



# Verification Report for

Terra Yazoo City #9,  
Nitrous Oxide Abatement Project  
Yazoo City, MS, USA

Ninth Reporting Period  
Climate Action Reserve Project CAR768

Nitric Acid Production  
Project Protocol, Version 1.0

November 14, 2016

Report Prepared for

CF Industries Nitrogen, LLC,  
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## Summary

CF Industries Nitrogen, LLC (“CFIN”) is the project developer for the “Terra Yazoo City #9, Nitrous Oxide Abatement Project” located at Yazoo City, MS. In this Ninth reporting period, CFIN reported on its nitrous oxide reduction results during one nitric acid production campaign that commenced on December 16, 2015 and concluded on May 10, 2016. NSF International (NSF) was engaged to verify the nitrous oxide emission reductions achieved during the campaign in accordance with the requirements of the Climate Action Reserve Nitric Acid Production Project Protocol, Version 1.0. CFIN reduced emissions into the atmosphere by 87,109 metric tons of carbon dioxide-equivalent in this reporting period. CFIN’s nitric acid production operations were described by the NAICS code 325311 (“nitrogenous fertilizer manufacturing”). For this project, CFIN engaged the services of ClimeCo America Corporation, a carbon emissions mitigation consultancy. ClimeCo consultants assisted CFIN with the preparation of emission reduction calculations for the Ninth reporting period.

## 1. Introduction

### 1.1 Objective

The objective of this verification audit was to determine, with reasonable assurance, that CFIN had quantified, monitored, and fairly reported to the Climate Action Reserve its emission reductions from the abatement of nitrous oxide emissions during nitric acid production and to confirm the project’s eligibility.

### 1.2 Scope

The scope of the engagement included verification of the quantification, monitoring and reporting of greenhouse gas emission reductions from the project. It also included verification of the project’s eligibility and the calculation of project emissions of nitrous oxide measured in the nitric acid plant stack.

### 1.3 Criteria

NSF verified the reported project emission reductions against criteria in the Climate Action Reserve Nitric Acid Production Project Protocol, Version 1.0 (December 2, 2009), including the Errata and Clarifications issued by the Climate Action Reserve on March 22, 2016 (hereafter, the “Protocol”). The project also was verified against applicable requirements of the Climate Action Reserve’s Program Manual (September 1, 2015). The verification methodology conformed to requirements in the Climate Action Reserve’s Verification Program Manual (December 20, 2010), and ISO 14064:2006 Part 3, *Greenhouse gases – Specification with guidance for the validation and verification of greenhouse gas assertions*.

### 1.4 Materiality

In accordance with the Climate Action Reserve Verification Program Manual, the threshold for materiality of emission reduction assertions was based upon annualized rates of issuance of

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Climate Reserve Tonnes (CRTs). As the project claimed more than 100,000 metric tons of emission reductions on an annualized basis during the reporting period, the emission reduction assertion was considered fairly stated if it varied by no more than 1% from a complete statement of the project's emission reductions. Thresholds of materiality defined by the Verification Program Manual allowed verifiers of emission reduction reports to consider as immaterial discrepancies of 1% or less.

### 1.5 Level of Assurance

This engagement was performed at the reasonable level of assurance.

## 2. Verification Approach

### 2.1 Team Appointment and COI Review

This verification was performed by Tina Sentner, Lead Verifier. The verification was internally reviewed by John Shideler, Lead Verifier. Conflict of Interest inquiries were completed for NSF and for the verification team and a finding of low COI risk was confirmed by the Climate Action Reserve.

### 2.2 Document Review

The verification team conducted a document review to inform the planning process in advance of performing verification activities. Documents and records reviewed were provided by CFIN, the project developer; and by ClimeCo, the project developer's consultant. Documents reviewed included previous project verification reports; project documentation submitted to the Climate Action Reserve; the project Monitoring Plan; spreadsheets providing logged hourly raw operating data and calculations of emission reductions; CEMS, gas flow meter, and methane analyzer calibration and verification records; regulatory compliance information from the US EPA Enforcement & Compliance History Online (ECHO) report and company records; and manufacturer's information related to monitoring equipment.

