



Landfill Project Protocol Version 2.1 ERRATA AND CLARIFICATIONS

The Climate Action Reserve (Reserve) published its Landfill Project Protocol Version 2.1 (LFPP V2.1) in October 2009. While the Reserve intends for the LFPP V2.1 to be a complete, transparent document, it recognizes that correction of errors and clarifications will be necessary as the protocol is implemented and issues are identified. This document is an official record of all errata and clarifications applicable to the LFPP V2.1.¹

Per the Reserve's Program Manual, both errata and clarifications are considered effective on the date they are first posted on the Reserve website. The effective date of each erratum or clarification is clearly designated below. All listed and registered LFPP projects must incorporate and adhere to these errata and clarifications when they undergo verification. The Reserve will incorporate both errata and clarifications into future versions of the LFPP.

All project developers and verification bodies must refer to this document to ensure that the most current guidance is adhered to in project design and verification. Verification bodies shall refer to this document immediately prior to uploading any Verification Statement to assure all issues are properly addressed and incorporated into verification activities.

If you have any questions about the updates or clarifications in this document, please contact Policy at: policy@climateactionreserve.org or (213) 891-1444 x3.

¹ See Section 4.3.4 of the Climate Action Reserve Program Manual for an explanation of the Reserve's policies on protocol errata and clarifications. "Errata" are issued to correct typographical errors. "Clarifications" are issued to ensure consistent interpretation and application of the protocol. For document management and program implementation purposes, both errata and clarifications to the LFPP are contained in this single document.

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Section 3

1. Attestations (CLARIFICATION – June 25, 2010)

Section: 3.4.2 (The Legal Requirement Test); 3.5 (Regulatory Compliance)

Context: The LFPP V2.1 makes reference to the Regulatory Attestation form. As written, the Regulatory Attestation is used to meet both the Legal Requirement Test and the Regulatory Compliance requirement. However, the Reserve no longer uses the Regulatory Attestation form and instead has developed two separate forms – the Attestation of Voluntary Implementation and the Attestation of Regulatory Compliance – for this purpose. These forms are described in the Reserve Program Manual.

Clarification: The Legal Requirement Test and Regulatory Compliance require execution of the Attestation of Voluntary Implementation and the Attestation of Regulatory Compliance, respectively.

2. Legal Requirement Test for Landfills in California (CLARIFICATION – August 16, 2012)

Section: 3.4.2.2 (State and Local Regulations, Ordinances and Permitting Requirements)

Context: Section 3.4.2 of the protocol states that if an eligible project begins operation at a landfill that later becomes subject to a regulation that calls for the installation of a landfill gas control system, GHG reductions may be reported to the Reserve up until the date that installation is legally required to be operational. The second paragraph of Section 3.4.2.2 on page 9 makes reference to ongoing work by the California Air Resources Board to develop a landfill methane control measure (later adopted June 17, 2010).² However, this section does not provide guidance on how landfill projects are to determine the status of their eligibility in regards to the Legal Requirement Test for additionality.

Based on the thresholds and timelines contained within the regulation, the Reserve has developed the following guidance for determining the additionality of landfill projects in California, provided that the projects meet all other requirements of the protocol.

Clarification: The California Landfill Methane Control Measure requires an active landfill gas control system (GCCS) to be installed and operated at MSW landfills that exceed the following two thresholds:³

- Size threshold: The regulation only applies to landfills with greater than 450,000 tons waste-in-place (WIP)
- LFG threshold: If a landfill exceeds the size threshold, the regulation only applies if the calculated heat input capacity exceeds 3.0 MMBtu/hr

Landfill projects at active landfills that had exceeded both thresholds and had begun operation of a GCCS prior to June 17, 2010 are eligible to receive CRTs for landfill gas destruction that

² <http://www.arb.ca.gov/cc/landfills/landfills.htm>

³ If a landfill exceeds both thresholds, there is a third, optional threshold for surface emissions specified in the regulation. For the purposes of this policy, it is conservative to assume that this optional testing and reporting would not have been carried out in the baseline scenario and thus is not included in this guidance.

