that location to flow out from the vent, and ambient air was being drawn into the Landfill venting system).

The vents that had methane and carbon dioxide detected were grouped into a data set for each of the two event dates, and an average static pressure across this group of vents was calculated. For the May 30, 2019 event, an average static pressure of 0.0270 inches w.c. was measured across 21 vents which detected methane, as shown in the data table below:

Well_ID	Date	CH4_Percent	CO2_Percent	O2_Percent	Balance _Percent	Init_ Static_P
Vent 84	5/30/2019 16:44	14.2	0.9	4.2	80.7	0.01
Vent 60	5/30/2019 16:54	11	1.5	7.3	80.2	0.02
Vent 68	5/30/2019 17:06	3	1.3	12.4	83.3	0
Vent 72	5/30/2019 17:13	8.8	1.2	10.8	79.2	-0.01
Vent 75	5/30/2019 17:18	1.2	0.1	18.2	80.5	0.02
Vent 66	5/30/2019 17:36	14.1	3.6	8.3	74	0.02
Vent 65	5/30/2019 17:44	11	6.3	6.6	76.1	0.02
Vent 64	5/30/2019 17:50	26.5	7.2	0.3	66	0.05
Vent 63	5/30/2019 17:55	34.6	2.8	2.5	60.1	0.05
Vent 70	5/30/2019 18:00	26.8	2.2	0.1	70.9	0.03
Vent 73	5/30/2019 18:06	12.6	2	0.6	84.8	0.1
Vent 62	5/30/2019 18:17	39.5	1.1	0	59.4	0.02
Vent 57	5/30/2019 18:23	32.3	0.7	0.1	66.9	0.08
Vent 61	5/30/2019 18:28	26.7	2.5	3.9	66.9	0.03
Vent 54	5/30/2019 18:34	13	1.6	0.8	84.6	0.04
Vent 49	5/30/2019 18:40	6.2	0.1	16	77.7	-0.02
Vent 43	5/30/2019 18:51	3.6	0.1	7.7	88.6	0
Vent 44	5/30/2019 18:56	2.4	0.4	13.1	84.1	-0.01
Vent 45	5/30/2019 19:01	8.8	0.3	0.9	90	0.04
Vent 46	5/30/2019 19:06	14.3	0.7	0	85	0.01
Vent 47	5/30/2019 19:11	14.3	0.1	1	84.6	0.06
	Ave Measurement:	15.47	1.75	5.47	77.31	**0.027**

For the June 17, 2019 event, an average static pressure of 0.0260 inches w.c. was measured across 16 vents that had methane detections as shown in the following data table:

Well_ID	Date	CH4_Percent	CO2_Percent	O2_Percent	Balance_Percent	Init_Static_P
Vent 49	6/17/2019 12:43	21.6	0.6	1.4	76.4	0.07
Vent 47	6/17/2019 12:48	12.4	0.1	2.9	84.6	0.03
Vent 45	6/17/2019 12:54	8.6	0.2	0.2	91	0.02
Vent 46	6/17/2019 13:01	12.2	0.5	0.2	87.1	0.02
Vent 84	6/17/2019 14:27	13	1.5	0.5	85	0.03
Vent 75	6/17/2019 14:36	2.6	0.9	11	85.5	-0.02
Vent 67	6/17/2019 14:44	0.1	1.8	13.6	84.5	-0.01
Vent 60	6/17/2019 14:57	9.6	3	3.7	83.7	0
Vent 66	6/17/2019 15:02	9.9	3.6	9.3	77.2	0.02
Vent 65	6/17/2019 15:06	3.9	5.5	8.4	82.2	0.05
Vent 73	6/17/2019 15:42	2.4	0.3	10.3	87	0.03
Vent 70	6/17/2019 15:45	23	1.6	4	71.4	0.01
Vent 63	6/17/2019 15:48	17.5	2.5	6.4	73.6	0.05
Vent 64	6/17/2019 15:52	22.3	7.9	0.6	69.2	0.06
Vent 62	6/17/2019 15:56	28.4	2.2	1.9	67.5	0.03
Vent 61	6/17/2019 16:00	10.2	2.2	10.9	76.7	0.02
	Ave Measurement:	12.36	2.15	5.33	80.16	**0.026**

An average static pressure of 0.0265 inches w.c. in each vent was therefore used in the flow equation. Other site-specific data such as barometric pressure, actual vent diameter, gas density based on actual concentrations measured, etc. obtained from the two 2019 methane investigation studies were utilized in the calculation for flow.

Flow from a passive vent can be calculated using the Bernoulli equation, as shown below:

Bernoulli Equation

$$0 = Z_2 - Z_1 + \frac{P_2 - P_1}{\rho g} + \frac{V_2^2 - V_1^2}{2g} \qquad Q = V_1 A_1 = V_2 A_2 \text{ . If circular, } A = \frac{\pi}{4} D^2$$

AND

$$\frac{P_1}{\rho g} + \frac{v_1^2}{2g} + z_1 - \frac{v^2}{2g}\frac{fL}{D_h} = \frac{P_2}{\rho g} + \frac{v_2^2}{2g} + z_2$$

Using this equation and the site-specific data collected in 2019, an average flow per vent of 7.27 ft^3/minute was calculated. When this flow volume is applied across the 22 individual vents, which measured methane during the two 2019 gas quality studies, a total flow rate of 159.94 ft^3/minute (cfm) was established for the passive vents in Landfill VI that evidenced gas production. 159.94 cfm equates to 4.53 m^3/min. This value will be used in the calculation for NMOC emissions.

Landfill VI ceased accepting waste over 20 years ago. Therefore, if estimated flow rates from data collected in 2019 are used in future calculations, it will be conservative since landfill gas volumes produced from closed areas decline over time as the waste mass ages.

The methodology used to estimate gas generation at Landfill VI can also be applied to Landfill Old V, which is also equipped with passive vents. Several rounds of gas quality readings were collected by landfill personnel in May 2023, and one set of pressure measurements was obtained as shown in the data table below:

Vent No.	Landfill No.	Date Measured	Entity	Method	ppm CH4	%CH4	Static Pressure Inches w.c.
SAN 5-1	Old V	5/10/2023	Allied	GEM 5000		0.00%	
		5/18/2023	Allied	GEM 5000		0.00%	
		5/19/2023	Allied	GEM 5000		0.00%	
		5/24/2023	Allied	GEM 5000		0.00%	
		5/25/2023	Allied	GEM 5000		0.00%	0.01
					AVERAGE	**0.0000%**	
SAN 5-2	Old V	5/10/2023	Allied	GEM 5000		0.00%	
		5/18/2023	Allied	GEM 5000		0.00%	
		5/19/2023	Allied	GEM 5000		1.20%	
		5/24/2023	Allied	GEM 5000		0.00%	
		5/25/2023	Allied	GEM 5000		0.10%	0.01
					AVERAGE	**0.2600%**	
SAN 5-3	Old V	5/19/2023	Allied	GEM 5000		0.20%	
		5/24/2023	Allied	GEM 5000		0.00%	
		5/25/2023	Allied	GEM 5000		0.30%	0.00
					AVERAGE	**0.1667%**	
SAN 5-4	Old V	5/19/2023	Allied	GEM 5000		0.00%	
		5/24/2023	Allied	GEM 5000		0.00%	
		5/25/2023	Allied	GEM 5000		0.00%	-0.01
					AVERAGE	**0.0000%**	
SAN 5-5	Old V	5/19/2023	Allied	GEM 5000		0.00%	
		5/24/2023	Allied	GEM 5000		0.00%	
		5/25/2023	Allied	GEM 5000		0.00%	-0.01
					AVERAGE	**0.0000%**	

Using this methodology, a gas generation rate of 4.99 ft^3/minute (cfm) was calculated for the only passive vent in Landfill Old V that measured both methane and pressure during the May 2023 gas quality readings. This gas generation rate will be used for Landfill Old V for future NMOC emissions calculations for GCCS removal. This flow value will also be used to determine "non-productivity" of this Landfill, as indicated later in this section.

Attachment 3: Lo Calculation from 40 CFR 98 GHG DOC Value for C&D

40 CFR Part 98 Subpart HH: MSW Waste Landfills

	DOC*	L_o
	metric tons C/metric ton waste	m^3 methane/metric ton waste
C&D waste	0.08	59

*From Table HH-1

L_0 = Std. Volume m^3/gm-mole X DOC (metric tons C/metric ton waste) x
(1,000,000 grams/metric ton / 16 gms/gm-mole CH4) x 0.5 (% Methane in LFG)

Standard Pressure:	101.325	kPa
Standard Temperature:	288.706	°K
Universal Gas Constant:	0.0083145	m^3-kPa/gm-mole °K
Std. Volume:	0.0237	m^3/gm-mole

Attachment 4: Landfill III Gas Generation Estimate

LANDFILL CHARACTERISTICS

Landfill Open Year	**1984**	
Landfill Closure Year (with 80-year limit)	**1987**	

MODEL PARAMETERS

Methane Generation Rate, k	**0.057**	*year-1*
Potential Methane Generation Capacity, L0	**59**	*m3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*hort tons/yea*	*(Mg)*	*(short tons)*
1984	57,281	63,009	0	0
1985	57,281	63,009	57,281	63,009
1986	57,281	63,009	114,562	126,018
1987	57,281	63,009	171,843	189,027
1988	0	0	229,124	252,036

Results

Year	Total landfill gas		
	(Mg/year)	*(m3/year)*	*(av ft^3/min)*
1984	0	0	0
1985	4.690E+02	3.756E+05	2.523E+01
1986	9.120E+02	7.303E+05	4.907E+01
1987	1.331E+03	1.065E+06	7.159E+01
1988	1.726E+03	1.382E+06	9.285E+01
1989	1.630E+03	1.305E+06	8.771E+01
1990	1.540E+03	1.233E+06	8.285E+01
1991	1.455E+03	1.165E+06	7.826E+01
1992	1.374E+03	1.100E+06	7.392E+01
1993	1.298E+03	1.039E+06	6.983E+01
1994	1.226E+03	9.817E+05	6.596E+01
1995	1.158E+03	9.273E+05	6.230E+01
1996	1.094E+03	8.759E+05	5.885E+01
1997	1.033E+03	8.274E+05	5.559E+01
1998	9.760E+02	7.815E+05	5.251E+01
1999	9.219E+02	7.382E+05	4.960E+01
2000	8.708E+02	6.973E+05	4.685E+01
2001	8.226E+02	6.587E+05	4.426E+01
2002	7.770E+02	6.222E+05	4.181E+01
2003	7.340E+02	5.877E+05	3.949E+01
2004	6.933E+02	5.552E+05	3.730E+01
2005	6.549E+02	5.244E+05	3.523E+01
2006	6.186E+02	4.953E+05	3.328E+01
2007	5.843E+02	4.679E+05	3.144E+01
2008	5.520E+02	4.420E+05	2.970E+01
2009	5.214E+02	4.175E+05	2.805E+01
2010	4.925E+02	3.944E+05	2.650E+01
2011	4.652E+02	3.725E+05	2.503E+01
2012	4.394E+02	3.519E+05	2.364E+01
2013	4.151E+02	3.324E+05	2.233E+01
2014	3.921E+02	3.140E+05	2.109E+01
2015	3.704E+02	2.966E+05	1.993E+01
2016	3.498E+02	2.801E+05	1.882E+01
2017	3.305E+02	2.646E+05	1.778E+01
2018	3.121E+02	2.499E+05	1.679E+01
2019	2.948E+02	2.361E+05	1.586E+01
2020	2.785E+02	2.230E+05	1.498E+01
2021	2.631E+02	2.107E+05	1.415E+01
2022	2.485E+02	1.990E+05	1.337E+01
2023	2.347E+02	1.880E+05	1.263E+01
2024	2.217E+02	1.776E+05	1.193E+01
2025	2.094E+02	1.677E+05	1.127E+01
2026	1.978E+02	1.584E+05	1.064E+01
2027	1.869E+02	1.496E+05	1.005E+01
2028	1.765E+02	1.414E+05	9.497E+00
2029	1.667E+02	1.335E+05	8.971E+00
2030	1.575E+02	1.261E+05	8.474E+00
2031	1.488E+02	1.191E+05	8.005E+00
2032	1.405E+02	1.125E+05	7.561E+00
2033	1.327E+02	1.063E+05	7.142E+00
2034	1.254E+02	1.004E+05	6.746E+00
2035	1.184E+02	9.485E+04	6.373E+00
2036	1.119E+02	8.959E+04	6.020E+00
2037	1.057E+02	8.463E+04	5.686E+00
2038	9.983E+01	7.994E+04	5.371E+00
2039	9.430E+01	7.551E+04	5.073E+00
2040	8.907E+01	7.133E+04	4.792E+00

9. ALLOWABLE POSITIVE PRESSURE UNDER GEOMEMBRANE & CAPPED VENTS

Introduction

40 C.F.R. § 63.1958(b)(2) allows landfill owners or operators to develop acceptable positive pressure limits for geomembranes or synthetic covers in the design plan. Additionally, because EPA has requested that Allied Niagara cap all passive vents not actively used for control, acceptable positive pressure limits have also been developed for those closed Landfills that do not have geomembrane or synthetic covers.

Allowable Pressure Calculations

Landfills V, VI (portions of) and VIII

Landfills V, VI and VIII each have areas that are closed with a final cover consisting of geosynthetics. These limits will apply to both vents connected to the active gas extraction system and vents that have been capped.

The EPA recognized that final cover with a geosynthetic membrane provides a superior barrier to methane emissions from the landfill surface, and that some positive gas pressure beneath the final cover will not lead to excess surface methane emissions. However, too much positive gas pressure could potentially lead to slope failure. EPA therefore requires an engineering evaluation of the specific cap configuration at each area to determine what pressure levels are acceptable within the framework of the GCCS Design Plan.

All pressure calculations were therefore prepared, signed and sealed by a licensed professional engineer who is qualified to conduct such slope stability analyses and make such determinations.

The calculations provided in **Appendix E** examined the impacts of positive pressure on 1) geomembrane seams, 2) final cover soils (lifting), and 3) stability of final cover (sliding) at the Facility. The minimum acceptable pressure was then selected.

Three different geosynthetic cap scenarios were evaluated for positive pressure allowance based on the actual configuration of the final cover surrounding groups of vents in Landfills V, VI, and VIII. These scenarios included:

1) LLDPE membrane on top of low permeability soils (Landfill VI and Part of Landfill V) – 48.1 inches w.c. of positive pressure allowance established;
2) LLDPE membrane on top of gas vent geocomposite (Part of Landfill V) – 34 inches w.c. of positive pressure allowance established; and
3) LLDPE membrane on top of geosynthetic clay liner (GCL) (Part of Landfill VIII) – 35 inches w.c. of positive pressure allowance established.

To be conservative, the Facility has elected to establish the lowest of these pressures (34 inches w.c.) as the action level for all vents under geosynthetic cap, rather than have multiple pressure allowances in geosynthetic-capped areas across the Facility.

Landfills I, II, IV & Sideslopes of V and VI

EIL has prepared engineering calculations to evaluate a reasonable value for positive pressure in vents located in areas of clay final cover that would not damage or uplift the surrounding cap. The calculations for the two clay cap final cover types described below are provided in **Appendix E**. Actions to be taken when these pressures are measured at a capped vent in the respective areas are further discussed in Section III.

Landfills I, II, and IV were designed with final cover consisting of two feet of clay/low permeability barrier soils and six inches of topsoil. An allowable positive pressure of up to 16 inches w.c. was determined for Landfills I – IV. Landfill Old V also has a clay cap and vents, but the vents will not be capped since this Landfill is excluded from controls on the basis of non-productivity.

The side slopes of Landfills V and VI were designed with final cover consisting of two feet of clay/low permeability barrier soils, drainage layer geocomposite and/or geotextile, and six inches of topsoil. An allowable positive pressure of up to 23 inches w.c. was determined for the side slopes of Landfills V and VI.

10. PROCEDURES FOR NMOC EMISSIONS CALCULATIONS AFTER LANDFILL VIII CLOSURE

Introduction

The following equation is provided in 40 C.F.R. § 63.1959(c) for calculating an NMOC emission rate for purposes of determining when the system can be capped, removed, or decommissioned:

$$MNMOC = 1.89 \times 10^{-3} Q_{LFG} C_{NMOC} \text{ (Eq. 3)}$$

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.

Q_{LFG} = Flow rate of landfill gas, m^3 per minute.

C_{NMOC} = Average NMOC concentration, ppmv as hexane.

1.89×10^{-3} = Conversion factor.

After permanent closure of Landfill VIII, Allied Niagara will follow the procedures outlined in 40 C.F.R. § 63.1957(b) to determine when the active GCCS operating in Landfills V and VIII can no longer be operated due to declining gas generation flow rates. This subsection of the Design Plan provides a procedure for estimating the NMOC emission rate contribution from Landfills not covered by the active GCCS based on the gas generation calculations provided on a Landfill-by-Landfill basis in subsection 8 above.

As a threshold for determining when Allied Niagara will be unable to operate the active GCCS due to "declining gas flow rates," Allied Niagara will use 20% of the maximum gas flow value established in subsection 3, normalized to 50% methane.

Landfills I, II and IV

Allied Niagara will utilize the equation in 40 C.F.R. § 63.1959(c) to calculate an NMOC emission rate for the Landfill areas previously covered by an active GCCS in the 1990s. Actual flow values from the years of operation were used to project future gas generation rates in subsection 8 of this Design Plan.

When the site begins collection of the three rounds of NMOC samples to calculate NMOC emission rates, Allied Niagara will use the flow value for that corresponding year in the calculation for an NMOC emission rate for Landfills I, II and IV. This NMOC emission rate will be included in a "site total" to verify if NMOC emissions from the entire site are below the 34 Megagram threshold for GCCS removal consistent with the New York State Section 111(d) Plan, implementing 40 C.F.R. Part 60 Subpart Cf.

With respect to the NMOC concentration used in the equation in 40 C.F.R. § 63.1959(c), Allied Niagara will use the values collected at the active GCCS during each of the three rounds of testing. This will provide a very conservative estimate of NMOC emissions on account of NMOC concentrations being lower in older waste and Landfills I, II and IV being among the oldest waste disposal areas at the Facility.

Landfill III

A methodology to estimate landfill gas generation rate in this Landfill was provided in subsection 8 using the EPA's LandGEM model. Similar to Landfills I, II and IV, when the site begins collection of the three rounds of NMOC samples in the active GCCS to calculate an NMOC emissions rate, Allied Niagara will use the gas generation flow value for that corresponding year in the calculation for an NMOC emissions rate for Landfill III. For the NMOC concentration used in the equation, Allied Niagara will use the values collected at the active GCCS during each of the three rounds of testing in the equation from 40 C.F.R. § 63.1959(c). The corresponding Landfill III NMOC emission rate will be included in the "site total" to verify that NMOC emissions are below the 34 Megagram threshold for GCCS removal.

Landfills Old V & VI

In subsection 8, a gas generation flow rate methodology was provided for these two Landfills that relied on pressure measurements in passive gas vents which also evidenced detectable levels of methane (regardless of methane concentration). A gas flow rate of 4.99 cfm was established for Landfill Old V and a gas flow rate of 159.94 cfm was established for Landfill VI. Allied Niagara will use these flow rates and the NMOC concentration established in each of the three rounds of active GCCS testing in the equation in 40 C.F.R. § 63.1959(c). The NMOC emission rates from each Landfill will then be added to the site total.

11. EXCLUSION OF AREAS FROM CONTROL

Introduction

Subpart AAAA includes the following equations for determining whether a nonproductive area may be excluded from control:

§ 63.1962(a)(3)(ii) -

$$Q_i = 2\,k\,L_o M_i (e^{-kt_i})\,(C_{NMOC})\,(3.6 \times 10^{-9}) \quad \text{(Eq. 7)}$$

Where:

Q_i = NMOC emission rate from the ith section, Mg/yr.
k = Methane generation rate constant, year^{-1}.
L_o = Methane generation potential, m^3/Mg solid waste.
M_i = Mass of the degradable solid waste in the ith section, Mg.
t_i = Age of the solid waste in the ith section, years.
C_{NMOC} = Concentration of NMOC, ppmv.
3.6×10^{-9} = Conversion factor.

§ 63.1959(a)(c) –

$$MNMOC = 1.89 \times 10^{-3} Q_{LFG} C_{NMOC} \quad \text{(Eq. 3)}$$

Where:

M_{NMOC} = Mass emission rate of NMOC, Mg/yr.
Q_{LFG} = Flow rate of landfill gas, m^3 per minute.
C_{NMOC} = Average NMOC concentration, ppmv as hexane.
1.89×10^{-3} = Conversion factor.