### 2.3 Planning

NSF's verification approach is risk-based. It draws upon our understanding of risks to fair statement of reported emissions and the operation of controls to reduce such risks. As a result of the document review and correspondence with ClimeCo personnel, a verification plan and a sampling plan were developed for this engagement.

### 2.4 Verification Activities

For this Ninth reporting period NSF conducted a site visit to CFIN's nitric acid plant #9 in Yazoo City, MS, on August 31, 2016. Verification activities for the Ninth reporting period commenced on August 18, 2016, with a kick-off teleconference with the project developer consultant, ClimeCo. Verification activities included:

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- Confirmation of the project start date and plant location.
- Verification of the ownership of the emission reduction credits earned by this project.
- Verification that the project monitored legal and regulatory changes and that the project continued to meet the legal requirement test for continuing eligibility under applicable laws and regulations.
- Verification that the project campaign were operated in material compliance with applicable environmental and safety laws.
- Demonstration by the project developer that none of the exclusions to eligibility applied to the nitric acid production campaign conducted during this reporting period.
- Review of project compliance with monitoring requirements and that any identified variances have been approved by the Climate Action Reserve and appropriately applied.
- Verification that applicable sources, sinks and reservoirs were included in the project assessment boundary.
- Verification that the project developer correctly calculated permitted operating ranges for temperature and pressure in accordance with protocol requirements.
- Assessment of the adequacy of the control environment, information management systems, and monitoring plans of CFIN.
- Inquiries concerning the records management system implemented at CFIN for acquisition and retention of all Protocol required information.
- Verification of the project emission reduction calculations.

### 3. Verification Findings

#### 3.1 Project Description

CFIN has implemented a project to abate the emissions of nitrous oxide (N<sub>2</sub>O) at its Yazoo City, MS, #9 nitric acid plant. To achieve this, CFIN has installed a secondary abatement catalyst immediately below the ammonia oxidation catalyst in the ammonia oxidation reactor (AOR). In this Ninth reporting period of the “Terra Yazoo City #9, Nitrous Oxide Abatement Project” CFIN abated 87,109 metric tons of carbon dioxide-equivalent greenhouse gas that would have been emitted into the atmosphere absent the application of secondary catalytic reduction technology. Reporting period 9 started on December 16, 2015 and concluded on May 10, 2016.

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### 3.2 Eligibility

**Location.** CFIN planned its nitric acid production project to abate N<sub>2</sub>O emissions at its existing Plant #9 in Yazoo City, MS. This facility met the protocol requirement for location in the United States.

**Project Definition.** CFIN installed a secondary abatement catalyst in its Plant #9. This plant had not had nonselective secondary catalytic reduction (NSCR) technology installed prior to the beginning of the project, including at any point within 24 months prior to December 2, 2009. The project installed a dedicated N<sub>2</sub>O abatement catalyst inside the Ammonia Oxidation Reactor (AOR). In the Ninth reporting period CFIN operated production campaign 18 from December 16, 2015 to May 10, 2016 that spanned a period of time that did not exceed 12 months.

**Project Start Date.** The start date of the project, defined by the Protocol as the date on which production commences after the first installation of a secondary catalyst, was April 16, 2009. This start date was verified by reviewing a verification maintenance report describing work activities during a 45-hour shut down that ended with the restart of the reactor at midnight on April 16, 2009. The project met eligibility requirements because it was submitted for listing on June 4, 2010, a date within 12 months after the adoption on December 2, 2009, of the Nitric Acid Production Protocol; and the project start date was no more than 24 months prior to the adoption by the Climate Action Reserve of the Nitric Acid Production Protocol.

**Crediting Period.** The crediting period for CFIN's nitric acid abatement project extends to April 15, 2019. This Ninth reporting period is within the crediting period for the project.