occurs until December 17, 2012.⁴ If the same is true at a landfill that was closed or inactive as of June 17, 2010, eligibility extends until December 17, 2013.⁵

Landfill projects with a start date after June 17, 2010 must assess their status against the regulatory thresholds on an ongoing basis. Any project with a start date after June 17, 2010, but prior to exceeding both thresholds must report its landfill's WIP to the Climate Action Reserve during each verification, as of the end of the previous calendar year. Once the size threshold has been exceeded, the project must also calculate the landfill's heat input capacity according to the regulation⁶ and report this figure during each verification, as of the end of the previous calendar year (beginning the year the size threshold is exceeded). If the LFG threshold is exceeded, the project will remain eligible for a period of 30 months for active landfills and 42 months for closed or inactive landfills following December 31 of the year in which the LFG threshold was exceeded. For example, a landfill project verifying a reporting period covering January 2011 through December 2011 would report its WIP and heat input capacity as of December 31, 2011. A landfill project verifying a reporting period covering June 2011 through June 2012 would report its WIP and heat input capacity as of December 31, 2011.

Any project with a start date that occurs after exceeding both thresholds is not eligible.

In all cases, a project must still meet all other criteria of the Landfill Project Protocol.

Example Scenario	Climate Action Reserve Eligibility Status
A project began operation in 2009, having already exceeded the size and LFG thresholds in the regulation. The landfill remains open and active.	Project is eligible until December 17, 2012.
A project began operation in 2009, having already exceeded the size and LFG thresholds in the regulation. The landfill remains open and active. However, the GCCS does not currently meet the requirements of the regulation and must be modified or upgraded.	Project is eligible until December 17, 2012.
A project began operation in 2009. As of December 31, 2011 the landfill has 400,000 tons of WIP. The landfill continues to receive waste.	Project must monitor and report WIP on a calendar year basis. Once the size threshold is exceeded, project must calculate and report heat input capacity on a calendar year basis. Once the LFG threshold is exceeded, the project is eligible for 30 months if the landfill is active and 42 months if the landfill is closed or inactive.
A project began operation in 2010. As of December 31, 2012, the landfill has exceeded the size and LFG thresholds for the first time. The landfill continues to receive waste.	Project is eligible until June 30, 2014.

⁴ In the baseline scenario for these sites, a design plan would have been required to be submitted by June 17, 2011. Upon approval of that design plan, the system would have been required to be operational within 18 months, or by December 17, 2012.

⁵ Closed or inactive landfills are allowed 30 months from the approval of the GCCS design plan before the system must be operational.

⁶ A tool for the annual quantification of landfill gas heat input capacity is available at: <http://www.arb.ca.gov/cc/landfills/landfills.htm>

Section 5

3. Determining OX (CLARIFICATION – July 11, 2011)

Section: 5.1 (Quantifying Baseline Emissions)

Context: Footnote 19 on page 15 provides guidance for determining the value of OX (used in Equation 5.1) to account for the oxidation of methane by soil bacteria. This guidance is also found in Equation 5.1 on page 17. The project is instructed to use an OX value of 0% for landfills where a synthetic liner is used as a component of the final cover system, and a value of 10% for all other landfills. It is not clear what value should be used for landfills where some portion of the final cover system uses a synthetic liner, and another portion does not.

Clarification: The first sentence of Footnote 19 on page 15 should read: “Landfill cover systems incorporating a synthetic liner throughout the entire area of the final cover system should use a default methane oxidation rate of zero.” The second sentence of the guidance for OX in Equation 5.1 should read: “Equal to 0.10 for all landfills except those that incorporate a synthetic liner throughout the entire area of the final cover system, where OX = 0.”