Old V Landfill can be excluded from control using these equations and the related assumptions and procedures outlined in Subpart AAAA. Allied Niagara is using the methodology provided in subsection 10 to calculate both total NMOC emissions from all Landfills combined, and NMOC emissions from Old Landfill V, for comparison to the 1 percent exclusion threshold. This methodology utilizes a combination of the equations provided in 40 C.F.R. § 63.1962(a)(3)(ii)(A) and (B). Alternative calculation procedures for some of the Landfills are proposed since the equations in §§ 63.1962(a)(3)(ii)(A) and (B) are not suitable for all of these landfilled areas, particularly those that were prohibited from accepting putrescible and/or bird-attracting wastes.

The 1% exclusion procedure provided herein will also be used in the future to exclude additional areas from control if the sum of all excluded areas can be demonstrated to be less than 1 percent of the Facility's NMOC total. Any future exclusions will be documented in the semi-annual report submitted consistent with the provisions of 40 C.F.R. § 63.1981(h).

In accordance with 40 C.F.R. § 63.1962(a)(3)(iii), since site-specific test data is not available for the C_{NMOC} concentration, the default value from § 63.1959(a)(1) of 4,000 ppm as hexane will be utilized in the calculations.

Calculate Total NMOC Emissions by Landfill:

Landfills I, II and IV

Using the methodology in the previous section, the gas generation flow rate in the current year (2023) was selected. From the curve provided, a flow rate of 18 ft^3/minute (0.51 m^3/minute) will be used as shown in **Attachment 5**. Based on this flow rate and an NMOC concentration of 4,000 ppm, an NMOC emissions rate of 3.85 Mg/year is calculated as the contribution towards "Total NMOC" for Landfills I, II and IV.

Landfill III

The methodology for NMOC emissions calculations at closure in the previous section used the LandGEM model for calculating a gas flow rate. See model results in **Attachment 4**. Since the calculation for control exclusion is conducted in the year 2023, the flow value of 12.63 ft^3/minute (0.36 m^3/minute) was utilized. At this flow rate and an NMOC concentration of 4,000 ppm, an NMOC emissions rate of 2.70 Mg/year is calculated as Landfill III's contribution towards "Total NMOC" for the Facility.

Landfill Old V

The calculation methodology for estimating gas generation flow rates in Landfill Old V was measurement of differential pressure in landfill gas vents with detectable methane in 2023. The value for flow established was 4.99 ft^3/minute (0.14 m^3/minute). When this flow rate and the NMOC concentration of 4,000 ppm is input into Equation 3 from § 63.1959(a)(c), an NMOC emissions rate of 1.07 Mg/year is calculated at Landfill Old V's contribution towards the NMOC total, and, the value that will be input as the numerator in the calculation for the 1% NMOC demonstration.

Landfills V & VIII

Section 63.1962(a)(3)(ii)(B) states that NMOC emissions from each physically separated closed area with gas collection systems must be computed using Equation 3 in § 63.1959(c). Although Landfill VIII is not yet closed, the maximum gas generation flow rate from the active GCCS was already established in 2020 as 1,381 ft^3/minute (39.11 m^3/minute). Based on this flow rate and an NMOC concentration of 4,000 ppm, an NMOC emissions rate of 295.68 Mg/year was calculated as the contribution towards "Total NMOC" for Landfills V and VIII as shown in **Attachment 5**.

Landfill VI

Similar to Landfill Old V, the calculation methodology for establishing a gas generation flow rate was the measurement of differential pressure in landfill gas vents with detectable methane during gas flow studies at the Landfill in 2019. A gas flow rate of 159.94 ft^3/minute (4.53 m^3/minute)

was established and using a 4,000 ppm NMOC concentration, Landfill VI contributes 34.24 Mg/year NMOC towards the site total.

Calculate Percent Contribution from Landfill Old V:

As shown in **Attachment 5**, the sum of NMOC emissions from all Landfills is 337.55 Mg/year. When the NMOC contribution from Landfill Old V of 1.07 Mg/year is divided by this value, the contribution is:

1.07 Mg/year ÷ 337.55 Mg/year = 0.32%

Since this value is less than 1%, Landfill Old V can be excluded from control on the basis of non-productivity.

Attachment 5: NMOC Emission Rate Calculations for 1% Exclusion Calculation - Allied Niagara Falls Landfill

$M_{NMOC} = 1.89E^{-03} \times QLFG \times CNMOC$

Where:

M_{NMOC} = Mass emission rate of NMOC, megagrams per year.

Q_{LFG} = Flow rate of landfill gas, cubic meters per minute.

C_{NMOC} = NMOC concentration, parts per million by volume as hexane.

Landfill No.	QLFG (scfm)	QLFG(m^3) (m^3)	CNMOC (PPMV as Hexane)	MNMOC
I, II & IV	18	0.51		3.85
III	12.63	0.36		2.70
Old V	4.99	0.14	4000	1.07
V & VIII	1381	39.11		295.68
VI	159.94	4.53		34.24
			TOTAL NMOC	337.55

Calculate Old V Emissions Percentage: **0.32%** **Less than 1%**

SECTION III

SECTION III

ALTERNATIVE PROCEDURES

ALTERNATIVE PROCEDURES

This Design Plan includes alternatives that differ from the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping, or reporting provisions provided in Subpart AAAA. These alternatives are appropriate for Allied Niagara due to its unique characteristics. As stated previously, the Facility ceased acceptance of general household waste and all putrescible solid waste in the early 1990's. Since that time, the Facility has accepted industrial waste, sludge, construction and demolition material and incinerator ash in disposal areas that are physically separate from the MSW landfills on site. Much of the in-place waste is 20 - 40 years old. Gas quality measurements in the passive vents show little to no methane. A satellite survey of the Niagara Landfill was conducted by GHG SAT on May 26, 2023 and no methane emissions were measured above the detection threshold.

The majority of landfill gas currently produced at the Facility is being generated in a limited area – primarily portions of Landfills V and VIII. Recent investigations of Landfills I, II, IV, Old V, and VI have demonstrated that methane generation is sporadic or non-detectable in these areas. Given the nature of the waste accepted in Landfills V & VIII, gas generation levels in these areas could drop off significantly with time and might not support the operation of an active gas collection and control system within a relatively short period of time. Therefore, alternative mechanisms for operation, monitoring, and closure of the gas collection and control system have been developed in accordance with the provisions found in Subpart AAAA, including 40 C.F.R. §§ 63.1955(a) and 63.1981(d)(2).

§ 63.1950 When am I no longer required to comply with this subpart?
Subsection II.10, "Procedures for NMOC Emissions Calculations After Landfill VIII Closure" provides an alternative mechanism for the site to demonstrate that the removal criteria of 40 C.F.R. § 63.1957(b) have been met.

§ 63.1957 Requirements for gas collection and control system installation and removal.
Section II.10 provides an alternative procedure for calculating NMOC emissions from all Landfills for purposes of system closure and removal of the GCCS, including a threshold for when "declining gas flow" precludes continued operation of the active GCCS, as established in Section II, subsection 10. This procedure is essential to allow the Facility to discontinue GCCS operations once gas generation flow rates become insufficient to keep the active GCCS operating, which is likely to occur in a relatively short period of time based on data collected over the past several years. Allied Niagara will adhere to the 34 Mg threshold for removal of GCCS equipment contained in the New York State Section 111(d) Plan at 40 C.F.R. § 60.33f(f).

§ 63.1958 Operational standards for collection and control systems.
Allied Niagara will limit active gas collection and control to those Landfills which are actually producing gas, which includes the portions of Landfill V currently connected to the active GCCS as shown in Appendices A & B and Landfill VIII.

Allied Niagara will cap the passive vents in Landfills I, II, IV, portions of V, and Landfill VI until the threshold for removal of the GCCS is reached and the Equipment Removal Report is submitted to and reviewed by the relevant authority (EPA prior to termination of the Consent Decree, or New York DEC after termination of the Consent Decree).

Following Design Plan approval, Allied Niagara will conduct monitoring of these Landfills as provided in this Design Plan to verify that surface methane emissions are generally consistent with the NESHAP provisions and the cover systems are not adversely impacted.

Allied Niagara has provided calculations to demonstrate that Landfill Old V can be excluded from control on the basis of non-productivity consistent with the provisions of 40 C.F.R. § 63.1962(a)(3)(ii).

Allied Niagara will maintain the "status quo" of Landfill III which has no passive vents. SEM and cover integrity monitoring will be performed as later described in Section IV.

Allied Niagara will also utilize positive pressure limits for wells/vents connected to the active GCCS, that are located in areas where a geomembrane or synthetic final cover has been placed. A value of 34 inches w.c. is provided in Section II.9 as the minimum acceptable value for all areas. Positive pressure limits for capped vents in non-geosynthetic areas are also provided to avoid slope failure, including a value of 23 inches w.c. for the side slopes of Landfills V & VI and a value of 16 inches w.c. for Landfills I – IV.

Allied Niagara will also utilize the following methodology for well decommissioning in the active GCCS. Since NYSDEC requires passive venting for all Landfills as part of their closure and post-closure plans, no extraction location that was originally a passive vent will ever be permanently removed – it will just be disconnected from the vacuum and capped. Since this action would not be a permanent removal and the location can easily be reconnected, it is not considered decommissioning and does not require EPA or New York DEC approval.

If the extraction location was a horizontal trench and qualifies for removal based on the criteria below, then the collection piping will be cut below grade, capped, and the cover restored to its original condition. Documentation will be kept which demonstrates that the evaluation criteria listed below was followed, and that the extraction location met the specified conditions. This documentation can be provided to EPA or New York DEC at any time upon request.

Individual extraction locations will be shut down if they are unable to sustain either gas flow rates or a combustible concentration of methane, which is an indicator of insufficient gas quantity and quality for active control purposes. The site will periodically review the monthly wellfield data to evaluate performance of the individual LFG collection locations. Both gas flow and methane concentrations will be evaluated and either may be a criteria for decommissioning.

Specifically, if the gas flow to a collector is less than 5 cfm or the methane quality is less than 20%, the location will be decommissioned in accordance with the procedures listed below.

Decommissioning Based on Flow

Gas flows at each LFG collection location will be compared to the systemwide average. If the flow at a collection location is less than 5 cfm, the evaluation procedures described below will be followed.

1. The location will be temporarily isolated from the GCCS for a month and the following criteria used to establish if the point should be decommissioned.

   a. If the location remains under a vacuum even after the location is isolated, then other collectors in the area are adequate to manage the gas being generated in the area and the location will be a candidate for decommissioning.
   b. The extraction location will be converted back to a passive venting location, which will be capped until the entire Allied Niagara complex submits an Equipment Removal Report which is reviewed by the relevant authority. If the extraction location was a horizontal trench, the collection piping will be cut below grade, capped, and the cover restored to its original condition.
2. The GCCS drawings will be updated to show the changes to the system, and the removal of the location from the active collection system will be documented in the semiannual report.
3. Locations that consist of passive capped vents will be monitored for pressure at the same frequency as the capped vents in the closed Landfills that were never connected to the active GCCS. Should pressures in excess of the calculated values in Section II be measured, a corrective action will be applied at the location. This can consist of re-connecting the passive vent to the active GCCS, or some other mitigation method until the pressure falls below acceptable levels.

Decommissioning Based on Gas Quality

If the data show that the methane concentration at an LFG collection location is less than 20%, the following actions may be taken:

1. The location will be temporarily isolated from the GCCS for a month and the following criteria used to establish if the point should be decommissioned or changed to a passive location.
   a. If the static (no flow) methane concentration does not recover to more than 20%, then the location will be a candidate for decommissioning.
   b. If the static methane concentration exceeds 20%, and/or the location has a positive pressure, then the point will be placed under vacuum and resampled in 24 hours. If methane falls below the threshold again, the extraction location will follow the procedures of 1.c. below. If methane is maintained above the threshold, the extraction location will be re-incorporated into the active GCCS.
   c. The extraction location will be converted back to a passive venting location, but will be capped until the entire Allied Niagara complex submits an Equipment Removal Report which is reviewed by the relevant authority. If the extraction location was a horizontal trench, the collection piping will be cut below grade, capped, and the cover restored to its original condition.
2. The GCCS drawings will be updated to show the changes to the system, and the removal of the location from the active monitoring system will be documented in the semiannual report.
3. Locations that consist of passive capped vents will be monitored for pressure at the same frequency as the capped vents in the closed Landfills that were never connected to the active GCCS. Should pressures in excess of the calculated values in Section II be measured, a corrective action will be applied at the location. This can consist of re-connecting the passive vent to the active GCCS, or some other mitigation method until the pressure falls below acceptable levels.

Since there is a discrepancy between the NESHAP and the New York State Plan with respect to temperature, Allied Niagara will utilize the temperature threshold of 145°F provided in the revised NESHAP.

Allied Niagara will make every attempt to conduct surface monitoring of the Landfills in accordance with the Surface Monitoring Design Plan presented in Section IV of this Design Plan. However, this part of New York State will sometimes experience harsh winters, which can result in unsafe conditions for the monitoring technicians. If SEM cannot be conducted during the first quarter due to adverse weather conditions, it will be noted in the next semiannual report.

With respect to dangerous areas, Allied Niagara will not conduct monitoring of the following locations while Landfill VIII is still active or undergoing final closure activities:

a. Roads;
b. Working areas and/or the working face;
c. Truck traffic areas;
d. Steep and dangerous slopes;
e. Icy, snow-covered (> 4 inches), and/or extremely muddy side slopes;
f. Areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate collection and removal systems; and
g. Areas that have membrane liner only in place – limit foot traffic on FML due to slip/fall hazard.

Solar flares may be temporarily installed to mitigate SEM and pressure exceedances at the capped vents, and the use of those flares may vary from provisions of 40 C.F.R. § 63.1958(e), since there will be no gas mover equipment that can be shut down and/or repaired. Additionally, since gas generation is limited and sporadic, it may unavoidably be vented through the passive flare if there is insufficient methane (less than 20%) to allow the flare to light, and this intermittent operation may vary from the provisions of § 63.1958(f).

40 C.F.R. § 63.1959 NMOC calculation procedures.

A Tier 1 NMOC calculation was prepared and submitted to EPA pursuant to 40 C.F.R. § 63.1959(a)(1). However, because this GCCS Design Plan was prepared as part of a settlement agreement between EPA and Allied Niagara, the facility did not conduct a Tier 2 or Tier 3 to determine an actual NMOC emissions rate under 40 C.F.R. § 63.1959(a)(3)-(5) & (b).

40 C.F.R. § 63.1959(b)(2)(ii)(B)(1) is only relevant to Landfill VIII's active GCCS and the sections of Landfill V that were connected to the active GCCS. A calculation for maximum gas flow rate was presented in Section II.3.

Allied Niagara will follow the provisions of 40 C.F.R. § 63.1959(b)(2)(ii)(B)(3) for the active GCCS via monthly monitoring at the wellheads for negative pressure in accordance with § 1960(a)(3) and § 1961(a)(1), with the exception of the allowance for positive pressure listed in § 1958(b)(1) – (3) and approved variances.

With respect to 40 C.F.R. § 63.1959(b)(2)(ii)(B)(4), as discussed in Section I, the base grades of each Landfill are at or above surrounding surface elevations. Since waste is not placed below surface grades, no subsurface migration is possible.

A procedure for calculating NMOC emissions from all Landfills for purposes of system closure was presented in Section 2.10, which varies somewhat from § 63.1959(c).

Allied Niagara conducted the non-enclosed flare performance test on April 30, 2019 and submitted a copy of the test report to EPA. The performance test was conducted in accordance 40 C.F.R. § 60.18 and the flare met the relevant exit velocity, visible emissions, and net heating value requirements. Therefore, no additional performance testing is planned. The test results are provided again in **Appendix D** of this Design Plan.

40 C.F.R. § 63.1960 Compliance provisions.

Allied Niagara has provided a gas generation flow rate calculation methodology in Sections II.3 and II.8 of this design plan for both active GCCS system design and ultimately system closure. Some of the calculation methodologies, especially those for the closed Landfills without control, vary from the provisions outlined in 40 C.F.R. § 63.1960(a)(1).

This design plan varies from the provisions of 40 C.F.R. § 63.1960(a)(2) due to the unique nature of the Allied Niagara Landfill and the lack of gas generation for the majority of the landfilled areas, which precludes Allied Niagara from installing and operating a gas system consistent with those provisions.

Therefore, the provisions of 40 C.F.R. § 63.1960(a)(3) only apply to the active GCCS system operations. Alternative procedures for monitoring pressure within the capped passive vents are provided later in this Section. Allowable pressure limits for these vents have also been provided in this Design Plan. Corrective actions for these locations will also be discussed later in this section if pressures above the allowable limits are measured. Since there are limited corrective actions that can be taken for the capped vent locations, no root cause evaluations or corrective action analyses will be conducted for the passive gas vents.

Similarly, the provisions of 40 C.F.R. § 63.1960(a)(4) are only relevant to the active GCCS system operations since no air infiltration will occur at the capped vent locations and no temperature monitoring will be conducted at these vents.

Allied Niagara will conduct SEM quarterly for Landfills V, VI, and VIII, in accordance with the provisions of 40 C.F.R. § 63.1960(c)(1). These Landfills may be monitored on an annual basis once they meet the requirements in 40 C.F.R. § 63.1961(f) allowing for reduced monitoring, as described in Section IV. Closed Landfills I – IV will revert to annual monitoring after three consecutive quarterly monitoring periods with no measured exceedances in accordance with NESHAP provisions.

This design plan also differs from 40 C.F.R. § 63.1960(c)(4)(v), in that it does not require Allied Niagara to install a new well or other collection device at the Landfills with capped vents. Instead, a mitigation action such as cover repairs, re-sealing of the penetration or installation of a passive solar flare on the vent will be taken. Corrective actions will be documented.

Allied Niagara will conduct cover integrity monitoring on a monthly basis for Landfills V and VIII, but this design plan varies from 40 C.F.R. § 63.1960(c)(5) for closed Landfills I – IV and VI, for which cover integrity monitoring will be conducted only quarterly. Since many of the Landfills have been final closed for decades, the vegetative cover has been firmly established and waste settlement is no longer occurring.

40 C.F.R. § 63.1961 Monitoring of operations

Monitoring of gauge pressure in the collection header is not relevant for the capped vents since there is no collection header. However, since these vents were designed and installed to prevent methane build-up beneath the final cover, pressure limits were established earlier in Section II for several final cover types. These pressure limits demonstrate allowable positive pressures in order to minimize the potential for slope failure from excessive methane pressure. Limits are established for vents under geomembrane or synthetic final cover, and, vents located in areas that have only low-permeability soil cover. During each monitoring event, the date and value for measured pressure at each capped vent will be recorded.

Allied Niagara will measure pressure at the capped vents at the following graduated frequency:

- Weekly monitoring for the first two months. If no measurements of pressure above the limits are detected during the weekly monitoring of all capped vents at a particular Landfill, then pressure will be measured monthly as indicated below. If pressure above the established limits are detected at a capped vent, corrective actions will be taken and the pressure measurement schedule for that entire Landfill will remain at weekly until the pressure is mitigated at the location, and all pressure measurements at all capped vents in the Landfill are below established limits for an additional four consecutive weeks (unless the exceedance occurs early in the initial eight-week period of monitoring). After this baseline metric is met, pressure measurements within capped vents at each Landfill will be tracked on an individual basis and the entire Landfill will not be held to the schedule established by one vent measuring excess pressure.

- Monthly monitoring for one year. If no measurements of pressure above the limits are detected in the monthly monitoring at a vent, then pressure will be measured quarterly for the vent as indicated below. If pressure is detected above the established limits during the monthly monitoring, corrective actions will be initiated and the frequency of monitoring will return to weekly at that vent location only, until the pressure exceedance is mitigated. Remaining capped vents within the Landfill will stay on a monthly schedule. Any location within a Landfill that has 12 consecutive pressure measurements below the established limits can then move to the next monitoring frequency.

- Quarterly monitoring for one year. If no measurements of pressure above the limits are detected in the quarterly monitoring at a capped vent within a particular Landfill, then pressure will be measured per the frequency indicated below. If pressure is detected above the established limits during the quarterly monitoring, corrective actions will be initiated and the frequency of monitoring will return to weekly at that location only until the mitigation effort is successful in alleviating the built-up pressure. Pressures at that capped vent will then be measured weekly for one month and monthly for six months as long as consecutive pressure measurements below the established limits are recorded. Pressure measurements will then revert to quarterly at that location until two consecutive events show pressure is below the established limits, at which time monitoring can go to an annual frequency as outlined below.