### 3.3 Additionality

**Legal Requirement Test.** During the site visit, the verification team interviewed the site's environmental, health and safety manager concerning the methods for monitoring legal and regulatory developments. In accordance with their procedure, CF Industries at the corporate level tracked changes to regulations affecting nitric acid production via trade association newsletters, through corporate compliance audits of the Yazoo City plant, and with fertilizer trade association officials. This information was shared with the relevant site personnel. With respect to nitric acid plant #9, CFIN reported no changes to their Title V operating permit which was renewed for an additional five-year period in November 2013. NSF reviewed the permit (no. 3020-00010, issued November 13, 2013), and found no new limitations of nitrous oxide emissions.. Lastly, NSF reviewed an email from MDEQ Office of Pollution Control dated September 16, 2016 stating the project is voluntary. On the basis of this evidence and NSF's review of the Attestation of Voluntary Implementation signed on September 14, 2016, by CFIN for this reporting period, NSF has concluded that there were no legal requirements that mandated the abatement of N<sub>2</sub>O at the project site, that the project met the Protocol's monitoring requirement for voluntary implementation, and that the project continued to pass the legal requirement test.

**Performance Standard Test.** CFIN had installed a secondary N<sub>2</sub>O abatement catalyst in the ammonia oxidation reactor of its nitric acid plant #9 in Yazoo, City, MS. The Yazoo City plant #9 had not been restarted after having been out of operation for a period of 24 months or longer.

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Plant #9 was not a newly constructed plant after the effective date of the protocol, and it did not have non-selective catalytic reduction technology installed at any point within 24 months prior to the effective date of the protocol. The N<sub>2</sub>O abatement technology was installed at a single nitric acid plant at the Yazoo City facility. From the review of evidence collected at the November 2014 site visit, NSF has concluded that CFIN met the Performance Standard Test.

### 3.4 Regulatory Compliance

**Regulatory Compliance.** NSF reviewed the Yazoo City site's regulatory compliance status during its site visit on August 31, 2016. NSF reviewed evidence from the US EPA ECHO report dated August 31, 2016, that showed the following issues:

- The Yazoo City plant was subject to provisions of a consent decree agreed with US EPA in February 2011 that covered all CF Industries plants. The consent decree had resulted from compliance issues at a different CF Industries plant. As a result of the decree, NOx emission limits were imposed upon all CF Industries' nitric acid plants, including Yazoo City nitric acid plant #9. Yazoo City personnel provided evidence that the #9 plant was in compliance with its consent decree NOx emission limits.
- US EPA inspection in November 2012 for RCRA compliance resulted in a consent decree. The date of this inspection occurred prior to the beginning of the project's Reporting Period 7. NSF reviewed the list of findings and concluded none pertained to the operation of the #9 nitric acid plant. The consent decree was officially in October 2015.
- The facility was noted to be in compliance with its Clean Water Act permit during the reporting period.

Plant management also disclosed during the site visit that the plant had received a potential notice of violation with respect to the Ammonia Gas Plant. NSF confirmed with the Regulatory agency (MDEQ) that Plant #9 was not part of the violation. NSF concluded that this issue was not a result of the Project activities or related to the Project.

NSF also reviewed the Attestation of Regulatory Compliance completed by CFIN for the Ninth reporting period dated September 14, 2016. From these verification activities, NSF concluded that the project was in material compliance with regulatory compliance during the project's Ninth reporting period.

### 3.5 Ownership

**Project Developer and Ownership.** CF Industries Nitrogen, LLC (CFIN), the project developer, is the owner of the emission reduction credits. For this Ninth reporting period CFIN attested to its ownership of the greenhouse gas emission reduction credits through a signed Attestation of Title dated August 8, 2016, which NSF reviewed. The signatory to the attestation of title was the General Manager of CF Industries Nitrogen, LLC, the operator of the Yazoo City plant. NSF also reviewed website information from the Mississippi Department of Environmental Quality which summarized historic and active permits issued by the agency for "CF Industries Nitrogen LLC". From this evidence NSF has concluded that CFIN was the legal owner of the greenhouse gas emission reduction credits during this reporting period.

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### 3.6 Project Boundaries and Emission Sources

**Sources, Sinks and Reservoirs.** NSF has verified that for this project reporting period, the relevant sources, sinks and reservoirs (SSRs) were identified. Sources included the nitric acid plant #9's AOR from the inlet of the ammonia burner to the waste gas stack, and the production of nitric acid. Nitrous oxide (N<sub>2</sub>O) is a by-product of nitric acid production. Secondary catalytic abatement reduces N<sub>2</sub>O immediately after it is formed in the ammonia oxidation step of nitric acid production. The project measured the amount of N<sub>2</sub>O released to the environment through the AOR stack and subtracted that from the baseline condition of uncontrolled N<sub>2</sub>O emissions.