4. Equation 5.1 (ERRATUM – January 4, 2011)

Section: 5.3 (Quantifying Project Emission Reductions)

Context: On page 17 of LFPP V2.1, Equation 5.1 is used to calculate the project emission reductions. The equation printed in the protocol accounts for oxidation of methane destroyed during the project, but not to the $PRE_{discount}$ factor for pre-project destruction. The oxidation factor should be applied to all methane destruction. As written, Equation 5.1 reads as follows:

$$ER_y = [(CH_4Dest_{PR}) * 21 * (1-OX) * (1-DF)] - FFCO_2 - ELCO_2 - PRE_{discount}$$

Correction: Equation 5.1 shall be corrected to read as follows:

$$ER_y = [(CH_4Dest_{PR}) * 21 * (1-OX) * (1-DF)] - FFCO_2 - ELCO_2 - PRE_{discount} * (1-OX)$$

5. Quantifying Project GHG Emission Reductions (CLARIFICATION – June 18, 2015)

Section: 5.1 (Quantifying Project Emission Reductions)

Context: Equation 5.1 on page 17 provides guidance for how to calculate total project emission reductions during the reporting period, including discounts that must be applied to account for oxidation and uncertainties associated with monitoring equipment.

The oxidation factor (OX) accounts for the oxidation of methane by soil bacteria. The protocol requires that an OX discount be applied if the landfill does not incorporate a synthetic liner throughout the entire area of the final cover system. No guidance is provided for how to apply the OX discount factor for cover systems that were in place for less than a full reporting period.

The discount factor for uncertainties associated with monitoring equipment (DF) is applied to projects where methane concentration values were taken weekly, rather than continuously. No guidance is provided for how to apply the DF discount factor for methane concentration

readings that were taken on a weekly basis using a portable gas analyzer for only part of the reporting period.

Clarification: The intent of the protocol is that both the OX discount factor and the DF discount factor shall only be applied to periods of time during the reporting period for which each factor is applicable. The OX discount factor shall only be applied for the number of days during the reporting period when the landfill did not incorporate a synthetic liner throughout the entire area of the final cover system. The DF discount factor shall only be applied for the number of days during the reporting period when methane concentration values were taken at a frequency that is less than continuous (every 15 minutes). Thus, Equation 5.1 may be calculated separately for different portions of the reporting period, with the results summed to provide total project GHG emission reductions.

6. Service Providers for Site-Specific Destruction Efficiency Testing (CLARIFICATION – January 21, 2014)

Section: 5.3 (Quantifying Project Emission Reductions)

Context: Footnote 21 on pages 18-19 states that service providers used to determine site-specific values for methane destruction efficiency must be “state or local agency accredited.” It is not clear what specific options are available and permissible to projects located in a state or locality which does not have an accreditation program for source test service providers. The last paragraph of Section 6.2 on pages 25-26 and the comment section of Table 6.1 for parameter DE on page 28 contain similar language.

Clarification: The intent of this requirement is to ensure that any source testing conducted for the determination of a site specific value for methane destruction efficiency is of a quality that would be acceptable for compliance by a regulatory body. The following text shall be added to the end of footnote 21 on page 19, after the last paragraph of Section 6.2 on page 26, and to the end of the comment section of Table 6.1 for parameter DE on page 28:

“If neither the state nor locality relevant to the project site offer accreditation for source testing service providers, projects may use an accredited service provider from another U.S. state or domestic locality. Alternatively, projects may choose a non-accredited service provider, under the following conditions: 1) the service provider must provide verifiable evidence of prior testing which was accepted for compliance by a domestic regulatory agency, and 2) the prior testing procedures must be substantially similar to the procedures used for determining methane destruction efficiency for the project destruction device(s).”

7. Determining LFG_{PP1} (CLARIFICATION – June 25, 2010)

Section: 5.3 (Quantifying Project Emission Reductions)

Context: Equation 5.3 on page 20 of LFPP V2.1 is used to calculate the pre-project adjustment associated with non-qualifying devices in the project baseline. If monitoring data is not available to estimate the term LFG_{PP1}, the maximum capacity of the pre-project device may be used, per Table 6.1. However, the protocol does not provide explicit guidance in this scenario on the appropriate PP_{CH4} value to be applied.