- Annual monitoring thereafter. Any measurement of pressure above the established limits during an annual event will result in initiation of corrective actions for that location, and, a return to weekly monitoring of pressure for that location only, until the corrective action is

successful in reducing the pressure to below the established threshold. Pressures at that capped vent will then be measured weekly for one month and monthly for six months as long as consecutive pressure measurements below the established limits are recorded. Pressure measurements will then revert to quarterly at that location until two consecutive events show pressure is below the established limits, at which time monitoring can resume an annual frequency.

- For all locations which undergo corrective actions, once pressures are reduced below the limits, the corrective action selected will continue to be applied for one additional week to avoid having immediate reoccurrences of the issue. After the corrective action is removed and the vent is re-capped, the Facility will (as described above) conduct pressure monitoring weekly for one additional month. After that time, monitoring at the affected capped vent will default to monthly, quarterly, and then annually as described above.

Monitoring of nitrogen or oxygen is not relevant for the capped vents since no vacuum is applied to them and no air intrusion is possible.

As stated previously, the provisions related to temperature monitoring (40 C.F.R. § 63.1961(a)(1) – (6)) are only relevant to the active GCCS system operations since no air infiltration will occur at the capped vent locations. Therefore, temperature monitoring of the capped vents is irrelevant and will not be conducted.

Also, as noted previously, the temperature standard in the NESHAP conflicts with that in New York's approved State Plan. Allied Niagara will therefore use the temperature threshold of 145°F in the revised NESHAP for extraction locations connected to the active GCCS.

If an exceedance is corrected within the initial 7-day period following the measurement, Allied Niagara will not initiate enhanced monitoring for that well.

The regulation as written establishes a set date on the initiation of enhanced monitoring. The phrase "must begin 7 days after the first measurement" would appear to require a site to start the corrective actions exactly 7 days after the measurement, even if that date falls on a holiday, or a weekend. Allied Niagara will initiate enhanced monitoring any time within 7 days of the initial measurement unless the corrective actions taken within the first 7 days (as discussed previously) reduce the well temperature to at or below 145°F.

This design plan also differs from Subpart AAAA with respect to down-hole temperature monitoring. The enhanced monitoring provisions of the NESHAP include measurements of the landfill gas temperature every 10 vertical feet of the well on an annual basis for each wellhead with a gas temperature greater than 165°F. Allied Niagara will conduct the following monitoring:

- Annual down-well monitoring will be performed at least once at any time during the 12 months following the first temperature measurement greater than 165°F.

- If the measured temperature at the wellhead drops below 165°F during that 12-month period following the initial exceedance, down-well monitoring will no longer be conducted for that well. If the measured temperature drops below 165°F before the initial annual down-well monitoring is performed, that initial monitoring will no longer be conducted. Similarly, if a Higher Operating Value is approved by the Agency before the

initial annual down-well monitoring is performed, that initial monitoring will no longer be conducted.

- The well will be shut off, and the wellhead removed, in order to perform down-well monitoring. Based on experience at other sites, down-well temperatures recorded while the well is operating are not representative due to heat transfer and mixing that occurs during gas extraction. Shutting off the well prior to monitoring also reduces risk to the technician performing the monitoring. Additional measures to ensure the technician's safety will also be implemented as needed.

- If conditions (temperature, gas quality, carbon monoxide, visual indicators, etc.) at the wellhead suggest that a subsurface fire is occurring, the well will be shut off in accordance with 40 C.F.R. § 60.763(b)(1) and § 63.1958(b)(1). To prevent potential oxygen intrusion and unnecessary risk to personnel, the wellhead will not be removed, and down-well temperature will not be measured, until data indicate the subsurface fire is no longer occurring. In these cases, the status of the affected well will be reported in the semi-annual report in accordance with 40 C.F.R. § 63.1981(h)(8).

Lastly, if the enhanced monitoring provisions are triggered, Allied Niagara will collect and analyze samples for carbon monoxide using any of the following (or equivalent) analytical methods:

- ASTM D 1945-03 or the latest version;
- ASTM D 1946-90 or the latest version;
- EPA Method 3-C;
- Modified Method 25-C reporting only the CO fraction;
- On-site portable gas chromatograph capable of measuring CO; or
- Other instruments demonstrated to measure CO in landfill gas with similar performance as the methods described above.
- Alt-143: ALTERNATIVE METHOD FOR THE FIELD DETERMINATION OF CARBON MONOXIDE CONCENTRATION IN LANDFILL GAS WELLHEADS UNDER 40 C.F.R. 63, SUBPART AAAA

Allied Niagara will use passive solar flares as temporary mitigation measures for SEM or positive pressure exceedances at capped vent locations. Since the passive solar flares are being utilized as a corrective action, the provisions of 40 C.F.R. § 63.1959(b)(2)(iii) are not relevant.

However, the passive flares are equipped with a solar powered battery which provides a spark. As stated earlier, the spark allows the flare to re-ignite as long as landfill gas of sufficient quality and quantity is present to sustain combustion. The production of the spark creates a continuous audible "clicking" sound when the flare is operated. If there is no clicking sound, then there may be a potential issue with the ignitor device which must be promptly rectified to ensure that the flares are always in a "readiness state" to operate when sufficient methane is present.

Therefore, Allied Niagara will conduct parametric monitoring in lieu of flame presence monitoring. Specifically, the site will conduct a weekly check of the spark ignition system (audible clicking sound) of each passive flare to verify flare functionality when a flare is in use as a control measure at a capped vent. The weekly inspection will be recorded. If no "clicking" sound is observed during an inspection, the monitoring technician will immediately inspect the spark ignition system and repair/replace any malfunctioning components. Corrective actions will be

documented.

Other preventative maintenance measures that will be employed to keep the solar flares fully functional will include (but are not limited to):

- Check battery functionality annually
- Clean solar panels semiannually
- Inspect ignitor box for the presence of insects and nests & clean out if present
- Clean flame arrestor annually

Maintenance, inspections and repairs to the passive solar flares will be documented. Note that if no solar flares are used for the prior year, they will be kept in storage and the inspections above will not be conducted, with the exception of battery functionality prior to the next use.

Manufacturer's information for these devices is provided in **Appendix F** of this Design Plan.

Closed Landfills I – IV will revert to annual monitoring after three consecutive quarterly monitoring periods with no measured exceedances in accordance with NESHAP provisions.

A map depicting the location and types of certified final cover is provided in **Appendix E** of this Design Plan. This map is current through November 2023.

40 C.F.R. § 63.1962 Specifications for active collection systems.
All Landfills were constructed at or above grade, which eliminates the potential for subsurface gas migration.

In accordance with 40 C.F.R. § 63.1962(a)(3)(i), Allied Niagara is excluding Landfill VII from gas control, since it was a monofil that only accepted industrial lime as described in Section I of this Design Plan. Additionally, in accordance with § 63.1962(a)(3)(ii), Allied Niagara is excluding Landfill Old V from controls because this plan presents calculations in Section II.11 demonstrating that Landfill Old V is "nonproductive," since NMOC emissions were shown to contribute less than 1 percent of the total amount of NMOC emissions from the Facility.

40 C.F.R. § 63.1981 What reports must I submit?
Allied Niagara will provide EPA (or New York DEC, after termination of the Consent Decree) with an additional 30 days of review time prior to shutting down the control equipment. Specifically, if no additional information request has been received by Allied Niagara from the regulatory authority 60 days after the Equipment Removal Report has been submitted, then Allied Niagara will proceed with system shutdown as contemplated by § 63.1981(g). If an information request is received from the regulatory authority, Allied Niagara will provide the regulatory authority with an additional 60 days of review time after submittal of the information so the regulatory authority can evaluate the requested information before the system is permanently shut down. The regulatory authority will have up to 120 days total (4 months) to evaluate and approve the Equipment Removal Report.

Similar to the discussion above regarding 40 C.F.R. § 63.1960(a)(3) and (4), the provisions of § 63.1981(j) are only relevant to the active GCCS system operations. For pressure, there are limited corrective actions that can be taken for the capped vent locations, so no root cause evaluations or

corrective action analyses will be conducted. No temperature monitoring is proposed for the capped vent locations, so no corrective action analysis will be conducted.

40 C.F.R. § 63.1983 What records must I keep?

Allied Niagara operates a non-enclosed (open) flare for the active GCCS and will therefore keep the records referenced in 40 C.F.R. § 63.1983(b)(4). However, those records will not be kept for the non-enclosed passive solar flares used as temporary corrective actions for capped vent SEM or pressure exceedances, and no performance tests will be conducted on these passive flares since at the locations they will be placed, these flares will not meet the fuel specifications of 40 C.F.R. § 63.11 at all times due to sporadic or non-existent methane production in the Landfills that did not accept bird-attracting wastes.

40 C.F.R. § 63.1985 Who enforces this subpart?

EPA approved New York's Section 111(d) State Plan implementing 40 C.F.R. Part 60 Subpart Cf on August 23, 2021. Therefore, the State has the authority to approve the Design Plan. However, since the document is being submitted as part of a Consent Decree with EPA and contains several alternatives for compliance, Allied Niagara believes that it is appropriate for EPA to approve this Design Plan instead of the State. Allied Niagara will copy the State on submittals for the Closure Report and the Equipment Removal Report, but the primary recipient of these documents will be the EPA until termination of the Consent Decree. After termination of the decree, reports will be sent only to New York DEC.

For the semiannual reports, copies will be submitted to both the State and the EPA prior to termination of the decree and to the State after termination. Requests for higher operating values or implementation schedules for exceedances that will take over 120 days to correct will also be submitted to EPA for approval, with a copy sent to the State until termination of the decree, after which such requests will be submitted only to the State. After the Consent Decree with EPA is terminated, requests for higher operating values or implementation schedules for exceedances that will take over 120 days to correct will be submitted to the NYSDEC for approval.

SECTION IV

SECTION IV

SURFACE EMISSIONS MONITORING PLAN

Introduction

This Surface Monitoring Design Plan specifies the monitoring procedures that Allied Niagara will use to comply with the Consent Decree used to settle the EPA enforcement action, which requires actions consistent with the NESHAP. This plan includes topographical maps with the monitoring routes and specifies the monitoring procedures that will be followed. Any departures from the surface monitoring requirements as stated in the NESHAP are contained in this plan.

Areas Monitored
Monitoring will be conducted along the entire perimeter of the collection area and along a serpentine pattern spaced 30 meters apart (or a site-specific established spacing) for each collection area on a quarterly basis. As stated in Section III, Landfill VIII is still active while the remaining Landfills (I – IV, portions of V and VI) are closed with certified final cover in place. All Landfills, with the exception of Landfills Old V and VII, which are excluded from controls, will have SEM conducted.

Areas exhibiting distressed vegetation and cracks or seeps in the cover will also be monitored. In addition, cover penetrations will be monitored and are defined under 40 C.F.R. § 63.1990 as follows:

- *Cover penetration* means a wellhead, a part of a landfill gas collection or operations system, and/or any other object that completely passes through the landfill cover. The landfill cover includes that portion which covers the waste, as well as the portion which borders the waste extended to the point where it is sealed with the landfill liner or the surrounding land mass. Examples of what is not a penetration for purposes of this subpart include but are not limited to: Survey stakes, fencing including litter fences, flags, signs, utility posts, and trees so long as these items do not pass through the landfill cover.

The attached map shows the surface monitoring route proposed for all Landfills at final grade conditions. The actual route taken while Landfill VIII is still active will be included with each quarterly surface scan report for Landfill VIII, or in other site files. The routes for the remaining Landfills will be as shown.

Areas which will be excluded include:

- Active areas of Landfill VIII. Active areas of the Landfill have a larger volume of equipment and/or refuse trucks which pose an unacceptable health and safety risk to an individual in the area. Active areas therefore also include site access roads within the waste footprint and other truck traffic areas.
- Landfills with more than four (4) inches of snow, or ice cover. Snow has the potential to cover uneven surfaces in the landfill cover (such as ruts) which could cause the technician to twist or break a leg. Furthermore, four inches of snow means the monitoring instrument cannot be placed 5 to 10 cm above the actual landfill surface as specified in 40 C.F.R. § 63.1960(c)(3). Icy slopes are difficult and dangerous to traverse.

- Areas of the Landfill with extremely muddy side slopes. Again, this can present a slip and fall hazard to the technician.
- Areas of the site that are undergoing construction or final cover activities. These areas also have a large volume of equipment traffic, which poses a health and safety risk to the technician performing the scan.
- Areas that have membrane liner only in place – limit foot traffic on FML due to slip/fall hazard. This includes areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate collection and removal systems.

The actual surface monitoring route followed by the technician will be documented in the SEM report, including any excluded dangerous areas.

Monitoring Frequency
Surface monitoring will be performed quarterly on a calendar basis pursuant to the NESHAP requirements on all Landfills, except that EPA has permitted a less frequent monitoring schedule for closed Landfills I-IV as detailed at the end of this Section ("Reduced Monitoring Frequency for Landfills I-IV"). Monitoring will be rescheduled if it cannot be conducted because temperature conditions are outside the operating range of the instrument and/or other conditions (snow cover, rain storms, etc.) prevent monitoring. The monitoring event will be rescheduled as soon as practical after the original scheduled date. Monitoring of closed areas is discussed later in this Plan.

Surface Monitoring Instrument
The monitoring will be conducted with an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications in 40 C.F.R. § 63.1960(d)(1):

> *The portable analyzer shall 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.*

To meet the performance evaluation requirements in EPA Method 21 of Appendix A of 40 C.F.R. Part 60, the instrument evaluation procedures must be used. The performance evaluation results will be documented during each SEM event.

Surface Monitoring Survey
Immediately before commencing a surface monitoring survey, the instrument shall be calibrated per EPA Method 21. The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air. Calibrations will be documented for each SEM event.

The background concentration at the Facility will be determined immediately prior to conducting the survey. The background concentration shall be determined by moving the probe inlet upwind outside the boundary of the subject Landfill at least 30 meters from the perimeter wells (when SEM is conducted over areas covered by the active GCCS) and at least 30 meters from the perimeter capped vents in the closed Landfills. The background concentration, measurement location, and basic meteorological conditions will be recorded for each SEM event. Other factors

that can affect "background" should be noted and accounted for (such as a nearby landfill, highway, refinery, chemical plant, etc.).

Surface emission monitoring shall be performed in accordance with EPA Method 21, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground and the probe will be moved continuously along the ground. Monitoring will not be performed during extreme meteorological conditions or if there is more than 4 inches of snow on the Landfill surface, as proposed in Section III.

Surface monitoring will be conducted around the perimeter of each Landfill and the route shown on the topographic map. Areas where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover, and all cover penetrations, will be monitored.

Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the following actions shall be taken:

i. The location of each monitored exceedance shall be marked and the location recorded using an instrument with an accuracy of at least 4 meters. The latitude and longitude coordinates of each surface emissions exceedance will be recorded in decimal degrees to at least 5 decimal places.

ii. Corrective actions taken for exceedances will vary depending on where the exceedance is located. For exceedances in Landfills with capped vents, initial corrective actions may include cover maintenance or, if appropriate, repairs to the pipe/landfill surface interface if damage is noted. For exceedances in the Landfills with the active GCCS, cover maintenance, well boot repairs or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance will be made as appropriate. For all exceedances, the location shall be re-monitored within 10 calendar days of detecting the exceedance.

iii. If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall 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 (v) below shall be taken, and no further monitoring of that location is required until the action specified in paragraph (v) 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 40 C.F.R. § 63.1960(c)(4) (ii) or (iii) shall be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month re-monitoring shows an exceedance, the location will be re-monitored within 10 calendar days of the second exceedance. A proposed corrective action plan and corresponding timeline will be submitted to the Administrator for approval for any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period,

except for when the exceedance will be corrected within 120 days by the addition of a new well or collection device.

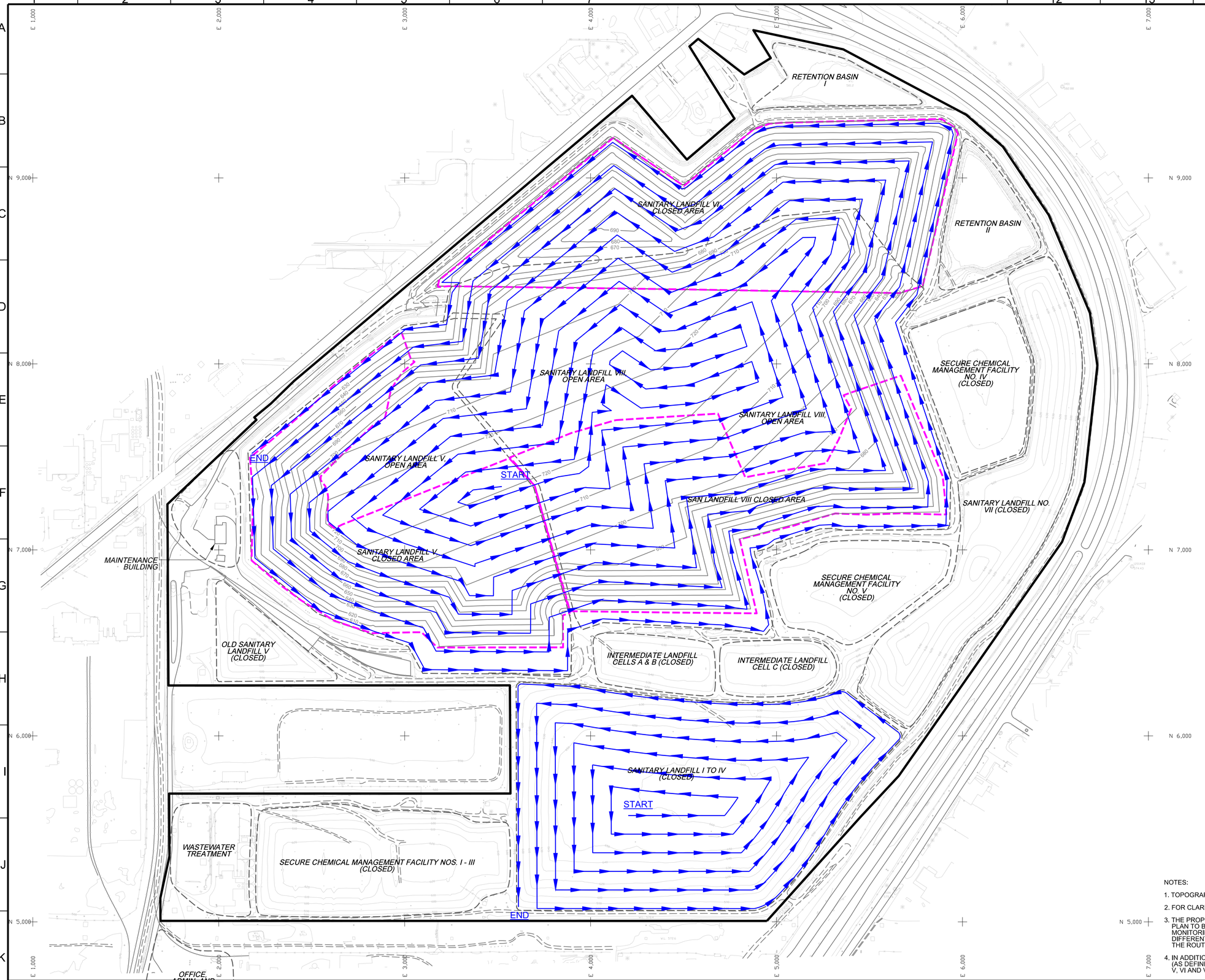
v. For the Landfills covered by the active GCCS, a proposed corrective action plan and corresponding timeline will be submitted to the Administrator for approval for any location where monitored methane concentration equals or exceeds 500 ppm above background three times within a quarterly period, except for when the exceedance will be corrected within 120 days by the addition of a new well or collection device. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may also be submitted to the Administrator for approval.

vi. For exceedances at Landfills with capped passive vents, Allied Niagara will not install a new well or other collection device since they do not have active collection. Instead, a mitigation action such as cover repairs, re-sealing of the penetration or temporary installation of a passive solar flare on the vent will be taken within the NESHAP-required timeframe and the specific corrective actions will be documented. An alternative remedy request with corresponding timeframe will be submitted if necessary.

Reduced Monitoring Frequency for Landfills I-IV

The following monitoring frequency alternative for the Landfills that are closed with certified final cover was presented in Section III:

Landfills I – IV will follow the provisions of § 63.1961(f). Specifically, three consecutive quarterly scans will be conducted and if no methane exceedance is detected 500 ppm above background, the SEM will be performed annually thereafter unless an exceedance is detected during an annual scan. Scans will then be performed quarterly until three consecutive exceedance-free quarters are documented.