### 3.7 Project Management System

**Management System.** NSF reviewed relevant aspects of the Yazoo City plant's management system during its on-site visit on August 31, 2016. NSF found a mature management system and competent personnel. Safety training was required for access inside the plant and procedures were in place for plant operation and environmental management. NSF included the following management systems elements in its evaluation:

- Definition and maintenance of an appropriate control environment by CFIN
- Training and competence of project managers and operating/data management personnel
- Identification and management of legal requirements related to nitric acid production
- Identification and maintenance of records required by the project
- Selection, installation, maintenance, calibration and monitoring of Continuous Emissions Monitoring, stack gas analyzer, and flow metering equipment
- Quantification methods and calculations of project emissions; and
- Checking and corrective action mechanisms.

From information gathered during the site visit, NSF has concluded that CFIN's management system continued to meet the requirements described in the Climate Action Reserve's Verification Program Manual.

**Project Documentation and Reserve Tracking System.** NSF verified that the required documents for the project had been completed and submitted to the Reserve. These included the Project Submittal form, uploaded at the beginning of the project; signed attestations of title, of regulatory compliance, and of voluntary implementation for this Ninth reporting period; a project diagram, and an assertion of Climate Reserve Tonnes earned during campaign 18.

### 3.8 Performance Against Project Protocol/Methodology

The project was implemented in conformity with the Climate Action Reserve Nitric Acid Production Project Protocol Version 1.0 and the applicable Errata and Clarifications document.

**Monitoring and Operations Plan.** CFIN's current "Monitoring Plan for Nitrous Oxide Abatement Project Yazoo City AOP #9" addressed monitoring, operations and reporting of relevant parameters included in Table 6.1 of the Protocol, including the frequency of data acquisition, the frequency of instrument field check and calibration activities, and the roles of

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individuals performing each specific monitoring activity. It also defined record keeping requirements and described the procedure CFIN used to determine that the project at all times met the Legal Requirement Test. NSF concluded from its review that the monitoring plan covered all aspects of monitoring and reporting contained in the Protocol.

**Baseline Scenario.** In accordance with the Protocol, the baseline emission rate had been established by measuring N<sub>2</sub>O emissions during a complete production campaign prior to the installation of the secondary catalyst for the abatement project. The baseline emission factor developed during this pre-project monitoring was verified during CFIN's first reporting period. NSF reviewed the baseline emission factor to ensure that it was consistent with the emissions factor verified in the first reporting period.

**Use of CEMS.** CFIN used a Continuous Emissions Monitoring System to directly measure N<sub>2</sub>O concentration and flow rate in the stack gas of the AOR. An ABB Uras26 non-dispersive infrared sensor installed in the stack pipe analyzed gas concentration. A Rosemount Model 3051 SFA flow meter measured flow in conjunction with a Rosemount differential pressure transmitter. Concentration and flow data were monitored continuously but logged in hourly increments along with stack temperature and pressure and the air-to-ammonia ratio and ammonia flow. The CEMS was maintained in accordance with a quality assurance/quality control program as defined in Appendix B to Part 75 of the Clean Air Act, Subpart H: NO<sub>x</sub> Mass Emissions Provisions. After a review of data logs provided by the project consultant, NSF concluded that the CEMS operated normally during the project reporting period.

**Initial Certification of CEMS.** CFIN (then operating under the name of Terra Industries or Terra Mississippi Nitrogen, Inc.) installed its CEMS in 2008 prior to the publication of the Nitric Acid Production Project Protocol. At the time it installed and operated the CEMS in accordance with European Norm EN 14181. Once the NAPPP was published it requested a variance from the Climate Action Reserve to allow it to demonstrate conformity with the system installation and certification requirements of EN 14181 rather than section 60.13 of CFR Part 60 and Performance Specification 2 of Appendix B of 40 CFR Part 60 and section 6 of Appendix A of 40 CFR Part 75. The Reserve approved the request and compliance with the variance conditions were verified at the conclusion of the first project reporting period. From evidence reviewed, NSF has concluded that the Project met the initial installation and certification requirements as these were modified by the Reserve's variance dated September 14, 2010.