Clarification: If the term LFG_{PP1} in Equation 5.3 is equal to the maximum capacity of the pre-project non-qualifying device(s) because monitoring data is not available, the term PP_{CH4} shall be equal to the average monitored methane concentration over the reporting period.

8. Application of Pre-Project Destruction Adjustment (CLARIFICATION – July 11, 2011)

Section: 5.3 (Quantifying Project Emission Reductions)

Context: Equation 5.3 on page 20 of LFPP V2.1 is used to calculate the pre-project adjustment associated with LFG destruction in the project baseline. This equation collects the two potential discounts that may be calculated to account for destruction in the baseline scenario ($PRE_{discount}$): $NQ_{discount}$ and $Dest_{max}$. The protocol does not specify the time period over which this equation should be totaled.

Equation 5.3 refers to time interval t as the “Time interval for which LFG flow and concentration measurements are aggregated. Equal to one day for continuously monitored methane concentration and one week for weekly monitored methane concentration.” It is not clear whether $Dest_{max}$, and thus $PRE_{discount}$, should be summed for the entire reporting period, or whether it is permissible to sum these discounts more frequently

The frequency will only affect the value of $PRE_{discount}$ during periods when the amount of methane destroyed is less than the baseline level of destruction. As shown in Box 5.1 on page 21, a negative value for project reductions is taken as a zero. The example in Box 5.1 is calculated on an annual basis, but it would also apply for sub-annual calculations.

Clarification: On page 20, the following sentence is to be added above Equation 5.3: “The time period over which the value of $PRE_{discount}$ is calculated using Equation 5.3 shall be chosen by the project developer, but cannot be less than weekly, and must be applied consistently throughout the reporting period.”

Section 6

9. Metering Multiple Destruction Devices (CLARIFICATION – October 26, 2011)

Section: 6.1 (Monitoring Requirements)

Context: The first paragraph and first bullet of Section 6.1 on page 23 state that the LFG control system “must be monitored with measurement equipment that directly meters: The flow of landfill gas delivered to each destruction device.” On July 11, 2011, the Reserve issued a clarification to this requirement stating that: “[a] single meter may be used for multiple, identical destruction devices. In this instance, methane destruction in these units will be eligible only if both units are verified to be operational.”

The Reserve has determined that in certain situations it may be acceptable for one flow meter to be used to monitor the flow of gas to multiple destruction devices without fulfilling the requirement that they be identical or that they all be operational. Such an arrangement will require extra steps for verification, depending on the situation and the monitoring data that are available.

Clarification: The following text shall replace the previously issued clarification (#10 below) as a footnote to the first bullet of Section 6.1:

“A single flow meter may be used for multiple destruction devices under certain conditions. If all destruction devices are of identical efficiency and verified to be operational, no additional steps are necessary for project registration. Otherwise, the destruction efficiency of the least efficient destruction device shall be used as the destruction efficiency for all destruction devices monitored by this meter.

If there are any periods when not all destruction devices are operational, methane destruction during these periods will be eligible provided that the verifier can confirm all of the following conditions are met:

- a. The destruction efficiency of the least efficient destruction device in operation shall be used as the destruction efficiency for all destruction devices monitored by this meter; and
- b. All devices are either equipped with valves on the input gas line that close automatically if the device becomes non-operational (requiring no manual intervention), or designed in such a manner that it is physically impossible for gas to pass through while the device is non-operational; and
- c. For any period where one or more destruction device within this arrangement is not operational, it must be documented that the remaining operational devices have the capacity to destroy the maximum gas flow recorded during the period. For devices other than flares, it must be shown that the output corresponds to the flow of gas.”

10. Metering Multiple, Identical Destruction Devices (CLARIFICATION – July 11, 2011)

Section: 6.1 (Monitoring Requirements)

Context: The first paragraph and first bullet of Section 6.1 on page 23 state that the LFG control system “must be monitored with measurement equipment that directly meters: The flow of landfill gas delivered to each destruction device.” There may be situations where multiple, identical destruction devices (with identical destruction efficiencies) may be operated in parallel. In this case, it is sufficiently conservative to use one meter to measure flow to all such devices, provided that they are all operational.