LEGEND

- PROPERTY BOUNDARY
- GRID COORDINATE
- EXISTING TOPO
- PERMITTED TOP OF WASTE GRADES
- UNPAVED PAVED EXISTING ROADS
- AREAS OF FINAL COVER ON SANITARY LANDFILLS V, VI AND VIII
- SURFACE SCAN ROUTE

N

0 250' 500'
SCALE

NOTES:

1. TOPOGRAPHIC MAP PROVIDED BY COOPER AERIAL SURVEYS CO., MARCH 20, 2019.
2. FOR CLARITY, NOT ALL SITE FEATURES ARE SHOWN.
3. THE PROPOSED SURFACE MONITORING PLAN/ROUTE REPRESENTS A TYPICAL PLAN TO BE FOLLOWED AT FINAL CLOSURE CONDITIONS. SURFACE MONITORING CONDUCTED WHILE THE SITE IS STILL ACTIVE MAY FOLLOW A DIFFERENT ROUTE, DEPENDING ON THE ACTUAL FIELD CONDITIONS. HOWEVER, THE ROUTE SHALL MEET THE NSPS REQUIREMENTS.
4. IN ADDITION TO THE SEM ROUTE SHOWN ON THIS MAP, COVER PENETRATIONS (AS DEFINED IN 40 CFR 63.1990) WILL ALSO BE MONITORED. ON LANDFILLS I - IV, V, VI AND VIII.

NO	REVISIONS	DRN	CHK	DATE

DRN DES CHK APP

PREPARED FOR: ALLIED WASTE

PREPARED BY: ENVIRONMENTAL INFORMATION LOGISTICS LLC

ALLIED WASTE NIAGARA FALLS LANDFILL, LLC
5600 NIAGARA FALLS BOULEVARD
NIAGARA FALLS, NEW YORK

SURFACE SCAN ROUTE PLAN

DATE: AUGUST 2023
PROJECT NO:
FILENAME: NC SURFACE SCAN PLAN
SHEET NO: 1 of 1
FIGURE NO: 3.1

C:\Users\pab\Documents\CTI-2018\Laura 2010\NIAGARA FALLS LF\NF 2019 SEC PLAN\001A NF SURFACE SCAN PLAN 08-16-23 REV-02.dgn

APPENDIX A

APPENDIX A

AS-BUILT DRAWINGS OF CURRENT ACTIVE GCCS, PASSIVE VENT LOCATIONS & VENT DETAILS

CITY OF NIAGARA FALLS
TOWN OF NIAGARA

SANITARY LANDFILL VI

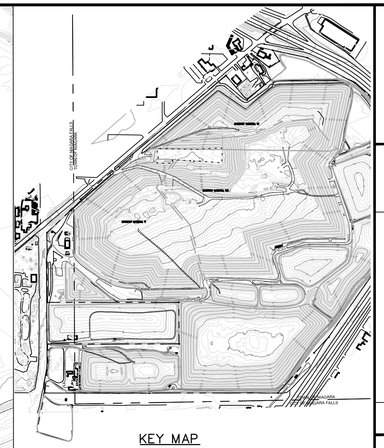
SANITARY LANDFILL VIII

SANITARY LANDFILL V

BLOWER/FLARE AND H2S REMOVAL SYSTEM

PIPE C.O.

RWH-537
RWH-536
RWH-535
WH-534



KEY MAP
SCALE: 1"=1000'

LEGEND

- LIMIT OF SANITARY LANDFILL VIII
- LIMIT OF SANITARY LANDFILL V
- LIMIT OF SANITARY LANDFILL VI
- FINAL CAP LIMITS
- LEACHATE PIPING (SAN VIII)
- EXISTING GAS VENT
- WH10 GAS WELLHEAD
- GAS COLLECTION PIPE
- PERFORATED GAS COLLECTION PIPE
- GV-106 EXISTING GAS VENT WITH CAP
- EXISTING PERFORATED GAS COLLECTION PIPE (BELOW CAP)
- EXISTING FINAL CAP LIMIT

NOTES:

1. AERIAL TOPOGRAPHY DATED NOVEMBER 15, 2022 PROVIDED BY GZA VIA EMAIL DATED 3/6/2023 (FILENAME: 2022-11-15 REPUBLIC – PINE AVE TOPO CAD.DWG)

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SCALE: 1"=150'

NO.	REVISION	DATE

SHEET TITLE
EXISTING GAS MANAGEMENT PLAN FIGURE

PROJECT TITLE
LANDFILL V, VI, VIII
NIAGARA FALLS LANDFILL

CLIENT
ALLIED WASTE
NIAGARA FALLS LANDFILL
5600 NIAGARA FALLS BLVD
NIAGARA FALLS, NY 14304

SCS ENGINEERS OF NY, PC
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
4 EXECUTIVE BLVD, SUITE 303, SUFFERN, NY 10901
PH: (845) 357-1510 FAX: (845) 357-1049

PROJ. NO. 07221607.05
DSN. BY: LKW
DWN. BY: SHY
CHK. BY: LKW
QA RVW BY: GPM
APP. BY: LKW

CADD FILE: EX COND & SEM PLAN 2023
DATE: 8/29/2023
SCALE: AS SHOWN
DRAWING NO. 1 of 1

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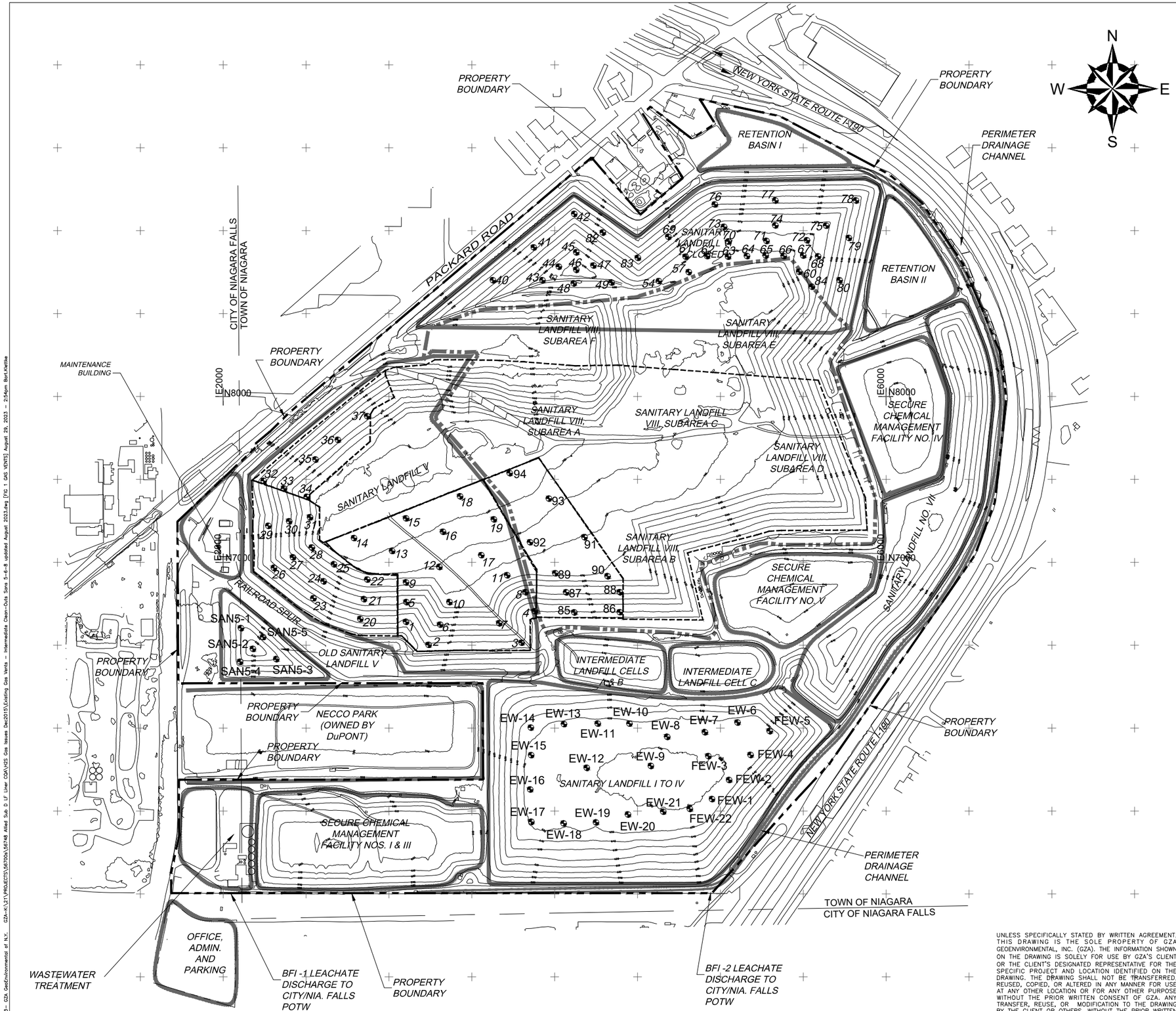


LEGEND

EW-10 ● *GAS VENT LOCATION - SAN LF I, II, III, & IV*

SAN5-1 ● *GAS VENT LOCATION - OLD SAN LF V*

0 150 300 600 900
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL NIAGARA FALLS, NEW YORK

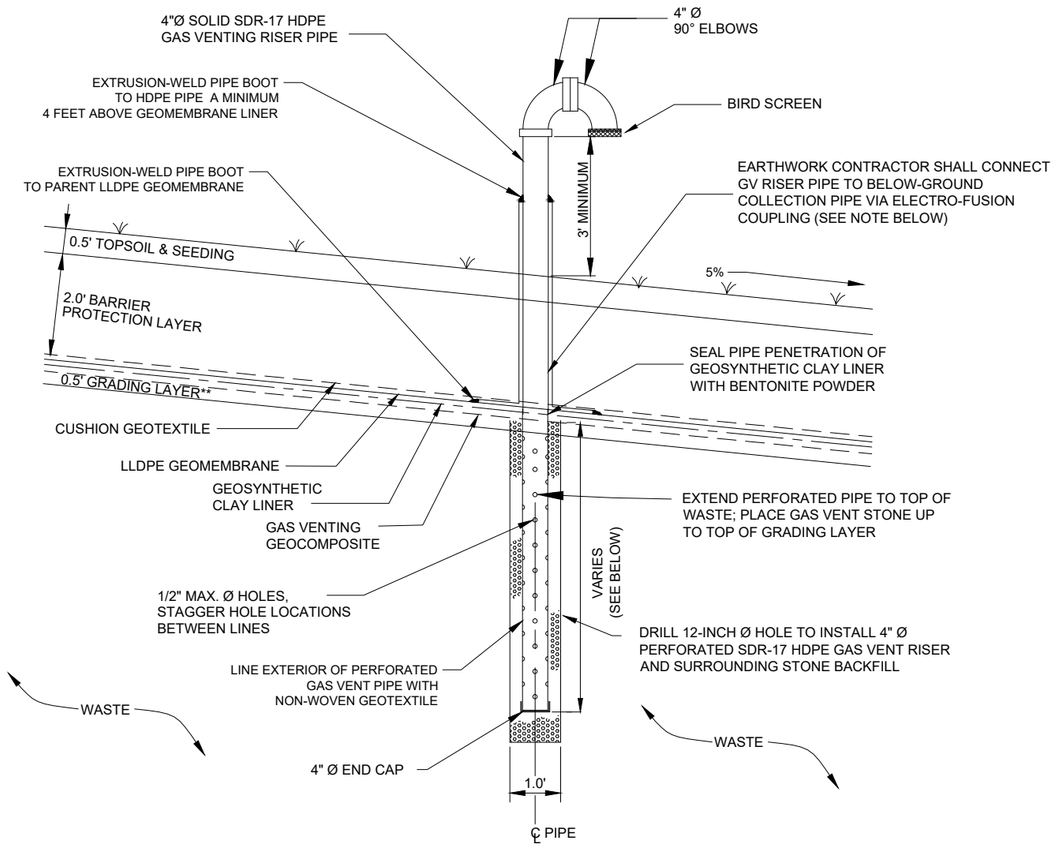
GAS VENT LOCATIONS LFS I, II, III, IV, V, VI AND VIII

APPROVED: BAK

PREPARED BY:
GZA GeoEnvironmental of N.Y.
Engineers and Scientists
300 PEARL STREET, SUITE 700
BUFFALO, NEW YORK 14202
(716) 685-2300

PREPARED FOR:
ALLIED WASTE
NIAGARA FALLS LANDFILL
DIVISION OF REPUBLIC SERVICES

PROJ MGR: BAK	REVIEWED BY: DJT	CHECKED BY: MDK	FIGURE No: 1
DESIGNED BY: BAK	DRAWN BY: TAK	SCALE: AS SHOWN	
DATE: AUGUST 2023	PROJECT NO.: 21.0056748.00	REVISION NO.	SHEET NO. 1 of 1



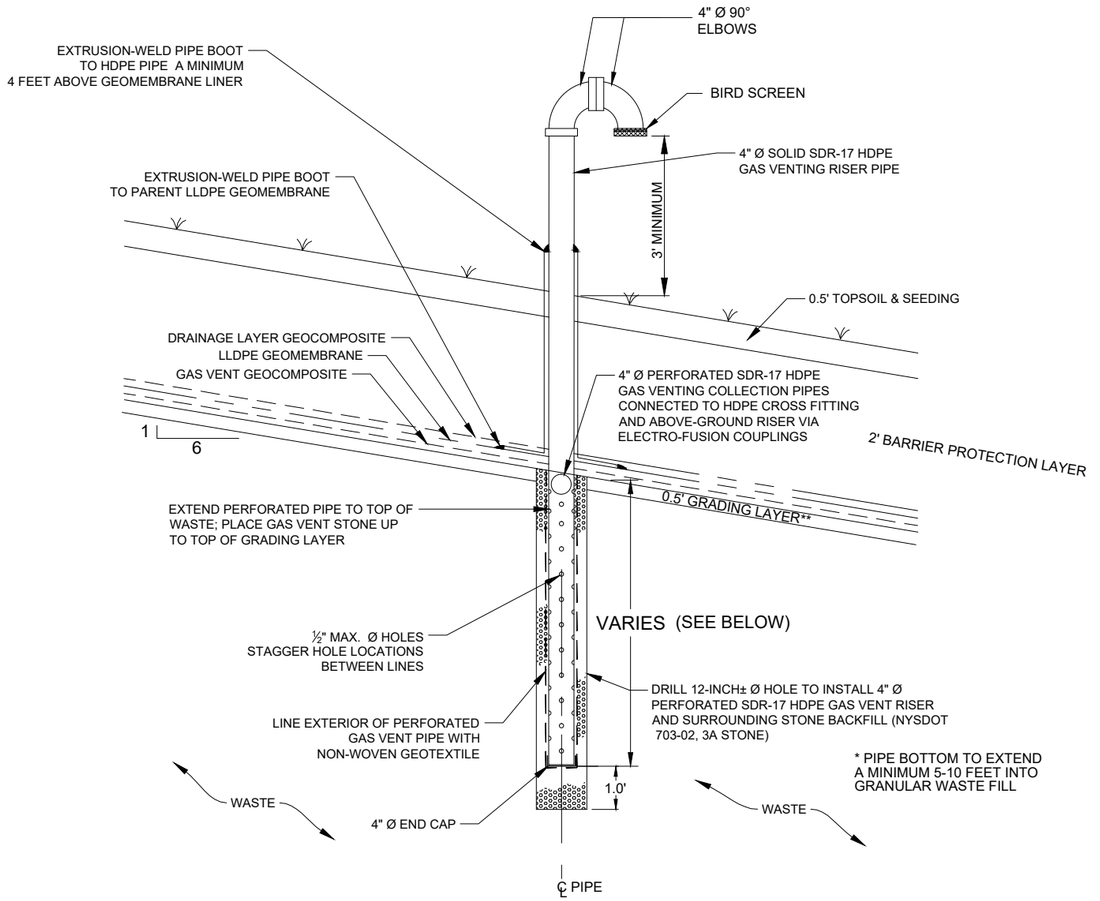
TYPICAL GAS VENT DETAIL FOR COVER SYSTEM ON TOP OF LANDFILL

NOT TO SCALE

GV INSTALLATION TYPICAL FOR SAN LF V GV'S: 12-19

GAS VENT DEPTHS± BELOW TOP OF WASTE:

GV-12: 20 FT.
GV-13: 20 FT.
GV-14: 20 FT.
GV-15: 20 FT.
GV-16: 20 FT.
GV-17: 20 FT.
GV-18: 20 FT.
GV-19: 6 FT. NOTE: INSTALLED IN A 5' x 5' x 7' DEEP EXCAVATION BY BACKHOE



TYPICAL GAS VENT DETAIL FOR COVER SYSTEM ON SIDESLOPE BENCHES OF LANDFILL

NOT TO SCALE

GV INSTALLATIONS TYPICAL FOR SAN LF V GV'S: 1-11

GAS VENT DEPTHS± BELOW TOP OF WASTE:

GV-1: 6 FT.
GV-2: 6 FT.
GV-3: 6 FT.
GV-4: 6 FT.
GV-5: 10 FT.
GV-6: 10 FT.
GV-7: 10 FT.
GV-8: 10 FT.
GV-9: 10 FT.
GV-10: 20 FT.
GV-11: 20 FT.

0 X X X X
AS SHOWN

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL

NIAGARA FALLS, NEW YORK

GAS VENT DETAILS FOR GV-1 THRU GV-19
(PART OF SAN LF V)

APPROVED: BAK

STATE OF NEW YORK MARY A. KLEITZ LICENSED PROFESSIONAL ENGINEER NO. 069423

PREPARED BY:
GZA GeoEnvironmental of N.Y.
Engineers and Scientists
535 WASHINGTON STREET 11th FLOOR
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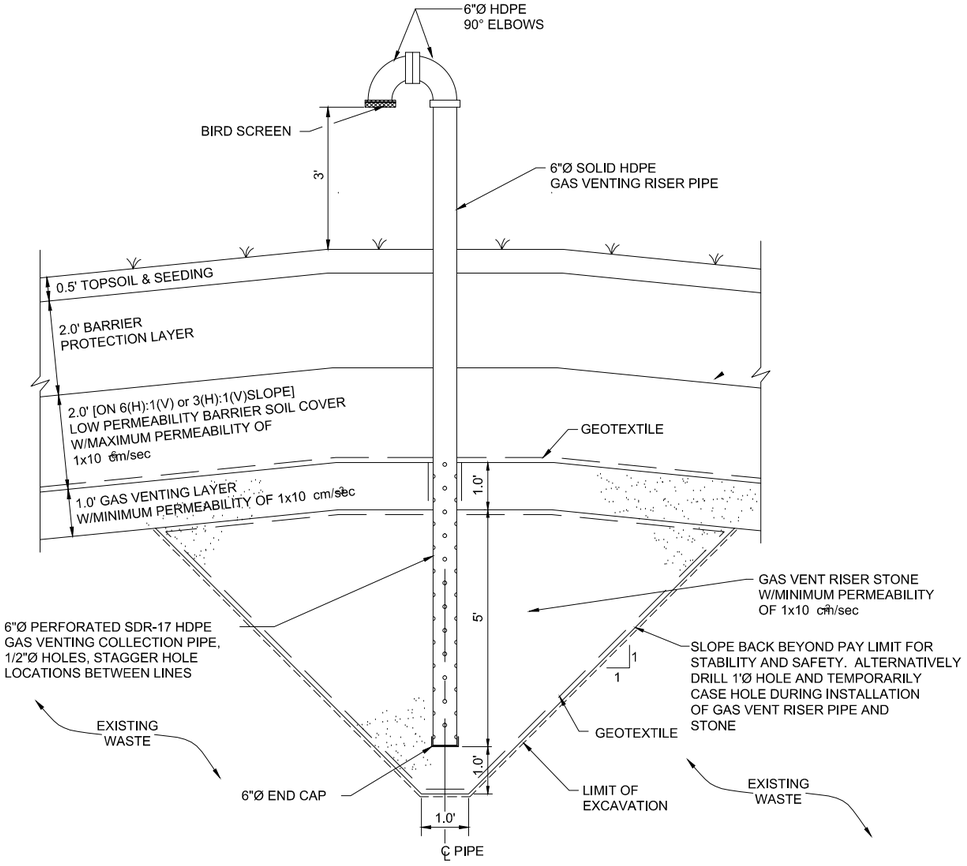
(716) 685-2300