**CEMS QA/QC and Frequency of Testing.** NSF verified that Quality Assurance/Quality Control procedures were implemented in accordance with Clean Air Act requirements of the U.S. Environmental Protection Agency, specifically those included in the Acid Rain Program regulations published at 40 CFR Part 75, Appendix B, as required by the Protocol. QA/QC procedures included daily, quarterly and annual assessments and scheduled preventive maintenance for the CEMS and its components.

**CEMs Daily Testing.** NSF verified that CFIN had performed daily tests of the N<sub>2</sub>O analyzer to ensure the accuracy of the CEMS recorded data. Minimum pressures of the certified calibration gases were monitored to ensure accurate daily test results. Data to the CEMS were deemed valid as long as the daily calibration tests resulted in variation of no greater than 5% from the N<sub>2</sub>O

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analyzer span. Variations greater than 2.5% and less than 5% over a two-day period triggered automatic recalibration of the analyzer. Variations greater than 5% were considered calibration failures and were acted upon immediately by plant personnel.

**CEMS Quarterly Testing.** NSF verified that CFIN had performed the following QA/QC on a quarterly basis: linearity checks to determine the accuracy of the gas composition analyzer, flow meter transducer calibration and leak testing. Linearity tests were performed at low, mid and high levels of concentration as required by 40 CFR Part 75 Appendix B. NSF reviewed linearity test records created on December 2, 2015, March 24, 2016, and June 20, 2016, to determine that the gas analyzer remained in calibration. In each case the average of three test runs returned results that varied by less than five percent from the reference values. NSF also reviewed flow meter transmitter calibration records from December 30, 2015, March 28, 2016, and June 20, 2016. The electrical output of the transmitter was measured at zero flow and at four intervals of 25%, 50%, 75%, and 100% of the flow meter's range (0 to 20 milliamps). The results remained well within prescribed calibration tolerances. All calibration records included records of leak testing on the flow meter transmitter pressure line tubing. NSF determined from these records that the Protocol's monitoring requirements (as updated by the Errata and Clarifications document published on March 22, 2016) were met. Flow-to-load ratio or gross heat rate evaluation was not performed because the nitric acid plant did not also produce electricity or steam.

**CEMS Relative Accuracy Test Audit.** NSF verified that CEMS data had been validated through the performance of a Relative Accuracy Test Audit (RATA) which was conducted on November 17, 2015, by an independent third party in accordance with the requirements of 40 CFR Part 75 Appendix A, 7.4, and the test methods specified in 40 CFR Part 60, Appendix B, Performance Specifications 2 and 6. This laboratory was certified by the Louisiana Department of Environmental Quality (reference 30661). Relative accuracy of the nitrogen analyzer was found to be 1.54 %, and a bias adjustment factor of 1.0 was applied. Relative accuracy of the flow meter was found to be 5.38%, and a bias adjustment factor of 1.052 was applied. Flow RATAs were performed at a single load level consistent with the steady-state operation of the nitric acid plant. The annual 2015 RATA met the requirements showed that the flow meter and gas analyzer instruments met accuracy requirements.

**Data Management.** NSF verified that the project had logged operational data on a continual basis and exported data on an hourly basis for monitoring purposes. Data logged included stack flow, temperature and pressure, N<sub>2</sub>O concentration, and stack flow corrected to 0°C. Data were recorded in English measurement units for operating room monitoring and converted for reporting purposes to metric units. NSF reviewed the conversion algorithms and determined that data had been properly reported in metric units. Operational data were checked for values outside permitted operating conditions. NSF verified that the nitric acid plant had not operated outside these limits for more than 50% of the duration of the reporting period. During campaign 18 operations outside permitted ranges occurred less than 5% of the time.