Clarification: The following sentence shall be considered as a footnote to the first bullet of Section 6.1: “A single meter may be used for multiple, identical destruction devices. In this instance, methane destruction in these units will be eligible only if both units are verified to be operational.”

11. Arrangement of LFG Metering Equipment (CLARIFICATION – July 11, 2011)

Section: 6.1 (Monitoring Requirements)

Context: The first sentence of footnote 23 on page 23 states “Methane fraction of the landfill gas to be measured on a wet/dry basis (must be measured on same basis as flow, temperature, and pressure).” However, there is the alternative arrangement of measuring methane content (along with temperature and pressure) on a wet basis and flow rate on a dry basis that would result in a conservative calculation of the fraction of methane in the landfill gas. This is because after the gas is de-watered, the methane fraction will be larger, while the overall volume of gas will be smaller. If methane fraction is measured on a wet basis and flow is measured on a dry basis, the resulting figures for methane volume will always be lower than if both measurements were taken on the same basis (both wet or both dry). The reverse situation, where methane fraction is measured on a dry basis and flow measured on a wet basis, would consistently result in over reporting, and would not be conservative.

Clarification: The following sentence shall be inserted after the first sentence of footnote 23 on page 23: “The methane analyzer and flow meter should be installed in the same relative placement to any moisture-removing components of the landfill gas system (there should not be a moisture-removing component separating the measurement of flow and methane fraction). An acceptable variation to this arrangement would be in the case where the flow meter is placed after a moisture-removing component (dry basis), while the methane analyzer is placed before this component (wet basis). The opposite arrangement is not permissible.”

12. Monitoring Operational Status (CLARIFICATION – October 8, 2013)

Section: 6.1 (Monitoring Requirements)

Context: The last paragraph of Section 6.1 on page 24 states that “operational activity of the landfill gas collection system and the destruction devices shall be monitored and documented at least hourly to ensure actual landfill gas destruction.”

Certain types of destruction devices, such as internal combustion engines and most large boiler systems, are designed in such a way that gas may not flow through the device if it is not operational. It has not been clear how the requirements of Section 6.1 apply to these devices. There has been confusion related to the Clarification issued on October 26, 2011 regarding Metering Multiple Destruction Devices.

Clarification: The Clarification regarding Metering Multiple Destruction Devices (October 26, 2011) shall not be construed to relax the requirement for hourly operational data for all destruction devices. Rather, that clarification is allowing a specific metering arrangement during periods when one or more devices are *known* to not be operating. In order to know the operational status of a device, it must be monitored. All destruction devices must have their operational status monitored and recorded at least hourly. In other words, the project dataset will include an indication of operational status corresponding to each hour of landfill gas data. If these data are missing or never recorded for a particular device, that device will be assumed to be not operating and no emission reductions may be claimed for landfill gas destroyed by that device during the period when data are missing.

13. Verifying Off-Site Destruction in Direct Use Projects (CLARIFICATION – July 21, 2016)

Section: 6.1 (Monitoring Requirements)

Context: The protocol requires that “operational activity of the landfill gas collection system and the destruction devices shall be monitored and documented at least hourly” (Section 6.1, page 24).

In scenarios where landfill gas is supplied to a third party end-user via a dedicated pipeline pursuant to a direct use agreement, the project developer may have no management control over the off-site destruction device. It has been unclear whether the operational status of those destruction devices must be monitored, or what alternative assurance may be given to verifiers to confirm that the destruction device is operational and project biogas is being destroyed.