PREPARED FOR:
ALLIED WASTE
NIAGARA FALLS LANDFILL
DIVISION OF REPUBLIC SERVICES

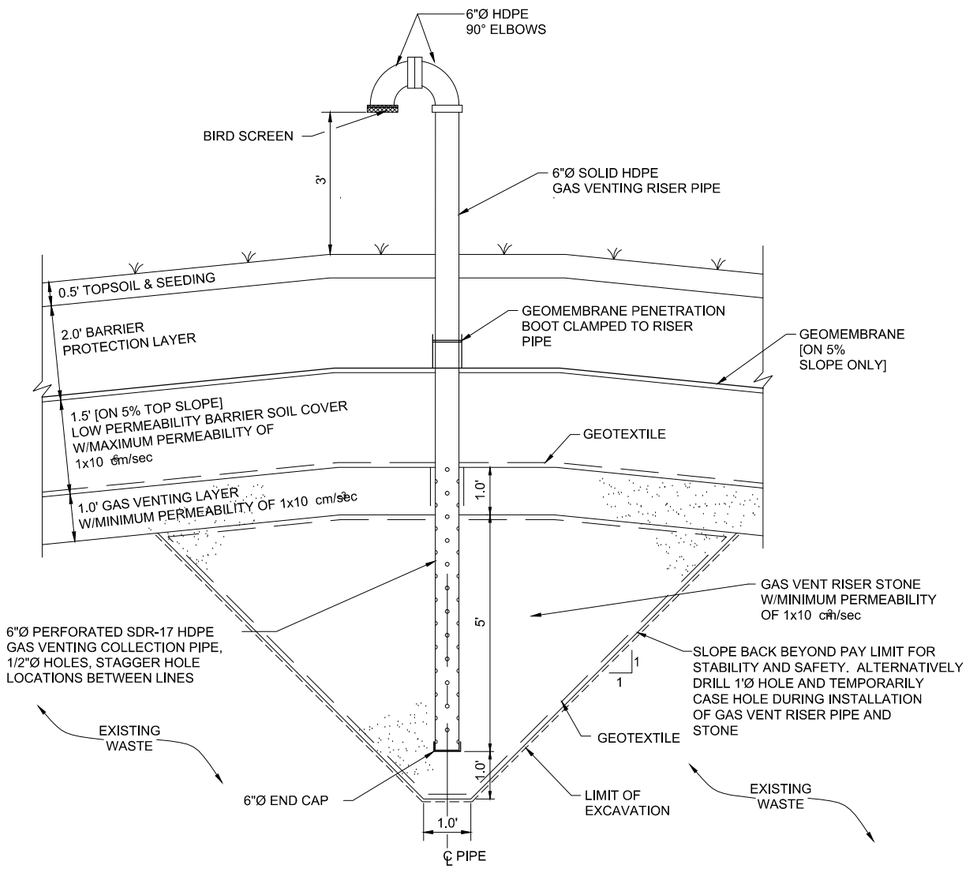
PROJ MGR: BAK	REVIEWED BY:	CHECKED BY: BAK	DRAWING No: 2
DESIGNED BY: BAK	DRAWN BY: TAK	SCALE: AS SHOWN	
DATE: FEBRUARY 2018	PROJECT NO. 21.0056748.00	REVISION NO.	SHEET NO.



TYPICAL GAS VENT DETAIL
ON LANDFILL SIDE-SLOPES WITH NO GEOMEMBRANE

NOT TO SCALE

GAS VENT INSTALL TYPICAL FOR:
1. SAN LF VI GV'S: 38-42, 50-53,69,76-83
2. SAN LF V GV'S: 20-37



TYPICAL GAS VENT DETAIL
ON LANDFILL TOP SLOPE WITH GEOMEMBRANE COVER

NOT TO SCALE

GV INSTALLATION TYPICAL FOR:
1. SAN LF VI GV'S: 43-49, 54-68, 70-75, 84

0 X X X X
NO SCALE

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL

NIAGARA FALLS, NEW YORK

TYPICAL GAS VENT INSTALLATION DETAILS
SAN LF VI & PART OF SAN LF V

APPROVED: BAK

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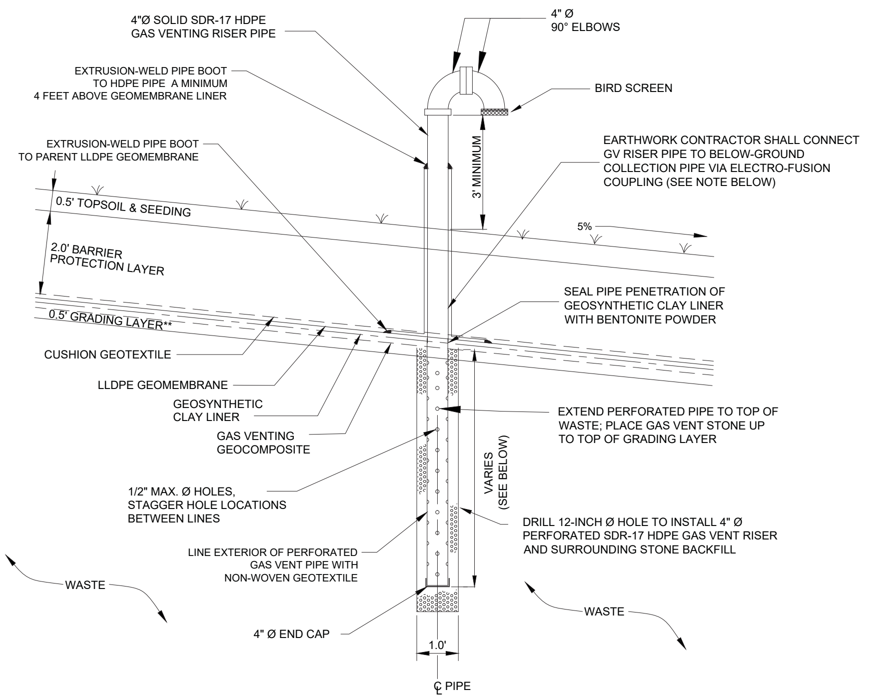
NIAGARA FALLS LANDFILL
DIVISION OF REPUBLIC SERVICES

PROJ MGR:	BAK	REVIEWED BY:	DJT	CHECKED BY:	MDK
DESIGNED BY:	BAK	DRAWN BY:	BAK	SCALE:	AS SHOWN
DATE	FEBRUARY 2018	PROJECT NO.	21.0056748.00	REVISION NO.	

FIGURE No: 1

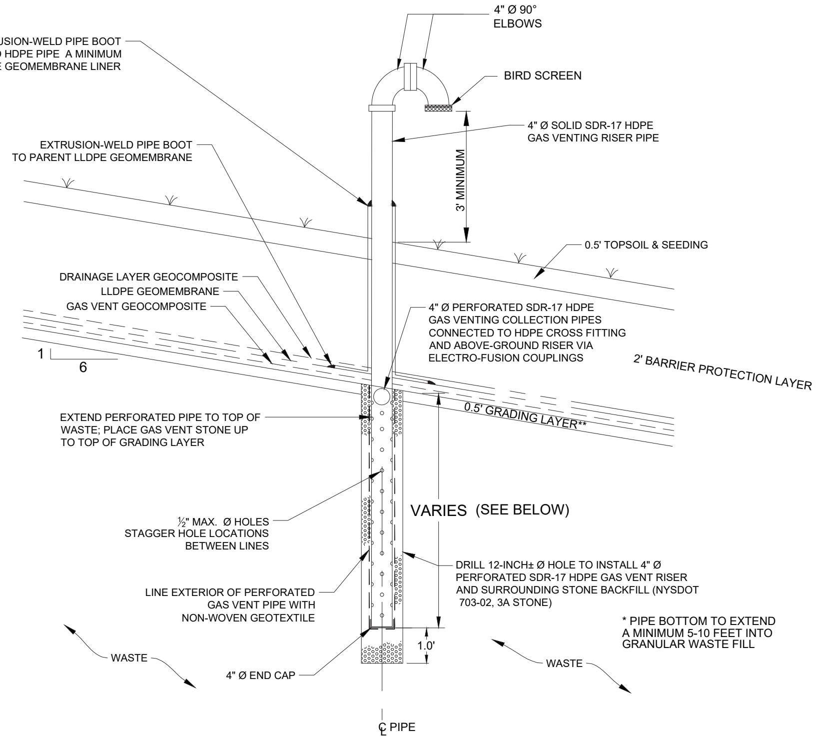


TYPICAL GAS VENT DETAIL
FOR COVER SYSTEM ON TOP OF LANDFILL

NOT TO SCALE

GV INSTALLATION TYPICAL FOR SAN LF VIII GV'S: 91-94
GAS VENT DEPTHS± BELOW TOP OF WASTE:

GV-91: 6 FT.
GV-92: 6.5 FT.
GV-93: 7 FT.
GV-94: 6 FT.



TYPICAL GAS VENT DETAIL FOR COVER
SYSTEM ON SIDESLOPE BENCHES OF LANDFILL

NOT TO SCALE

GV INSTALLATIONS TYPICAL FOR SAN LF VIII GV'S:
85-90 GAS VENT DEPTHS± BELOW TOP OF WASTE:

GV-85: 5.5 FT.
GV-86: 6 FT.
GV-87: 6 FT.
GV-88: 5.5 FT.
GV-89: 6 FT.
GV-90: 6 FT.

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL

NIAGARA FALLS, NEW YORK

GAS VENT DETAILS FOR GV-85 THRU GV-94
(PART OF SAN LF VIII)

0 X X X X
AS SHOWN

APPROVED: BAK

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PREPARED FOR:
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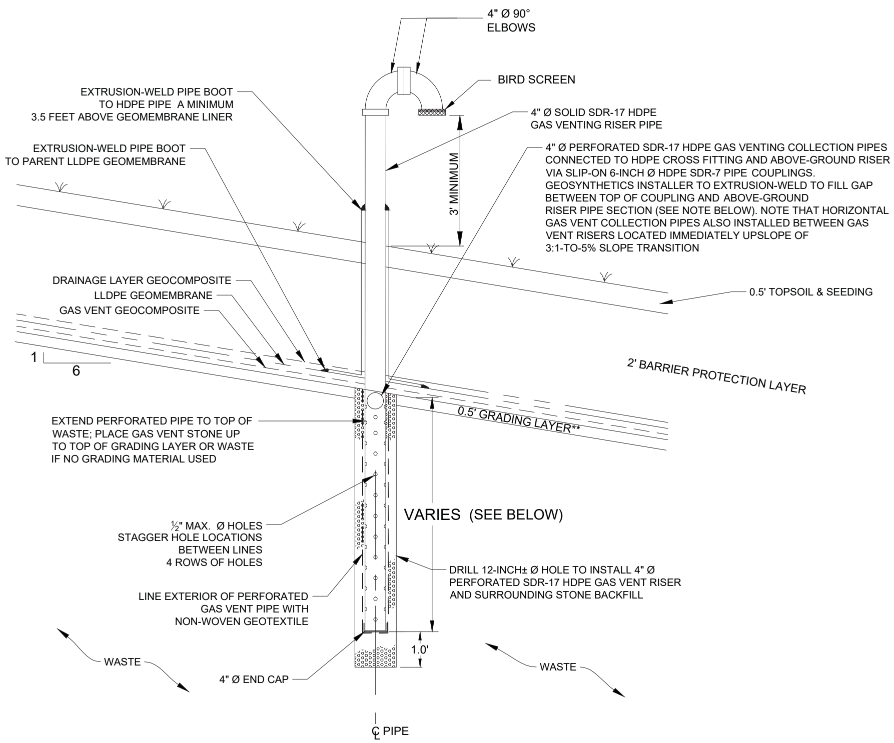
NIAGARA FALLS LANDFILL
DIVISION OF REPUBLIC SERVICES

PROJ MGR: BAK	REVIEWED BY:	CHECKED BY: BAK	DRAWING No:
DESIGNED BY: BAK	DRAWN BY: TAK	SCALE: AS SHOWN	3
DATE: FEBRUARY 2018	PROJECT NO. 21.0056748.00	REVISION NO.	SHEET NO.



TYPICAL GAS VENT DETAIL FOR COVER SYSTEM ON SIDESLOPE BENCHES OF LANDFILL

NOT TO SCALE

GV INSTALLATIONS TYPICAL FOR SAN LF VIII GV'S:
95-110 GAS VENT DEPTHS± BELOW TOP OF WASTE:

GV-95: 7 FT.
GV-96: 7 FT.
GV-97: 7 FT.
GV-98: 7 FT.
GV-99: 7 FT.
GV-100: 7 FT.
GV-101: 6.5 FT.
GV-102: 7 FT.
GV-103: 6.5 FT.
GV-104: 6 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)
GV-105: 6.5 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)
GV-106: 6.5 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)*
GV-107: 7 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)*
GV-108: 7 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)*
GV-109: 7 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)*
GV-110: 7 FT. (18-INCH WIDE TRENCH EXCAV. BY BACKHOE)*

* SEE DRAWINGS 4A & 4B FOR ADDED PIPE STUBS CONNECTED TO THESE VERTICAL RISERS)

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AS SHOWN

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL

NIAGARA FALLS, NEW YORK

GAS VENT DETAILS
FOR GV WELL NOS. 95 - 110

APPROVED: BAK

PREPARED BY: GZA GeoEnvironmental of N.Y. Engineers and Scientists, 535 WASHINGTON STREET 11th FLOOR, BUFFALO, NEW YORK 14203, (716) 685-2300

PREPARED FOR: ALLIED WASTE NIAGARA FALLS LANDFILL DIVISION OF REPUBLIC SERVICES

PROJ MGR: BAK	REVIEWED BY: DJT	CHECKED BY: BAK	DRAWING No: 4
DESIGNED BY: BAK	DRAWN BY: DEW	SCALE: AS SHOWN	
DATE FEBRUARY 2018	PROJECT NO. 21.0056748.00	REVISION NO.	

APPENDIX B

APPENDIX B

ACTIVE GCCS AT FINAL GRADES

CITY OF NIAGARA FALLS
TOWN OF NIAGARA

SANITARY LANDFILL VI

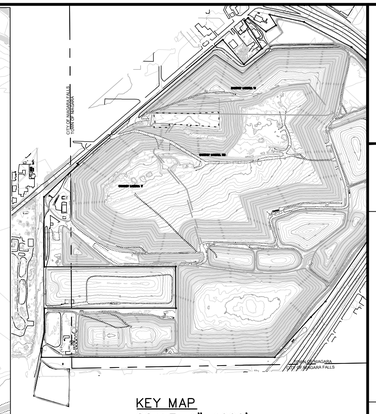
SANITARY LANDFILL VIII

SANITARY LANDFILL V

PIPE C.O.

RWH-537
RWH-536
RWH-535
WH-534

LP



KEY MAP
SCALE: 1"=1000'

LEGEND

- LIMIT OF SANITARY LANDFILL VIII
- LIMIT OF SANITARY LANDFILL V
- LIMIT OF SANITARY LANDFILL VI
- FINAL CAP LIMITS
- LEACHATE PIPING (SAN VIII)
- FUTURE HEADER / FUTURE LATERAL / FUTURE HORIZONTAL COLLECTOR
- FUTURE CONTOUR LINE
- FUTURE WELLHEAD
- EXISTING GAS VENT
- WH10 GAS WELLHEAD
- GAS COLLECTION PIPE
- PERFORATED GAS COLLECTION PIPE
- GV-106 EXISTING GAS VENT WITH CAP
- EXISTING PERFORATED GAS COLLECTION PIPE (BELOW CAP)
- EXISTING FINAL CAP LIMIT

NOTES:

1. AERIAL TOPOGRAPHY DATED NOVEMBER 15, 2022 PROVIDED BY GZA VIA EMAIL DATED 3/6/2023 (FILENAME: 2022-11-15 REPUBLIC – PINE AVE TOPO CAD.DWG)

150 75 0 150 300
SCALE: 1"=150'

NO.	REVISION	DATE

SHEET TITLE: FINAL GAS MANAGEMENT PLAN

PROJECT TITLE: LANDFILL V, VI & VIII
NIAGARA FALLS LANDFILL

CLIENT: ALLIED WASTE
NIAGARA FALLS LANDFILL
5600 NIAGARA FALLS BLVD
NIAGARA FALLS, NY 14304

SCS ENGINEERS OF NY, PC
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PROJ. NO. 07221062.07.05
DSN: BY: LKW
DWN: BY: SHY\BO
CHK: BY: LKW
Q/A REVIEW: BY: JPM
APP: BY: LKW

CADD FILE: EX COND & SEM PLAN 2023
DATE: 8/29/2023
SCALE: AS SHOWN
DRAWING NO. 1 of 1

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APPENDIX C

APPENDIX C

CALCULATIONS FOR HEADER PIPE SIZING (EXCERPTED FROM 2018 SCS ENGINEERS WORKPLAN)

HDPE PIPE SIZING CALCULATIONS

Subarea C and D Pipe Sizing

The existing gas collection system installed in Subarea C and D consists of 19 collectors. Eleven gas vents and two surface collectors will be installed and connected to the collection system with the 2018 final cover system construction. Hence, there will be a total of 32 collectors in Subarea C and D (see Drawing 1 in Appendix C).

Exhibit B-1 calculates a design gas recovery flow of approximately 800 cfm in 2019 for waste disposed in Subareas C and D of the Landfill. We have assumed that all the recoverable gas is collected by the 32 collectors, as noted above, or approximately 25 cfm/collector (793 scfm/32 collectors). Therefore, we expect a flow of 400 cfm from Subarea C (16 collectors x 25 cfm/collector) and a flow of 400 cfm from Subarea D (16 collectors x 25 cfm/collector).

Exhibit D-1 shows that a 4-inch lateral (above the geomembrane) has a capacity ranging from 102 to 129 cfm depending on concurrent or countercurrent flow. For dedicated 4-inch laterals, there will be sufficient capacity for the 25 cfm from each collector. In Subarea C, the majority of the laterals are concurrent. In Subarea D, flow in the laterals will be concurrent from all collectors upslope of the 14-inch header. All laterals to gas vents downslope of the 14-inch header have countercurrent flow.

A 6-inch header has a capacity of 362 cfm with concurrent flow (see Exhibit D-1). There is sufficient capacity in the two existing 6-inch laterals in Subarea C to carry gas from 4 collectors (100 cfm) or 9 collectors (225 cfm) (see calculations in Exhibit D-2).

An 8-inch header has a capacity of 719 cfm with concurrent flow (see Exhibit D-1). There is sufficient capacity for the existing 8-inch header installed from WH-3 to the flare to carry the estimated 400 cfm from Subarea C to the flare.

In Subarea D, there are two laterals (above the geomembrane) with concurrent flow that will provide vacuum to 3 collectors (lateral to WH20, WH10, GV116 and lateral to WH21, GV120, WH11) (see Drawing 1 in Appendix C). The 4-inch laterals will have sufficient capacity for the 75 cfm (25 cfm x 3) from the three collectors.

Exhibit D-1 shows that a 14-inch header has a capacity of 2,444 cfm for concurrent flow of condensate and gas. The 14-inch header, within the 11.3 acre cap in Subarea D, will be installed with concurrent flow of condensate and gas. Even at the peak design flow of 1,350 scfm (estimated for Year 2026 per Exhibit B-1), the 14-inch header has sufficient capacity to carry all the gas to the blower/flare station.

Additionally, if the 4-inch perforated gas collection pipes (below the geomembrane) are assumed to convey all the gas under the final cover system to the gas vents (which is highly conservative

as the gas venting geocomposite will also transmit gas to the vents), the 4-inch pipes will have sufficient capacity for the 25 cfm for each collector.

Subarea E and F Pipe Sizing

As previously mentioned, the peak design flow of 1350 scfm is expected in 2026. For the Subarea E and F main header sizing, it is conservatively assumed that all this gas is collected from Subarea E and F (i.e. no contribution from Subarea C and D).

In Subarea E and F, approximately 56 horizontal collectors will be installed (See Drawing 2 in Appendix C), resulting in a flow of approximately 24 cfm per collector (1350 cfm/56 collectors). A main header installed on the north and east sides of Subarea E and F will convey gas from the horizontals to the Subarea D 14-inch header (see Drawing 2 in Appendix C). The header size varies from 14-inch to 16-inch depending on whether flow is concurrent or countercurrent (see Exhibit D-2). The maximum headloss in the main header based on a flow of 1350 cfm is approximately 12 inches of water column (in-w.c.),

Estimates of the headlosses in the Subarea E and F system are:

- Desired vacuum at each collector: 20 in-w.c.
- Estimated Piping losses: 12 in-w.c.
- Blower Station valves and fittings: 10 in-w.c.
- Flare back pressure: 10 in-w.c.