**Consistency With Past Reporting Periods.** NSF compared the emission reductions claimed during the Ninth reporting period to those claimed during prior reporting periods, and found comparable rates of CRT generation per ton of nitric acid produced. The following table relates emission reductions to respective rates of nitric acid production in recent reporting periods:

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| Reporting Period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Campaign Dates           | CRTs Quantified  | Nitric Acid Produced (mt) | Ratio CRTs/HNO <sub>3</sub> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|---------------------------|-----------------------------|
| RP 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          | 218,069          | 146,567                   | 1.49                        |
| RP 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          | 221,182          | 160,700                   | 1.38                        |
| RP 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          | 154,430          | 122,220                   | 1.26                        |
| Campaign 8 (RP 4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2011-12-14 to 2012-03-07 | 53,127           | 41,482                    | 1.28                        |
| Campaign 9 (RP 4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2012-03-08 to 2012-07-31 | 101,303          | 80,738                    | 1.25                        |
| RP 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7/31/2012 to 7/2/2013    | 223,732          | 167,232                   | 1.34                        |
| Campaign 10 (RP 5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7/31/2012 to 2/5/2013    | 113,373          | 82,006                    | 1.38                        |
| Campaign 11 (RP 5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2/05/2013 to 7/2/2013    | 110,359          | 85,226                    | 1.29                        |
| RP 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7/3/2013 to 6/9/2014     | 223,835          | 185,551                   | 1.21                        |
| Campaign 12 (RP 6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7/3/2013 to 10/14/2013   | 60,701           | 56,387                    | 1.08                        |
| Campaign 13 (RP 6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10/15/2013 to 3/18/2014  | 94,272 (87,692)* | 77,995                    | 1.21                        |
| Campaign 14 (RP 6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3/19/2014 to 6/9/2014    | 68,862 (65,824)* | 51,169                    | 1.35                        |
| Campaign 15 (RP7)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 06/10/2014 to 11/19/2014 | 92,968           | 80,587                    | 1.15                        |
| Campaign 16 (RP7)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11/20/2014 to 05/05/2015 | 96,196           | 91,247                    | 1.05                        |
| Campaign 17 (RP8)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 05/06/2015 to 12/15/2015 | 76,636           | 86,288                    | .88                         |
| Campaign 18 (RP9)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12/15/2015 to 05/10/2016 | 87,109           | 84,967                    | 1.03                        |
| <p>* Note: During parts of campaign 13 and 14 (12/10/2013 to 5/20/2014) the project developer has increased by 15% the monitored concentration of N<sub>2</sub>O in the stack gas in order to compensate for a period of time when the CEMS exceeded a 10% relative accuracy threshold. In order to provide meaningful comparisons to past campaign of the ratio of emission reductions to nitric acid production, two values for the ERs quantified for Campaign 13 and 14 are given. The first number represents the unadjusted ERs. This number was used to calculate the ratio of ERs to HNO<sub>3</sub> produced. In parentheses the number of ERs expressed as CRTs issued is also given. The latter number reflects the adjustment stipulated in the variance granted by the Reserve.</p> |                          |                  |                           |                             |

There were no periods of downtime or maintenance noted for this campaign. From this evidence NSF concluded that the reported emission reductions were consistent with those achieved in the previous reporting periods.

### 3.9 Calculation of GHG Emission Reductions

NSF separately calculated project emission reductions from monitored information and confirmed that CFIN's claimed emission reductions did not vary by a material amount from those calculated by NSF. The verification team reviewed data downloaded from the CEMS and performed check calculations in the spreadsheet on values such as mean concentration of stack

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gas and the mean stack gas volume flow. The verification team checked the raw logged data to verify that the AOR did not exceed permitted operating conditions during more than 50% of the time during the reporting period, and verified that average operating values obtained during each campaign remained within historical ranges. For this reporting period, NSF confirmed the Project did not implement data substitution procedures.