Clarification: The following text shall be inserted after the last paragraph of page 24 in Section 6.1:

“In scenarios where landfill gas is delivered off-site to a third party end user (not to a commercial natural gas transmission and distribution system or to a facility under management control of the project operator), reasonable efforts must be made to obtain data demonstrating the operational status of the destruction device(s). If it is not possible to obtain such data, the verifier must use their professional judgment to confirm that there has been no significant release of project landfill gas and that the project developer is using the appropriate destruction efficiency value. Evidence that may assist a verifier in making a determination to that effect may include, but is not limited to, one or more of the following:

- a signed attestation from the third party operator of the destruction device that no catastrophic failure of destruction or significant release of landfill gas occurred during the reporting period;
- the verifier confirming the same via an interview with the third party operator;
- examination of the safety features and/or design of the destruction equipment, such that the destruction device does not allow landfill gas to pass through it when non-operational and/or that the project developer is able to switch off the flow of landfill gas off-site in the event of emergencies;
- records that can corroborate the type and level of operation of the destruction device during the reporting period, such as engine output data, etc.

If the verifier is reasonably assured that no significant release of landfill gas has occurred off-site during the reporting period, the project can use the destruction efficiency appropriate to that off-site destruction device, despite the lack of hourly data from a monitoring device confirming operational status.”

14. Meter Field Check Procedures (CLARIFICATION – October 8, 2013)

Section: 6.2 (Instrument QA/QC)

Context: The paragraph below the first bulleted list of page 25 in Section 6.2 states that “if the field check on a piece of equipment reveals accuracy outside of a +/- 5% threshold, calibration by the manufacturer or a certified service provider is required for that piece of equipment.”

Certain types of gas flow meters and methane analyzers are susceptible to measurement drift due to buildup of moisture or contaminants on the metering sensor, even if the equipment itself is not out of calibration. If the as-found condition of the meter is outside of the accuracy threshold, but the as-left condition (after cleaning) is within the accuracy threshold, it is not clear whether a full calibration is still required for this piece of equipment. In some cases the manufacturer provides specific guidance to the effect that no further calibration is required if the as-left condition shows the meter to be in calibration.

Clarification: The as-found condition (percent drift) of a field check must always be recorded. If the meter is found to be measuring outside of the +/- 5% threshold for accuracy, the data must be adjusted for the period beginning with the last successful field check or calibration event up until the meter is confirmed to be in calibration (unless the last event occurred during the prior reporting period, in which case adjustment is made back to the beginning of the current reporting period). If, at the time of the failed field check, the meter is cleaned and checked again, with the as-left condition found to be within the accuracy threshold, a full calibration is not required for that piece of equipment. This shall be considered a failed field check, followed by a successful field check. The data adjustment shall be based on the percent drift recorded at the time of the failed field check. However, if the as-left condition remains outside of the +/- 5% accuracy threshold (whether or not additional cleaning and accuracy testing occurs), calibration is required by the manufacturer or a certified service provider for that piece of equipment.

15. Portable Instrument QA/QC (CLARIFICATION – June 3, 2013)

Section: 6.2 (Instrument QA/QC)

Context: Section 6.2 (page 25) states: “If a portable calibration instrument is used (such as a pitot tube), the portable instrument shall be calibrated at least annually by the manufacturer or at an ISO 17025 accredited laboratory.”

It has been unclear what sort of portable instruments must satisfy this requirement. Some portable pieces of equipment are used in the process of the field check, but are not themselves instruments that are able to measure and produce data. The Reserve has determined that all portable instruments used for field checks and calibrations that have the ability to measure the parameter that the meter in question would normally measure must themselves be calibrated annually. Some devices however, namely those pieces of equipment that do not produce a data output that could be used in emission reduction calculations, are not considered to be “portable instruments” per the protocol requirement, and must simply be maintained and calibrated according to the manufacturer’s specifications.

Clarification: The following text shall replace the penultimate paragraph (cited above) on page 25:

“If a portable instrument is used to field check the calibration accuracy of equipment that acquires project data and the portable instrument produces a data output that is or could be used in emission reduction calculations (i.e. flow or concentration), the portable instrument shall be maintained and calibrated per the manufacturer’s specifications, and calibrated at least annually by the manufacturer, by a laboratory approved by the manufacturer, or at an ISO 17025 accredited laboratory. Other pieces of equipment used for QA/QC of monitoring instruments shall be maintained according to the manufacturer’s specifications, including calibration where specified. The portable instrument must also be field calibrated to a known sample gas prior to each use.”