Total pressure head required is 52 in-w.c. with 42 in-w.c. of vacuum. The permanent flare skid blowers are designed provide 80 in-w.c. of vacuum at a flow of 1500 cfm, leaving approximately 38 in-w.c. contingency.

Exhibit D-1. Maximum Flow Limits in HDPE Pipe
Niagara Falls Landfill GCCS

Concurrent Flow of Gas and Condensate

Nominal	SDR 17 ID (in)[3]	Flow [1][2] cfm	Velocity [1][2] fpm
4	3.94	129	1,530
6	5.80	362	1,975
8	7.55	719	2,314
14	12.25	2,444	2,985

(based on 50 fps and 1 in-w.c. loss per 100 feet pipe)

Countercurrent Flow of Gas and Condensate with Slope = 1% - 3%

Nominal	SDR 17 ID (in)[3]	Flow [1][2] cfm	Velocity [1][2] fpm
4	3.94	102	1,200
14	12.25	983	1,200
16	14.01	1,284	1,200

(based on 20 fps velocity)

COUNTERCURRENT FLOW; SLOPE > 3%

Nominal	SDR 17 ID (in)[3]	Flow [1][2] cfm	Velocity [1][2] fpm
4	3.94	127	1,500
14	12.25	1,228	1,500
16	14.01	1,605	1,500

(based on 25 fps velocity)

(1) Flow and velocity calculations for concurrent flow assumes LFG specific gravity of 0.975, which is based on gas at atmospheric pressure, 60degF, 50% methane, 40%CO2, 8% N2, 2%O2 (dry concentrations) and 100%RH.
(2) Flow and velocity calculation based on Spitzglass equpation for Low Pressure Gas
(3) Pipe Inside Diameter (ID) for PE4710, SDR 17 per ISCO Industries

Exhibit D-2. Headloss Calculations
Niagara Falls Landfill GCCS

From	To	Length (ft.)	Header Flow (cfm)	Diameter (in.)	Velocity (fpm)	Pressure Loss (in.-w.c.)	Loss per 100 ft. (in.-w.c.)
Case 1: Subarea C (Flow 400 cfm)							
WH-8	WH-3	790	100	5.85	536	0.59	0.07
WH-6	WH-3	350	225	5.85	1,205	1.32	0.38
WH-3	Flare	400	400	7.55	1,287	1.27	0.32
					TOTAL =	2.59	
Case 2: Subarea D (Flow 400 cfm)							
Lateral							
WH-20	WH-10	75	25	3.97	291	0.03	0.04
WH-10	GV-116	75	50	3.97	582	0.11	0.15
GV-116	14-inch header	100	75	3.97	872	0.33	0.33
					TOTAL =	0.47	
Header							
GV119	Flare	1500	400	12.25	489	0.41	0.03
Case 3: Subarea E and F (Flow 1350 cfm)							
Subarea F West (1)	Subarea E HP	2000	1,350	14.01	1,261	3.24	0.16
Subarea E HP (2)	Subarea E LP	800	1,350	12.25	1,649	2.51	0.31
Subarea E LP (3)	Subarea D	830	1,350	14.01	1,261	1.34	0.16
Subarea D Header(4)	Flare	1500	1,350	12.25	1,649	4.70	0.31
					TOTAL =	11.79	

Case 1: Conservatively assumes all gas enters pipe at starting wellhead
Case 2: Sample calculation for one 4-inch lateral with 3 wells; 14-inch header with 2019 Subarea D flow only

Case 3: Conservatively assumes all peak gas flow contributed by Subarea E and F; realistically gas still generated by Subareas C and D

(1) Future Main 16-inch header on north side of landfill from northwest corner of Subarea F to highpoint of north side of Subarea E with counterconcurrent flow of gas and condensate.

(2) Future Main 14-inch header on northeast side of landfill from highpoint of Subarea E to lowpoint of Subarea E with concurrent flow of gas and condensate.

(3) Future Main 16" header from Subarea E lowpoint to 2018 Subarea D final cap header countercurrent flow of gas and condensate

(4) Subarea D Final cap header; concurrent flow of gas and condensate

APPENDIX D

APPENDIX D

INITIAL PERFORMANCE TEST REPORT FOR OPEN FLARE

June 27, 2019
File No. 02216707.04

Mr. Ralph Larimore
Environmental Manager
Republic Services
5600 Niagara Falls Landfill
Niagara Falls, New York 14304

SUBJECT: Summary of Results of Initial Performance Test
Niagara Falls Landfill
Niagara Falls, New York

Dear Ralph:

SCS Engineers (SCS) prepared this letter to summarize the results of the initial performance test of the 3,000 scfm utility flare manufactured by John Zink Company at the Niagara Falls Landfill located in Niagara Falls, New York. This test was conducted in general accordance with 40 CFR 60.754(e) and 40 CFR 60.18, and covers the following requirements:

- The net heating value of the gas being combusted (for non-assisted flares) shall be 200 Btu/scf or greater. The net heating value is based on methane content, as measured by EPA Method 3C.
- The flare shall be operated with an exit velocity less than 60 ft/sec. A higher exit velocity (Vmax) is permitted when the Btu content of the gas exceeds 200 Btu/scf, as calculated according to the methods of 60.18(f)(5).
- Observation of flare visible emissions per EPA Method 22. Visible emissions shall not be present except for periods not to exceed a total of 5 minutes during any 2 consecutive hours.

The results of the initial performance test are summarized below.

HEAT CONTENT

We visited the site on April 30, 2019 to conduct sampling to evaluate compliance with the heat content requirement (minimum 200 Btu/scf), outlined in 40 CFR 60.18 for non-assisted LFG utility flares. Four samples were collected at the flare inlet using 6-Liter SUMMA canisters. Prior to sampling, we measured gas composition using a Landtec GEM 5000 infrared gas analyzer. The samples were delivered to ALS Environmental, Ltd. for analyses per EPA Method 3C for methane, carbon dioxide, oxygen, nitrogen, hydrogen, and carbon monoxide. The laboratory analysis results are summarized in Table 1; the complete laboratory results are presented in Attachment 1.

Table 1. Results of Laboratory Analysis

Sample	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Nitrogen (% v/v)
Can #1	39.6	27.4	2.88	30.1
Can #2	39.3	27.2	3.07	30.4
Can #3	39.0	27.2	3.21	30.6
Can #4	39.3	27.2	3.10	30.4

We utilized the results of the laboratory analyses for methane and its HHV to calculate the net heating value of the gas being combusted in the flare. Methane has a higher heating value (HHV) of 1,010 BTU/scf[1]. A summary of the heat content calculations is provided in Table 2.

Table 2. LFG Heat Content Calculation

Sample	Methane (% v/v)	Heating Value (BTU/scf)	LFG Heat Content (BTU/scf)
Can #1	39.6	1010	400
Can #2	39.3	1010	397
Can #3	39.0	1010	394
Can #4	39.3	1010	397
		Average	**397**

As presented in Table 2, the average heat content of the LFG directed to the flare was 397 BTU/scf during the performance testing. This demonstrates compliance with the minimum net heating value requirement (200 BTU/scf), as stipulated in 40 CFR 60.18.

[1] Engineering Data Book, Gas Processors Association. Volume II Sections 17-26 10th ed., 1987.

EXIT VELOCITY

During our April 30, 2019 site visit, we recorded the flow rate of the gas directed to the flare to evaluate compliance with the maximum exit velocity requirement (60 ft/sec) outlined in 40 CFR 60.18.

In a May 20, 2009 letter, the EPA documented that it is acceptable to utilize a mass flow meter to measure the gas flow rate to determine exit velocity for a flare. The flare is equipped with a Thermal Instruments mass flow meter (model 62-9/9500PI), which measures the LFG flow at the flare inlet. A copy of the most recent certificate of calibration for the flow meter is provided in Attachment 2.

During the performance test, we recorded the LFG flow measured by the flow meter every five minutes over a two-hour period. SCS then calculated the exit velocity using the measured LFG flow rates and the flare stack cross-sectional area. A summary of the LFG flow and the exit velocity calculations are provided in Table 3; the complete exit velocity calculations are presented in Attachment 3.

Table 3. Summary of Flow and Exit Velocity Calculations

Stack Diameter (in)	Stack Area (sq ft)	Average Flow (scfm)	Exit Velocity (ft/s)
12	0.79	974	21

As presented in Table 3, the average exit velocity was 21 ft/sec. This demonstrates compliance with the maximum exit velocity of 60 ft/sec stipulated in 40 CFR 60.18

VISIBLE EMISSIONS EVALUATION

On April 30, 2019, site personnel conducted a visible emissions evaluation of the flare. The objective of this evaluation was to determine compliance with the visible emissions requirement outlined in 40 CFR 60.18 (no visible emissions, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours).

In accordance with 40 CFR 60.18, the visible emissions evaluation was conducted in accordance with EPA Method 22 for a 2-hour period. Conditions that could affect visible emissions observations, such as wind direction, sun location, and weather were noted during the test. The results were documented on the Fugitive Emission Inspection summary form provided as Attachment 4.

During the visible emissions evaluation, no visible emissions were observed from the utility flare. This demonstrates compliance with the applicable visible emissions limitations stipulated in 40 CFR 60.18.

Please call with any questions.

Sincerely,

Lisa K. Wilkinson, P.E.
Project Director I
SCS ENGINEERS

Gregory P. McCarron, P.E.
Project Director II
SCS ENGINEERS

Attachment 1

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

LABORATORY REPORT

May 20, 2019

Scott Schoffner
SCS Field Services
4330 Lewis Road, Suite 1
Harrisburg, PA 17111

RE: Pine Ave Landfill

Dear Scott:

Enclosed are the results of the samples submitted to our laboratory on May 6, 2019. For your reference, these analyses have been assigned our service request number P1902554.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 11:26 am, May 20, 2019

For Kate Kaneko
Laboratory Director

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

Client: SCS Field Services
Project: Pine Ave Landfill

Service Request No: P1902554

CASE NARRATIVE

The samples were received intact under chain of custody on May 6, 2019 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (hydrogen, oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
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www.alsglobal.com

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2018027
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1521096
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-006
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: SCS Field Services
Project ID: Pine Ave Landfill
Service Request: P1902554

Date Received: 5/6/2019
Time Received: 09:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	3C Modified - Fxd Gases Can
Pine Ave CAN 1	P1902554-001	Air	4/30/2019	09:47	SC01511	-0.56	3.65	X
Pine Ave CAN 2	P1902554-002	Air	4/30/2019	10:13	SC01756	-0.68	3.70	X
Pine Ave CAN 3	P1902554-003	Air	4/30/2019	10:41	SC02032	-0.81	3.77	X
Pine Ave CAN 4	P1902554-004	Air	4/30/2019	11:03	SC00250	-1.03	3.64	X

Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. P1902554

Company Name & Address (Reporting Information)	SCS Field Services 4330 Lewis Road Suite 1 Harrisburg, PA 17111
Project Manager	Scott Schaffner
Phone	717 671 5102
Fax	
Email Address for Result Reporting	SSchaffner@scsfieldservices.com
Project Name	Pine Ave Landfill
Project Number	
P.O. # / Billing Information	
Sampler (Print & Sign)	BEN Lock Ben Lock
ALS Contact:	

Analysis Method: EPA Method TO-15

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method		Comments e.g. Actual Preservative or specific instructions
Pine Ave CAN 1		4/30/19	9:47	02150		-19.7	-3		✓		
Pine Ave CAN2		4/30/19	10:13	01756		-19.5	-3		✓		
Pine Ave CAN3		4/30/19	10:41	02032		-19.3	-3		✓		
Pine Ave CAN 4		4/30/19	11:03	00250		-19.2	-3		✓		4th can is a backup. Analyze only if required.
GQ: CH4 36.9											
CO2 28											
O2 2.6											
BAL 32.5											

Report Tier Levels - please select
Tier I - Results (Default in not specified) _____ Tier III (Results + QC & Calibration Summaries) _____
Tier II (Results + QC Summaries _____ Tier IV (Date Validation Package) 10% Surcharge _____

EDD required (YES) / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) Ben Lock	Date: 4/30/19	Time: 11:30	Received by: (Signature)	Date: 5/01/19	Time: 0930	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature _____ °C

ALS Environmental
Sample Acceptance Check Form

Client: SCS Field Services Work order: P1902554

Project: Pine Ave Landfill

Sample(s) received on: 5/6/19 Date opened: 5/6/19 by: HAYDEN.AKERS

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☐	☒
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1902554-001.01	6.0 L Source Can					
P1902554-002.01	6.0 L Source Can					
P1902554-003.01	6.0 L Source Can					
P1902554-004.01	6.0 L Source Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **SCS Field Services**
Client Sample ID: **Pine Ave CAN 1**
Client Project ID: **Pine Ave Landfill**

ALS Project ID: P1902554
ALS Sample ID: P1902554-001

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Gilbert Gutierrez
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01511

Date Collected: 4/30/19
Date Received: 5/6/19
Date Analyzed: 5/14/19
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -0.56 Final Pressure (psig): 3.65

Container Dilution Factor: 1.30

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.13	
7782-44-7	**Oxygen***	**2.88**	0.13	
7727-37-9	**Nitrogen**	**30.1**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**39.6**	0.13	
124-38-9	**Carbon Dioxide**	**27.4**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **SCS Field Services**
Client Sample ID: **Pine Ave CAN 2**
Client Project ID: **Pine Ave Landfill**

ALS Project ID: P1902554
ALS Sample ID: P1902554-002

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Gilbert Gutierrez
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01756

Date Collected: 4/30/19
Date Received: 5/6/19
Date Analyzed: 5/14/19
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -0.68 Final Pressure (psig): 3.70

Container Dilution Factor: 1.31

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.13	
7782-44-7	**Oxygen***	**3.07**	0.13	
7727-37-9	**Nitrogen**	**30.4**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**39.3**	0.13	
124-38-9	**Carbon Dioxide**	**27.2**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **SCS Field Services**
Client Sample ID: **Pine Ave CAN 3**
Client Project ID: **Pine Ave Landfill**

ALS Project ID: P1902554
ALS Sample ID: P1902554-003

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Gilbert Gutierrez
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC02032

Date Collected: 4/30/19
Date Received: 5/6/19
Date Analyzed: 5/14/19
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -0.81 Final Pressure (psig): 3.77

Container Dilution Factor: 1.33

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.13	
7782-44-7	**Oxygen***	**3.21**	0.13	
7727-37-9	**Nitrogen**	**30.6**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**39.0**	0.13	
124-38-9	**Carbon Dioxide**	**27.2**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **SCS Field Services**
Client Sample ID: **Pine Ave CAN 4**
Client Project ID: **Pine Ave Landfill**

ALS Project ID: P1902554
ALS Sample ID: P1902554-004

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Gilbert Gutierrez
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00250

Date Collected: 4/30/19
Date Received: 5/6/19
Date Analyzed: 5/14/19
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.03 Final Pressure (psig): 3.64

Container Dilution Factor: 1.34

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.13	
7782-44-7	**Oxygen***	**3.10**	0.13	
7727-37-9	**Nitrogen**	**30.4**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**39.3**	0.13	
124-38-9	**Carbon Dioxide**	**27.2**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **SCS Field Services**
Client Sample ID: **Method Blank**
Client Project ID: **Pine Ave Landfill**

ALS Project ID: P1902554
ALS Sample ID: P190514-MB

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Gilbert Gutierrez
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 5/14/19
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **SCS Field Services**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1902554
Client Project ID: **Pine Ave Landfill** ALS Sample ID: P190514-LCS

Test Code: EPA Method 3C Modified Date Collected: NA
Instrument ID: HP5890 II/GC1/TCD Date Received: NA
Analyst: Gilbert Gutierrez Date Analyzed: 5/14/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
1333-74-0	Hydrogen	40,000	**43,100**	**108**	97-113	
7782-44-7	Oxygen*	40,000	**41,400**	**104**	96-112	
7727-37-9	Nitrogen	50,000	**50,000**	**100**	94-110	
630-08-0	Carbon Monoxide	50,000	**51,600**	**103**	96-111	
74-82-8	Methane	40,000	**41,700**	**104**	96-112	
124-38-9	Carbon Dioxide	50,000	**50,400**	**101**	92-107	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

Attachment 2

CALIBRATION CERTIFICATION

We certify that the calibration accuracies listed below are obtained on equipment, and with methods, that can be traced directly to the US National Institute of Standards and Technology.

FLOWRATE READOUT ACCURACY: ± 1% Full Scale

PRESSURE TESTED AT:

METER SERIAL NUMBER: **2018138** MODEL NUMBER: **62-9/9500PI**

The calibration listed above was performed under the following conditions:

0 - 4000 SCFM SATURATED LFG
32 - 200 DEG F
0 - 15 PSIG
12" SCH 40 CS LINE
12.0" LINE ID

Standard Conditions: 60Deg F @ 1 ATM

Signature _____ Date **May 11, 2018**

THERMAL INSTRUMENT COMPANY, INC.

217 Sterner Mill Road, Trevose, PA 19053 Phone: 215-355-8400 Fax: 215-355-1789 Web: www.thermalinstrument.com

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAY 20 2009

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

David H. Penoyer
SCS Engineers
4041 Park Oaks Boulevard, Suite 100
Tampa, FL 33610

Dear Mr. Penoyer:

In your May 1, 2009 letter, you requested permission to use an alternative procedure to measure the flow rate of gas exiting the candlestick flare at the Richland Creek Road Landfill in Buford, Georgia. The flare is subject to 40 CFR Part 60.18 for an open flare burning landfill gas. You would like to use a mass flowmeter in place of Method 2, 2A, 2C, or 2D to satisfy the requirements of 60.18(f)(4). Your flowmeter will be sent to the manufacturer to assess the calibration prior to conducting the performance test. A copy of the flowmeter calibration certificate will be attached to the test report.

We approve your use of the mass flowmeter in place of Method 2, 2A, 2C or 2D to measure the flare flow rate at the Richland Creek Road Landfill in Buford, Georgia. Since this alternative method is applicable to other similar facilities in this source category, we will be posting this letter on our website at http://www.epa.gov/ttn/emc/approalt.html for use by other interested parties.

If you have questions or would like to discuss the matter further, please call Foston Curtis at (919) 541-1063, or you may e-mail him at curtis.foston@epa.gov.