NSF confirmed that CFIN had performed the required statistical analysis steps specified in the Errata and Clarifications document (March 22, 2016) to compare the average values of permitted operating conditions (stack gas flow,  $\text{N}_2\text{O}$  concentration, temperature, pressure and maximum ammonia to air ratio) with the average values obtained during the baseline sampling period. NSF found that the results obtained for campaign 18 were well within the permitted operating conditions. Equation 5.3 of the protocol incorporated a mean baseline nitrous oxide concentration rate of  $2,080 \text{ mgN}_2\text{O}/\text{m}^3$  based on the results of the baseline sampling period. This compared to a mean  $\text{N}_2\text{O}$  concentration rate of 945.92 during campaign 18.  $\text{HNO}_{3,\text{MAX}}$  was selected from the maximum production value in the historical sampling period.  $\text{HNO}_{3,\text{MAX,SCALED}}$  was determined by multiplying the average hourly production rate of  $\text{HNO}_{3,\text{MAX}}$  by the number of operating hours in the campaign. The result of that calculation was compared to the amount of  $\text{HNO}_3$  production in the campaign, and the lower of the two values (specifically,  $\text{HNO}_{3\text{n}}$  or  $\text{HNO}_{3,\text{MAX,SCALED}}$ ) was retained for the variable  $\text{HNO}_{3\text{ER}}$ . In campaign 18 the value used for calculating emission reductions was  $\text{HNO}_{3\text{n}}$ .

NSF reviewed the inputs to Equation 5.4 which calculated project emissions as the product of stack gas flow volume multiplied by the  $\text{N}_2\text{O}$  concentration and the operating hours. The input numbers for this equation matched operating records provided by CFIN. An emissions factor for each campaign was calculated in accordance with Equation 5.5 as a ratio of product emissions to nitric acid produced.

### 3.10 Corrective Action Requests

NSF issued findings throughout the verification process. Details are provided to the project developer and to the Reserve in a List of Findings, a private document.

### 3.11 Approved Variances

There were no variances reviewed for the reporting period.

## 4. Verification Results

### 4.1 Verification Team Recommendation

Based on the verification activities described above, the verification team has concluded that the CFIN's CAR768 project, "Terra Yazoo City #9, Nitrous Oxide Abatement Project") Ninth reporting period, has achieved the following emission reductions:

| Emission Reductions, Ninth Reporting Period                    | Metric tons $\text{CO}_2\text{-e}$ |
|----------------------------------------------------------------|------------------------------------|
| Secondary abatement emission reductions <i>ER, Campaign 18</i> | 9,516                              |

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|                                                                                  |               |
|----------------------------------------------------------------------------------|---------------|
| (vintage 2015)                                                                   |               |
| Secondary abatement emission reductions <i>ER, Campaign 18</i><br>(vintage 2016) | 77,593        |
| <b>Total Emission Reductions, Ninth Reporting Period</b>                         | <b>87,109</b> |

### 4.2 Verification Audit Summary

|                                                                                                   |                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Developer                                                                                 | CF Industries Nitrogen LLC<br>4608 Highway 49 East<br>Yazoo City, MS 39194 (USA)                                                                                                                                                                                                                                                    |
| Project Location                                                                                  | CF Industries Nitrogen LLC<br>4608 Highway 49 East, Plant #9<br>Yazoo City, MS 39194 (USA)                                                                                                                                                                                                                                          |
| Project Type                                                                                      | Nitric Acid N <sub>2</sub> O – Secondary Catalyst                                                                                                                                                                                                                                                                                   |
| Project Period                                                                                    | December 16, 2015 – May 10, 2016                                                                                                                                                                                                                                                                                                    |
| Protocol/Methodology                                                                              | Climate Action Reserve, Nitric Acid Production Project Protocol, v. 1, including Errata and Clarifications issued on March 22, 2016.                                                                                                                                                                                                |
| Emissions/Removals Verified                                                                       | Vintage 2015: 9,516 metric tons CO <sub>2</sub> -e<br>Vintage 2016: 77,593 metric tons CO <sub>2</sub> -e                                                                                                                                                                                                                           |
| Verification Conclusion                                                                           | Based upon the verification activities described above, NSF has concluded that CF Industries LLC's reported 2015 and 2016 vintage emission reductions of 87,109 metric tons CO <sub>2</sub> -e reported to the Climate Action Reserve for the period December 16, 2015 – May 10, 2016 are, in all material respects, fairly stated. |
| Lead Verifier                                                                                     | <br>Tina Sentner, November 14, 2016                                                                                                                                                                                                              |
| Independent Reviewer                                                                              | <br>John C. Shideler, November 20, 2016                                                                                                                                                                                                          |
| <i>This verification statement is valid when signed and dated by an NSF independent reviewer.</i> |                                                                                                                                                                                                                                                                                                                                     |