Sincerely,

Conniesue B. Oldham, Ph.D., Group Leader
Measurements Technology Group

cc: Foston Curtis (E143-02))
Karen Hays, Georgia EPD
David McNeal, Region 4

Attachment 3

Attachment 3- Exit Velocity Calculations

Test Information			
Date:	4/30/19		
Personnel:	Ben Lock		
Flare Information			
Diameter (in):	12		
Flow Meter Information			
Make:	Thermal Instrument		
Model:	62-9/9500PI		
Time	**Flow (scfm)**	**Stack Area (sq ft)**	**Exit Velocity (ft/s)**
8:00	1086	0.79	23
8:05	995	0.79	21
8:10	970	0.79	21
8:15	971	0.79	21
8:20	1003	0.79	21
8:25	982	0.79	21
8:30	991	0.79	21
8:35	963	0.79	20
8:40	959	0.79	20
8:45	976	0.79	21
8:50	990	0.79	21
8:55	977	0.79	21
9:00	993	0.79	21
9:05	981	0.79	21
9:10	979	0.79	21
9:15	964	0.79	20
9:20	934	0.79	20
9:25	942	0.79	20
9:30	968	0.79	21
9:35	945	0.79	20
9:40	951	0.79	20
9:45	1003	0.79	21
9:50	942	0.79	20
9:55	958	0.79	20
10:00	919	0.79	20
Average	974		21

Attachment 4

OBSERVATION RECORD

PAGE _____ OF _____

COMPANY: Republic Services
LOCATION: Niagara Falls, NY
TEST NUMBER: 1
DATE: 4/30/2019

OBSERVER: Ben Lock
TYPE FACILITY: Landfill
POINT OF EMISSIONS: John Zink LFG flare

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	
8:00	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
8:05	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
8:10	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
8:15	15	0	0	0	0			
	16	BREAK						
	17							
	18							
	19							
8:20	20							
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
8:25	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	
8:30	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
8:35	35	0	0	0	0			
	36	BREAK						
	37							
	38							
	39							
8:40	40							
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
8:45	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
8:50	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
8:55	55	0	0	0	0			
	56	BREAK						
	57							
	58							
	59							

OBSERVATION RECORD

PAGE _____ OF _____

COMPANY: Republic Services
LOCATION: Niagara Falls, NY
TEST NUMBER: 1
DATE: 4/30/2019

OBSERVER: Ben Lock
TYPE FACILITY: Landfill
POINT OF EMISSIONS: John Zink LFG flare

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	
9:00	0	BREAK						
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
9:05	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
9:10	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
9:15	15	0	0	0	0			
	16	BREAK						
	17							
	18							
	19							
9:20	20							
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
9:25	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	
9:30	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
9:35	35	0	0	0	0			
	36	BREAK						
	37							
	38							
	39							
9:40	40							
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
9:45	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
9:50	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
9:55	55	0	0	0	0			
	56	BREAK						
	57							
	58							
	59							

OBSERVATION RECORD

PAGE _____ OF _____

COMPANY: Republic Services
LOCATION: Niagara Falls, NY
TEST NUMBER: 1
DATE: 4/30/2019

OBSERVER: Ben Lock
TYPE FACILITY: Landfill
POINT OF EMISSIONS: John Zink LFG flare

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	
10:00	0	BREAK						
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
10:05	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
10:10	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
10:15	15	0		0	0			

HOUR	MIN	SECONDS				STEAM PLUME		COMMENTS
		0	15	30	45	Attached	Detached	

APPENDIX E

APPENDIX E

ALLOWABLE POSITIVE PRESSURE CALCULATIONS FOR CAPPED VENTS

N
W E
S

SANITARY LANDFILL VI SUB D
SAN. LANDFILL VI SUBAREA B
SAN. LANDFILL VI SUB C
SANITARY LANDFILL VIII SUBAREA F WEST
SANITARY LANDFILL VIII SUBAREA F EAST
SANITARY LANDFILL VIII SUBAREA E
SANITARY LANDFILL VIII SUBAREA A
SANITARY LANDFILL VIII SUBAREA C
SANITARY LANDFILL VIII SUBAREA D
SANITARY LANDFILL V SUBAREA A
SANITARY LANDFILL VIII SUBAREA B
SANITARY LANDFILL V SUBAREA C
FLARE #9
FLARE #10
FLARE #3
LCO-2
LCO-1

LEGEND

- BOUNDARY OF AREAS HAVING A SOIL CAP EXCLUSIVELY
- 2 AREAS ATOP SAN LF VI HAVING A FINAL COVER SYSTEM WITH GEOMEMBRANE AS PART OF THE LOW PERMEABILITY SOIL BARRIER (COMPOSITED WITH 1.5' LOW PERM. SOIL)
- AREAS ATOP SAN LF V AND VIII HAVING A GEOSYNTHETIC FINAL COVER SYSTEM
- BOUNDARY OF SUBAREAS OF SANITARY LANDFILL VI
- BOUNDARY OF SUBAREAS OF SANITARY LANDFILLS V AND VIII
- 106 GAS VENT LOCATION AND DESIGNATION
- LCO-2 LEACHATE CLEAN-OUT LOCATION AND DESIGNATION

0 125 250 500 750
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

ALLIED WASTE NIAGARA FALLS LANDFILL

SANITARY LF'S V, VI & VIII GEOSYNTHETIC CAP AREAS VS. SOIL CAP AREAS AND GAS VENT LOCATIONS AT END OF 2023

APPROVED: BAK

PREPARED BY:
GZA GeoEnvironmental of N.Y.
Engineers and Scientists
300 PEARL STREET, SUITE 700
BUFFALO, NEW YORK 14202
(716) 685-2300

PREPARED FOR:
ALLIED WASTE
NIAGARA FALLS LANDFILL
DIVISION OF REPUBLIC SERVICES

PROJ MGR: BAK	REVIEWED BY: DJT	CHECKED BY: MDK	FIGURE No:
DESIGNED BY: BAK	DRAWN BY: BAK	SCALE: AS SHOWN	1
DATE: NOVEMBER 2023	PROJECT NO.	REVISION NO.	

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/17/2019 Checked: DW

062-052405 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
Date: 08/25/2020
License Expires on 11/30/2021

REGULATION

Positive pressure at each wellhead is allowable for those areas that use a geomembrane or synthetic cover. Further, the rules stipulates that the owner or operator develop acceptable pressure limits in the design plan.

SCENARIO

Landfill VI and parts of V : LLDPE Membrane on top of Low Permeability Soil Cover

OBJECTIVE

Calculate the maximum allowable positive pressure under the geomembrane final cover such that neither the geomembrane nor the stability of the final cover are impacted.

REFERENCES

1. Infinite Slope Analysis Method
2. Thiel, R.S. (1998), "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, Vol. 5, No. 6 pp. 589-617.
3. Koerner and Narejo (2005), "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces", Geosynthetic Research Institute, GRI Report #30, June 14, 2005.

ASSUMPTIONS

Cover Configuration

	Material	Thickness (inches)	Unit Weight (pcf)	"Weight" on Membrane (psf)
Layer 1	Topsoil	6	100	50.0
Layer 2	Protective Soil	24	100	200.0
Layer 3	Geosynthetics	0.04	60	0.2
Layer 4	Compacted Clay Cover	24	100	200.0
Layer 5	NA	0	0	0.0
Layer 6	NA	0	0	0.0

Green Cells require user input.

Slope Angle		20 :1	
Slope Angle	β =	2.86	deg
Cover Thickness Perpendicular to Slope		30.04	inches
Cover Thickness Perpendicular to Slope	h =	2.50	ft
Vertical Cover Thickness	h_{ver} =	2.51	ft
"Weight" on Cover Perpendicular to Slope		250.2	psf
Equivalent Unit Weight on Cover	γ =	99.95	lbs/ft3

Geosynthetic ϕ (Clay/T LLDPE membrane) LD	δ =	13	deg
Geosynthetic Adhesion	c =	146	psf
Geosynthetic Adhesion		1.01	psi

Source of interface data: GRI Direct Shear Database, 2005

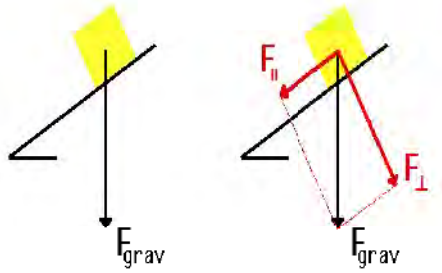
Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/17/2019 Checked: DW

062-052405 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
Date: 08/25/2020
License Expires on 11/30/2021

Defined Terms

$F_{||}$ =Force parallel to surface of cover
$F_{\perp}$ = Force perpendicular to cover
F_{grav} = Force of gravity due to final cover



The force of gravity can be resolved into two components. Together, these two components can replace the effect of the force of gravity.

Figure 1

CALCULATIONS:

Evaluate the following three potential impacts of positive gas pressure on the final cover system:

1) impact of positive pressure on the geomembrane seams

2) impact of positive pressure on the overlying soil material causing localized lifting and potential final cover soil movement, and

3) impact of positive pressure on the intermediate cover soil sub-base interface causing localized slope instability.

1. Impact on Geomembrane Seams:

For 40 mil (nominal) textured LDPE Geomembrane, the following are typical tensile strengths (at yield) for geomembrane seams:

Bonded seam strength (shear) = 60 ppi (1,500 psi) = 41,520 inches water column
Peel strength (extrusion) = 44 ppi (1,133 psi) = 30,448 inches water column
Peel strength (fusion) = 50 ppi (1,267 psi) = 35,600 inches water column

For 40 mil (nominal) textured geomembrane, the following are the tensile strengths (at break) for the Geomembrane sheet:

Tensile strength = 60 ppi (1,500 psi) = 41,520 inches water column

Based on the above analysis, positive gas pressures would have to exceed 30,000 psf to approach the yield strength of a geomembrane seam. Therefore, positive pressure within the landfill will have no impact on the geomembrane seams.

Allowable Gas Pressure Calculation - Closed Site

Job:	Niagara Landfill	Made by: DW
Date:	7/17/2019	Checked: DW

Date: 08/25/2020
License Expires on 11/30/2021

2. Impact on Final Cover Soils (Lifting):

Calculate the positive pressure within the landfill that would counteract the weight of the final cover soil above the geomembrane, and thus cause the soil to "float," potentially making it unstable on the landfill slope.

Note that cohesion between layers of the final cover is ignored to be conservative.

Refer to Figure 1:

Calculation for Flat Benches on Final Cover: Positive pressure must overcome F_{grav} to "float" cover soil.

$F_{grav} = h_{ver}g$ = 250.5 psf = 48.2 inches W.C

Calculation for Sideslopes of Final Cover: Positive pressure must overcome $F_{\perp}$ to "float" cover soil.

$F_{\perp} = F_{grav} \cos \beta$ = 250.2 psf = **48.1** inches W.C

Thus, positive gas pressures within the landfill would have to exceed **48.2** **inches W.C. to cause uplift on horizontal benches**

Thus, positive gas pressures within the landfill would have to exceed **48.1** **inches W.C. to cause uplift on the slopes**

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/17/2019 Checked: DW

062-052405 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
Date: 08/25/2020
License Expires on 11/30/2021

3. Impact on Stability of Final Cover Soils

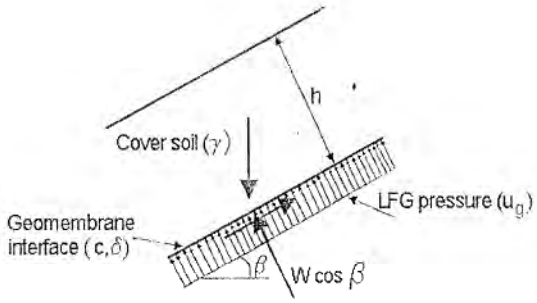
Calculate the factor of safety against sliding of the final cover assuming that the landfill is under positive pressure.

Factor of safety against sliding is defined as: $FS = F_{resist} / F_{driving}$, where

F_{resist} = Resisting forces

$F_{driving}$ = Driving forces

Using the infinite slope analysis method, which is conservative under these conditions, the resisting forces and driving forces are illustrated in the figure below. The Factor of Safety equation is shown at the bottom of the figure.



$$FS = \frac{c + (h\gamma \cos \beta - u_g) \tan \delta}{h\gamma \sin \beta}$$

Figure 2

For this analysis, the "geomembrane interface" referred to in the figure will be the interface between the geomembrane and the underlying barrier layer. This is the interface that will be subject to a reduction in normal force (and thus shear strength, or resisting force) if positive pressure builds up within the landfill.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/17/2019 Checked: DW

Calculate the factor of safety of the slope using the maximum allowable gas pressure calculated in Section 2.

Maximum Allowable Gas Pressure: 48.1 inches water column
convert from inches w.c. to psf:
u_g = 250.12 psf

Resultant Factor of Safety: *FS* = **11.68**

Typical minimum factor of safety using this type of analysis and for short term conditions is 1.25.

Therefore at: 48.1 inches w.c. positive pressure, slope MEETS typical minmum industry standard Factor of Safety

Calculate the positive pressure that would result in a factor of safety of 1.25 using the infinite slope analysis method.

Minimum Allowable Factor of Safety: 1.25

Maximum Allowable Gas Pressure:
u_g = **157 inches water column**

Since this pressure is greater than the pressure calculated in section 2, this pressure will be ignored.

CONCLUSIONS

Based on the assumptions and calculations above, the maximum allowable positive gas pressure within the landfill is 48.1 inches of water column. The limiting condition is causing uplift on the top of the cover.

This calculation should be revised once actual interface friction values of the geomembrane and the underlying clay cover are available.

DIRK WRIGHT
062-052405
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

Date: 08/25/2020
License Expires on 11/30/2021

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

062-052405 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
Date: 08/25/2020
License Expires on 11/30/2021

REGULATION

Positive pressure at each wellhead is allowable for those areas that use a geomembrane or synthetic cover. Further, the rules stipulates that the owner or operator develop acceptable pressure limits in the design plan.

SCENARIO

Landfill V : LLDPE Membrane on top of Gas Vent Geocomposite

OBJECTIVE

Calculate the maximum allowable positive pressure under the geomembrane final cover such that neither the geomembrane nor the stability of the final cover are impacted.

REFERENCES

1. Infinite Slope Analysis Method
2. Thiel, R.S. (1998), "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, Vol. 5, No. 6 pp. 589-617.
3. Koerner and Narejo (2005), "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces", Geosynthetic Research Institute, GRI Report #30, June 14, 2005.

ASSUMPTIONS

Cover Configuration

	Material	Thickness (inches)	Unit Weight (pcf)	"Weight" on Membrane (psf)
Layer 1	Topsoil	6	100	50.0
Layer 2	Protective Soil	24	100	200.0
Layer 3	Geosynthetics	0.04	60	0.2
Layer 4	Gas Vent Geocomposite	0.24	60	1.2
Layer 5	NA	0	0	0.0
Layer 6	NA	0	0	0.0

Green Cells require user input.

Slope Angle		3 :1	
Slope Angle	β =	18.43	deg
Cover Thickness Perpendicular to Slope		30.04	inches
Cover Thickness Perpendicular to Slope	h =	2.50	ft
Vertical Cover Thickness	h_{ver} =	2.64	ft
"Weight" on Cover Perpendicular to Slope		250.2	psf
Equivalent Unit Weight on Cover	γ =	99.95	lbs/ft3

Geosynthetic ϕ (Geocomposite/S LLDPE membrane) LD	δ =	18.3	deg
Geosynthetic Adhesion	c =	79	psf
Geosynthetic Adhesion		0.55	psi

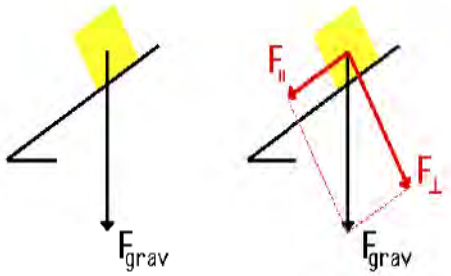
Source of interface data: Pine Avenue Landfill Interface Testing, 11/01/2018

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

Defined Terms

$F_{||}$ =Force parallel to surface of cover
$F_{\perp}$ = Force perpendicular to cover
F_{grav} = Force of gravity due to final cover



The force of gravity can be resolved into two components. Together, these two components can replace the effect of the force of gravity.

Figure 1

CALCULATIONS:

Evaluate the following three potential impacts of positive gas pressure on the final cover system:

1) impact of positive pressure on the geomembrane seams

2) impact of positive pressure on the overlying soil material causing localized lifting and potential final cover soil movement, and

3) impact of positive pressure on the intermediate cover soil sub-base interface causing localized slope instability.

1. Impact on Geomembrane Seams:

For 40 mil (nominal) textured LDPE Geomembrane, the following are typical tensile strengths (at yield) for geomembrane seams:

Bonded seam strength (shear) = 60 ppi (1,500 psi) = 41,520 inches water column
Peel strength (extrusion) = 44 ppi (1,133 psi) = 30,448 inches water column
Peel strength (fusion) = 50 ppi (1,267 psi) = 35,600 inches water column

For 40 mil (nominal) textured geomembrane, the following are the tensile strengths (at break) for the Geomembrane sheet:

Tensile strength = 60 ppi (1,500 psi) = 41,520 inches water column

Based on the above analysis, positive gas pressures would have to exceed 30,000 psf to approach the yield strength of a geomembrane seam. Therefore, positive pressure within the landfill will have no impact on the geomembrane seams.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

2. Impact on Final Cover Soils (Lifting):

Calculate the positive pressure within the landfill that would counteract the weight of the final cover soil above the geomembrane, and thus cause the soil to "float," potentially making it unstable on the landfill slope.

Note that cohesion between layers of the final cover is ignored to be conservative.

Refer to Figure 1:

Calculation for Flat Benches on Final Cover: Positive pressure must overcome F_{grav} to "float" cover soil.

$F_{grav} = h_{ver}g$ = 263.7 psf = 50.7 inches W.C

Calculation for Sideslopes of Final Cover: Positive pressure must overcome $F_{\perp}$ to "float" cover soil.

$F_{\perp} = F_{grav} \cos \beta$ = 250.2 psf = **48.1** inches W.C

Thus, positive gas pressures within the landfill would have to exceed **50.7** **inches W.C. to cause uplift on horizontal benches**

Thus, positive gas pressures within the landfill would have to exceed **48.1** **inches W.C. to cause uplift on the slopes**

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

3. Impact on Stability of Final Cover Soils

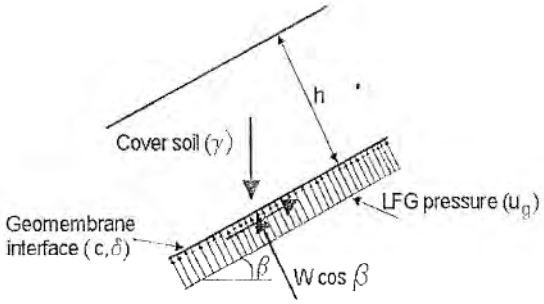
Calculate the factor of safety against sliding of the final cover assuming that the landfill is under positive pressure.

Factor of safety against sliding is defined as: $FS = F_{resist} / F_{driving}$, where

F_{resist} = Resisting forces

$F_{driving}$ = Driving forces

Using the infinite slope analysis method, which is conservative under these conditions, the resisting forces and driving forces are illustrated in the figure below. The Factor of Safety equation is shown at the bottom of the figure.



$$FS = \frac{c + (h\gamma \cos \beta - u_g) \tan \delta}{h\gamma \sin \beta}$$

Figure 2

For this analysis, the "geomembrane interface" referred to in the figure will be the interface between the geomembrane and the underlying geocomposite. This is the interface that will be subject to a reduction in normal force (and thus shear strength, or resisting force) if positive pressure builds up within the landfill.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

Calculate the factor of safety of the slope using the maximum allowable gas pressure calculated in Section 2.

Maximum Allowable Gas Pressure: 48.1 inches water column
convert from inches w.c. to psf:
u_g = 250.12 psf

Resultant Factor of Safety: *FS* = **0.95**

Typical minimum factor of safety using this type of analysis and for short term conditions is 1.25.

Therefore at: 48.1 inches w.c. positive pressure, slope DOES NOT MEET typical minium industry standard Factor of Safety

Calculate the positive pressure that would result in a factor of safety of 1.25 using the infinite slope analysis method.

Minimum Allowable Factor of Safety: 1.25

Maximum Allowable Gas Pressure:
u_g = **34 inches water column**

CONCLUSIONS

Based on the assumptions and calculations above, the maximum allowable positive gas pressure within the landfill is 34 inches of water column. The limiting condition is sliding of the cover.

This calculation should be revised once actual interface friction values of the geomembrane and the underlying geocomposite are available.

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Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

REGULATION

Positive pressure at each wellhead is allowable for those areas that use a geomembrane or synthetic cover. Further, the rules stipulates that the owner or operator develop acceptable pressure limits in the design plan.

SCENARIO

Landfill VIII: LLDPE Membrane on top of GCL

OBJECTIVE

Calculate the maximum allowable positive pressure under the geomembrane final cover such that neither the geomembrane nor the stability of the final cover are impacted.

REFERENCES

1. Infinite Slope Analysis Method
2. Thiel, R.S. (1998), "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, Vol. 5, No. 6 pp. 589-617.
3. Koerner and Narejo (2005), "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces", Geosynthetic Research Institute, GRI Report #30, June 14, 2005.

ASSUMPTIONS

Cover Configuration

	Material	Thickness (inches)	Unit Weight (pcf)	"Weight" on Membrane (psf)
Layer 1	Topsoil	6	100	50.0
Layer 2	Protective Soil	24	100	200.0
Layer 3	Geosynthetics	0.04	60	0.2
Layer 4	GCL	0.24	60	1.2
Layer 5	NA	0	0	0.0
Layer 6	NA	0	0	0.0

Green Cells require user input.

Slope Angle		20 :1	
Slope Angle	β =	2.86	deg
Cover Thickness Perpendicular to Slope		30.04	inches
Cover Thickness Perpendicular to Slope	h =	2.50	ft
Vertical Cover Thickness	h_{ver} =	2.51	ft
"Weight" on Cover Perpendicular to Slope		250.2	psf
Equivalent Unit Weight on Cover	γ =	99.95	lbs/ft3
Geosynthetic ϕ (GCL/T HDPE membrane) LD	δ =	13	deg
Geosynthetic Adhesion	c =	0.1	psf
Geosynthetic Adhesion		0.00	psi

Source of interface data: GRI, Direct Shear Database, 2005

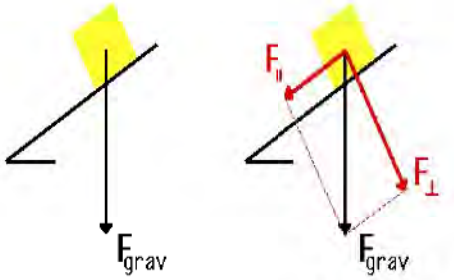
Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

Date: 08/25/2020
License Expires on 11/30/2021

Defined Terms

$F_{||}$ =Force parallel to surface of cover
$F_{\perp}$ = Force perpendicular to cover
F_{grav} = Force of gravity due to final cover



The force of gravity can be resolved into two components. Together, these two components can replace the effect of the force of gravity.

Figure 1

CALCULATIONS:

Evaluate the following three potential impacts of positive gas pressure on the final cover system:

1) impact of positive pressure on the geomembrane seams

2) impact of positive pressure on the overlying soil material causing localized lifting and potential final cover soil movement, and

3) impact of positive pressure on the intermediate cover soil sub-base interface causing localized slope instability.

1. Impact on Geomembrane Seams:

For 40 mil (nominal) textured LDPE Geomembrane, the following are typical tensile strengths (at yield) for geomembrane seams:

Bonded seam strength (shear)	= 60 ppi (1,500 psi) = 41,520 inches water column
Peel strength (extrusion)	= 44 ppi (1,133 psi) = 30,448 inches water column
Peel strength (fusion)	= 50 ppi (1,267 psi) = 35,600 inches water column

For 40 mil (nominal) textured geomembrane, the following are the tensile strengths (at break) for the Geomembrane sheet:

Tensile strength	= 60 ppi (1,500 psi) = 41,520 inches water column

Based on the above analysis, positive gas pressures would have to exceed 30,000 psf to approach the yield strength of a geomembrane seam. Therefore, positive pressure within the landfill will have no impact on the geomembrane seams.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

2. Impact on Final Cover Soils (Lifting):

Calculate the positive pressure within the landfill that would counteract the weight of the final cover soil above the geomembrane, and thus cause the soil to "float," potentially making it unstable on the landfill slope.

Note that cohesion between layers of the final cover is ignored to be conservative.

Refer to Figure 1:

Calculation for Flat Benches on Final Cover: Positive pressure must overcome F_{grav} to "float" cover soil.

$F_{grav} = h_{ver}g$ = 250.5 psf = 48.2 inches W.C

Calculation for Sideslopes of Final Cover: Positive pressure must overcome $F_{\perp}$ to "float" cover soil.

$F_{\perp} = F_{grav} \cos \beta$ = 250.2 psf = **48.1** inches W.C

Thus, positive gas pressures within the landfill would have to exceed **48.2** **inches W.C. to cause uplift on horizontal benches**

Thus, positive gas pressures within the landfill would have to exceed **48.1** **inches W.C. to cause uplift on the slopes**

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

3. Impact on Stability of Final Cover Soils

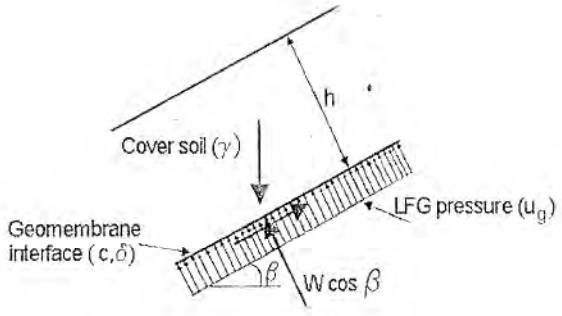
Calculate the factor of safety against sliding of the final cover assuming that the landfill is under positive pressure.

Factor of safety against sliding is defined as: $FS = F_{resist} / F_{driving}$, where

F_{resist} = Resisting forces

$F_{driving}$ = Driving forces

Using the infinite slope analysis method, which is conservative under these conditions, the resisting forces and driving forces are illustrated in the figure below. The Factor of Safety equation is shown at the bottom of the figure.



$$FS = \frac{c + (h\gamma \cos \beta - u_g) \tan \delta}{h\gamma \sin \beta}$$

Figure 2

For this analysis, the "geomembrane interface" referred to in the figure will be the interface between the geomembrane and the underlying geocomposite. This is the interface that will be subject to a reduction in normal force (and thus shear strength, or resisting force) if positive pressure builds up within the landfill.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/12/2019 Checked: DW

Calculate the factor of safety of the slope using the maximum allowable gas pressure calculated in Section 2.

Maximum Allowable Gas Pressure: 48.1 inches water column
convert from inches w.c. to psf:
u_g = 250.12 psf

Resultant Factor of Safety: FS = **0.00**

Typical minimum factor of safety using this type of analysis and for short term conditions is 1.25.

Therefore at: 48.1 inches w.c. positive pressure, slope DOES NOT MEET typical minium industry standard Factor of Safety

Calculate the positive pressure that would result in a factor of safety of 1.25 using the infinite slope analysis method.

Minimum Allowable Factor of Safety: 1.25

Maximum Allowable Gas Pressure:
u_g = **35 inches water column**

CONCLUSIONS

Based on the assumptions and calculations above, the maximum allowable positive gas pressure within the landfill is 35 inches of water column. The limiting condition is sliding of the cover.

This calculation should be revised once actual interface friction values of the geomembrane and the underlying GCL are available.

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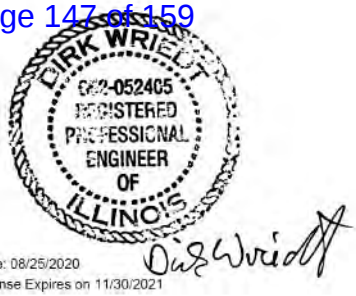
Job: Niagara Landfill Made by: DW
Date: 9/10/2019 Checked: DW



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PURPOSE

USEPA has requested that all vents not connected to the active gas collection system or controlled by a passive flare be temporarily capped. Some vents are located under clay final cover and not geosynthetic final cover, which has a positive pressure allowance already established. Calculations were prepared to determine an allowable pressure limit for vents in clay final covered areas based on engineering evaluations of clay cover performance such as sliding and uplift. A safety factor was also incorporated.

SCENARIO

Landfill V & VI: Compacted Clay Cover with gas venting layer and geotextile

OBJECTIVE

Calculate the maximum allowable positive pressure under the compacted clay final cover such that the stability of the final cover is not impacted.

REFERENCES

1. Infinite Slope Analysis Method
2. Thiel, R.S. (1998), "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, Vol. 5, No. 6 pp. 589-617.
3. Koerner and Narejo (2005), "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces", Geosynthetic Research Institute, GRI Report #30, June 14, 2005.

ASSUMPTIONS

Cover Configuration

	Material	Thickness (inches)	Unit Weight (pcf)	"Weight" on sliding surface (psf)
Layer 1	Topsoil	6	100	50.0
Layer 2	Protective Soil	24	100	200.0
Layer 3	Low Permeability Soil	24	100	200.0
Layer 4	Geotextile	0.24	60	1.2
Layer 5	Gas Venting Layer	12	100	100.0
Layer 6	NA	0	0	0.0

Green Cells require user input.

Slope Angle		3 :1	
Slope Angle	β =	18.43	deg
Cover Thickness Perpendicular to Slope		54	inches
Cover Thickness Perpendicular to Slope	h =	4.50	ft
Vertical Cover Thickness	h_{ver} =	4.74	ft
"Weight" on Cover Perpendicular to Slope		450.0	psf
Equivalent Unit Weight on Cover	γ =	100.00	lbs/ft3

Geosynthetic ϕ (NW Geotextile, needle punched on Cohesive Soil) Peak	δ =	30	deg
Geosynthetic Adhesion	c =	0.01	psf
Geosynthetic Adhesion		0.00	psi

Source of interface data: GRI, Direct Shear Database, 2005

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 9/10/2019 Checked: DW

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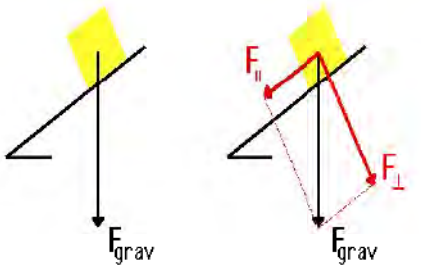
Defined Terms

$F_{||}$ =Force parallel to surface of cover
$F_{\perp}$ = Force perpendicular to cover
F_{grav} = Force of gravity due to final cover



The force of gravity can be resolved into two components. Together, these two components can replace the effect of the force of gravity.

Figure 1

CALCULATIONS:

Evaluate the following three potential impacts of positive gas pressure on the final cover system:

1) impact of positive pressure on the geomembrane seams

2) impact of positive pressure on the overlying soil material causing localized lifting and potential final cover soil movement, and

3) impact of positive pressure on the intermediate cover soil sub-base interface causing localized slope instability.

Allowable Gas Pressure Calculation - Closed Site

Job:	Niagara Landfill	Made by:	DW
Date:	9/10/2019	Checked:	DW

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1. Impact on Final Cover Soils (Lifting):

Calculate the positive pressure within the landfill that would counteract the weight of the final cover soil above the waste, and thus cause the soil to "float," potentially making it unstable on the landfill slope.

Note that cohesion between layers of the final cover is ignored to be conservative.

Refer to Figure 1:

Calculation for Flat Benches on Final Cover: Positive pressure must overcome F_{grav} to "float" cover soil.

$F_{grav} = h_{ver}g$ = 474.3 psf = 91.2 inches W.C

Calculation for Sideslopes of Final Cover: Positive pressure must overcome $F_{\perp}$ to "float" cover soil.

$F_{\perp} = F_{grav} \cos \beta$ = 450 psf = **86.5** inches W.C

Thus, positive gas pressures within the landfill would have to exceed **91.2** **inches W.C. to cause uplift on horizontal benches**

Thus, positive gas pressures within the landfill would have to exceed **86.5** **inches W.C. to cause uplift on the slopes**

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Date:	9/10/2019	Checked: DW

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2. Impact on Stability of Final Cover Soils

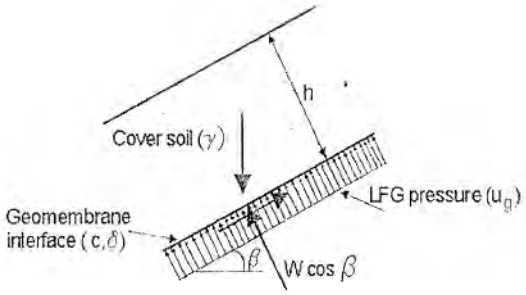
Calculate the factor of safety against sliding of the final cover assuming that the landfill is under positive pressure.

Factor of safety against sliding is defined as: $FS = F_{resist} / F_{driving}$, where

F_{resist} = Resisting forces

$F_{driving}$ = Driving forces

Using the infinite slope analysis method, which is conservative under these conditions, the resisting forces and driving forces are illustrated in the figure below. The Factor of Safety equation is shown at the bottom of the figure.



$$FS = \frac{c + (h\gamma \cos \beta - u_g) \tan \delta}{h\gamma \sin \beta}$$

Figure 2

For this analysis, the "geomembrane interface" referred to in the figure will be the interface between the low permeability clay and the underlying geotextile. This is the interface that will be subject to a reduction in normal force (and thus shear strength, or resisting force) if positive pressure builds up within the landfill.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 9/10/2019 Checked: DW

Calculate the factor of safety of the slope using the maximum allowable gas pressure calculated in Section 2.

Maximum Allowable Gas Pressure: 86.5 inches water column
convert from inches w.c. to psf:
u_g = 449.8 psf

Resultant Factor of Safety: FS = **-0.09**

Typical minimum factor of safety using this type of analysis and for short term conditions is 1.25.

Therefore at: 86.5 inches w.c. positive pressure, slope DOES NOT MEET typical minium industry standard Factor of Safety

Calculate the positive pressure that would result in a factor of safety of 1.25 using the infinite slope analysis method.

Minimum Allowable Factor of Safety: 1.25

Maximum Allowable Gas Pressure:
u_g = 23 inches water column
119 psf

CONCLUSIONS

Based on the assumptions and calculations above, the maximum allowable positive gas pressure within the landfill is 23 inches of water column. The limiting condition is sliding of the cover.

This calculation should be revised once actual interface friction values of the geotextile and the overlying compacted clay layer are available.

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Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/11/2023 Checked: ED

PURPOSE

USEPA has requested that all vents not connected to the active gas collection system or controlled by a passive flare be temporarily capped. Some vents are located in areas with a geosynthetic final cover, which has a positive pressure allowance already established. Other vents are located in areas with clay final cover. These calculations determine an allowable pressure limit for vents in clay final covered areas based on engineering evaluations of clay cover performance such as sliding and uplift. A safety factor was also incorporated.

SCENARIO

Landfill I through IV: Compacted Clay Cover

OBJECTIVE

Calculate the maximum allowable positive pressure under the compacted clay final cover such that the stability of the final cover is not impacted.

REFERENCES

1. Infinite Slope Analysis Method
2. Thiel, R.S. (1998), "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, Vol. 5, No. 6 pp. 589-617.

ASSUMPTIONS

1. The clay cover has sufficient tensile strength to resist the positive gas pressure. **This assumption is extremely conservative but highly unrealistic**. The clay is likely to have existing fissures and cracks that will allow gas to vent before building up appreciable pressures. If existing cracks do not allow gas to vent, new cracks will form as the pressure puts the clay cover into tension. Gas venting through cracks in clay covers has been observed at numerous landfills.
2. The interface friction angle between waste and cover clays is 30 degrees.

Cover Configuration

	Material	Thickness (inches)	Unit Weight (pcf)	"Weight" on sliding surface (psf)
Layer 1	Topsoil	6	100	50.0
Layer 2	Low Permeability Soil	24	124	248.0
Layer 3	Waste	120	70	700.0

Max Slope Angle	2.8	:1	
Max Slope Angle	β =	19.65	deg
Cover Thickness Perpendicular to Slope		30	inches
Cover Thickness Perpendicular to Slope	h =	2.50	ft
Vertical Cover Thickness	h_{ver} =	2.65	ft
"Weight" on Cover Perpendicular to Slope		298.0	psf
Equivalent Unit Weight on Cover	γ =	119.20	lbs/ft3
Friction angle between Clay Cover and Waste	δ =	30	deg
Cohesion between Clay Cover and Waste	c =	10	psf
		0.07	psi

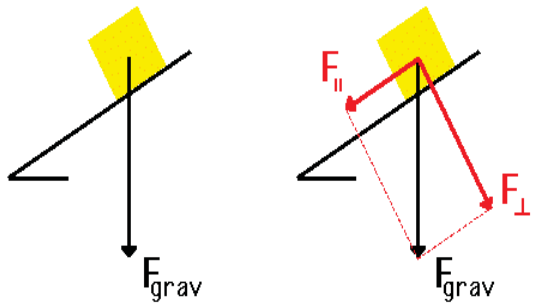
Date: 07/11/2023
License Expires on 11/30/2023

Allowable Gas Pressure Calculation - Closed Site

Job:	Niagara Landfill	Made by:	DW
Date:	7/11/2023	Checked:	ED

Defined Terms

$F_{||}$=Force parallel to surface of cover
$F_{\perp}$ = Force perpendicular to cover
F_{grav} = Force of gravity due to final cover



The force of gravity can be resolved into two components. Together, these two components can replace the effect of the force of gravity.

Figure 1

CALCULATIONS:

Evaluate the following two potential impacts of positive gas pressure on the final cover system:

1) impact of positive pressure on the overlying soil material causing localized lifting and potential final cover soil movement, and

2) impact of positive pressure on the clay cover / waste interface causing localized slope instability.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/11/2023 Checked: ED

1. Impact on Final Cover Soils (Lifting):

Calculate the positive pressure within the landfill that would counteract the weight of the final cover soil above the waste, and thus cause the soil to "float," potentially making it unstable on the landfill sideslope.

Note that cohesion between layers of the final cover is ignored to be conservative.

Refer to Figure 1:

Calculation for Flat Benches on Final Cover: Positive pressure must overcome F_{grav} to "float" cover soil.

$F_{grav} = h_{ver}g$ = 316.4 psf = 60.9 inches W.C

Calculation for Sideslopes of Final Cover: Positive pressure must overcome $F_{\perp}$ to "float" cover soil.

$F_{\perp} = F_{grav} \cos \beta$ = 298 psf = **57.3** inches W.C

Thus, positive gas pressures within the landfill would have to exceed **60.9** **inches W.C. to cause uplift on horizontal benches**

Thus, positive gas pressures within the landfill would have to exceed **57.3** **inches W.C. to cause uplift on the slopes**

2. Impact on Stability of Final Cover Soils

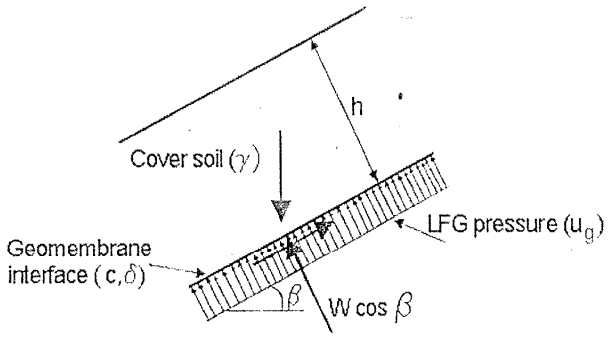
Calculate the factor of safety against sliding of the final cover assuming that the landfill is under positive pressure.

Factor of safety against sliding is defined as: $FS = F_{resist} / F_{driving}$, where

F_{resist} = Resisting forces

$F_{driving}$ = Driving forces

Using the infinite slope analysis method, which is conservative under these conditions, the resisting forces and driving forces are illustrated in the figure below. The Factor of Safety equation is shown at the bottom of the figure.



$$FS = \frac{c + (h\gamma \cos \beta - u_g) \tan \delta}{h\gamma \sin \beta}$$

Figure 2

For this analysis, the "geomembrane interface" referred to in the figure will be the interface between the cover clay and the underlying waste. This is the interface that will be subject to a reduction in normal force (and thus shear strength, or resisting force) if positive pressure builds up within the landfill. This is not a likely scenario under field conditions because the clay cover with its fissures and cracks will not be able to sustain the tensile forces required to allow significant pressure build-up. **However, while this is unrealistic it is extremely conservative**.

Allowable Gas Pressure Calculation - Closed Site

Job: Niagara Landfill Made by: DW
Date: 7/11/2023 Checked: ED

Calculate the factor of safety of the slope using the maximum allowable gas pressure calculated in Section 2.

Maximum Allowable Gas Pressure: 57.3 inches water column
convert from inches w.c. to psf:
u_g = 298 psf

Resultant Factor of Safety: *FS* = **-0.00023**

Typical minimum factor of safety using this type of analysis and for short term conditions is 1.25.

Therefore at: 57.3 inches w.c. positive pressure, slope DOES NOT MEET typical minium industry standard Factor of Safety

Calculate the positive pressure that would result in a factor of safety of 1.25 using the infinite slope analysis method.

Minimum Allowable Factor of Safety: 1.25

Maximum Allowable Gas Pressure:
u_g = **16 inches water column**
81 psf

CONCLUSIONS

Based on the assumptions and calculations above, the maximum allowable positive gas pressure within the landfill is 16 inches of water column. The limiting condition is sliding of the cover.

APPENDIX F

APPENDIX F

MANUFACTURER'S INFORMATION ON PASSIVE SOLAR FLARES

TECHNICAL DATA

Standard 2" Vent Flare

Flow: 5 – 50 SCFM design flow
The flow can be controlled by the 2" SS ball valve on the flare by closing it to half way the flow will be decreased to 25 SCFM.

Landfill Gas

Methane Content: 40-60%

Oxygen Content: Less than 5%

Pressure Range: While in operation, the flare shall always have a positive Header pressure to prevent possible flashback.

Temperature Range: 140 Deg. F Maximum
30 Deg. F Minimum

Destruction Efficiency: At design flow with gas methane content 40-60%--98%
Overall destruction of total hydrocarbons

Guaranteed to meet E.P.A. emission standards for landfill Gas disposal in utility "candle type" flare.

Note: Flare is designed in accordance with the United States Environmental Protection Agency (EPA) Established criteria for open flares, 40 CFR 60.18

Note: Flare is designed to conform to the tip velocity criteria of US EPA 40 CFR 60.18. The flares will not meet other requirements of this regulation such as continuous flame monitoring, and no free venting during shut down. The vent flares can be used to control odors at sites were flare installation is not required or NSPS sites in area not designated to be closed, etc..

Note: Flare should not be operated outside of state maximum/minimum parameters