Guide to Calculating Environmental Benefits from EPA Enforcement Cases: FY2014 Update

U.S. Environmental Protection Agency
Office of Compliance

Note: This version of the document contains clarification and editorial changes to the FY2012 Guide. Further updates to the guidance are being considered for implementation in the near future.

March 2014 Version FY14.0

DISCLAIMER

This document is to be used for CCDS data input guidance only and not for regulatory interpretation.

History of Guide to Calculating Environmental Benefits from EPA Enforcement Cases – FY2014 Update

	Date
Original	January 10, 2012
Revision FY14.0	March 2014

Summary of Changes in Revision FY14.0

***** Revised and/ or new text appears in blue font in the document *****

Section	Page Number (Original)	Page Number (Version 14.0)	Changes
Cover Page			Changed date to March 2014 Version FY14.0
History of Changes	-	iii and iv	Added History of Changes page
All			Added measure under which an ICIS input will be counted. Applied to all examples.
1.3.3 Table 1-1	1-15	1-15	Added UST Release Detection as a Work Practices complying action
2.2.3	-	2-8	Added clarified background text for oil and hazardous substance cleanup/removal as Section 2.2.3.
2.2.4	2-8	2-8	Examples section becomes 2.2.4
2.2.4	2-10	2-11	Modified Example 4 (Pesticide Contaminated Groundwater Ex-situ Treatment) to show "Contaminated Groundwater" as the pollutant associated with 148,148 cubic yards. This example will also show "AND you can report "Pesticides" as a secondary pollutant with 0 for the amount/unit.
2.2.4	2-16 and 2-17	2-18	Example 12 (Spill Cleanup Removal of Released Oil or Hazardous Substances). Revised example description and added "Contaminated Soil" associated with 10,560 cubic yards.
2.2.4	-	2-18 and 2-19	Added Example 13 CWA 311 (b) Administrative Penalty
2.3.1	2-18	2-19	Clarified units for reporting clean-up of liquid wastes. For both solid and liquid wastes report in cubic yards.
3.2.1.1	3-16 and 3-18	3-16 and 3-18	Changed headings to read, "Proper Carcass Disposal"
3.3.1 Table 3-4	3-29	3-30	Replaced Table 3-4
3.3.1.3	-	3-37 and 3-38	Added Example 8 RCRA SMWU Corrective Measures
3.4.3.2	3-43	3-47	Replaced outdated reference to Texas A&M Erosivity Index Calculator with EPA's current Rainfall Erosivity Factor Calculator URL
3.5.1	3-58, 3-60 and 3-61	3-62, 3-64 and 3-65	Added text to include instructions for reporting the gallons of untreated sewage eliminated from CSO enforcement.
3.5.2	3-62, 3-63 and 3-64	3-66, 3-67 and 3-68	Added text to include instructions for reporting the gallons of untreated discharge eliminated from SSO enforcement.

Section	Page Number (Original)	Page Number (Version 14.0)	Changes
4.2.1	4-4	4-4	Modified text to read, "For preventative complying actions, report the volume of hazardous waste impacted by the action; use cubic yards for contaminated medium, gallons for UST capacities, and pounds for hazardous wastes or other chemical substances not contained within the volume of hazardous waste."
4.2.2	4-4	4-4	Modified Example 1 (Proper Waste Transport) to show amount and units in pounds.
4.2.2	4-4	4-4	Modified Example 2 (Proper Waste Transport) to show amount and units in pounds.
4.2.2	4-5	4-5	Modified Example 3 (Proper Waste Storage) to show amount and units in pounds.
4.2.2	4-5	4-5	Changed Example 4 pollutant to "Contaminated Leachate" and change units to pounds.
4.2.2	4-6	4-6	Modified Example 5 (Proper Waste Disposal) to show amount and units in pounds.
4.2.2	4-6	4-6	Modified Example 6 (Proper Waste Export) to show amounts and units in pounds.
4.5.1	4-23	4-24	Added Section 4.5.1 Facility Response Plan (FRP)
4.5.1	4-23	4-24	Added Example 1. CWA Facility Response Plan Implemented
4.5.2	4-24	-	Moved old Example 1. CWA 311(b) Administrative Penalty to Section 2.2.3
4.5.1	4-23	4-25	Added Section 4.5.2 Oil Spill Prevention, Control, and Countermeasures (SPCC) Program
4.5.2	4-24	4-25	Modified old Example 2 to show that it applies to CWA 311(j)
4.5.2	4-24	4-26	Modified old Example 3 CWA Section 311(b) Plan Implemented to replace with a revised example
5.1 Table 5-1	5-3	5-3	Added "UST Release Detection" as a new complying action under Program-Specific Hazardous Waste Management area. Definition: Management of procedures to determine whether a pollutant release is occurring from an underground storage tank.
Appendix A	A-3	A-3	Q.19 (b) reference Q.21; Q.19 (c) reference Q.21;Sectoin G list, add UST Release Detection; Changed to FY2014 in header
Appendix F	F-1	F-1	Updated location for all calculator tools

CONTENTS

Page

(Continued)

Page

(Continued)

Page

(Continued)

Page

FOREWARD

The Office of Enforcement and Compliance Assurance (OECA) uses the Case Conclusion Data Sheet (CCDS) to collect information on the results and environmental benefits achieved from concluded federal enforcement cases. In order to ensure a national consistency for estimating environmental benefits, OECA published the CCDS Guide to Calculating Benefits of Enforcement (CCDS Guidance) to standardize the methodologies for calculating benefits.

However, the current CCDS Guidance does not include environmental benefit methodologies for all complying actions. Also, the structure of the CCDS Guidance prevents use of certain complying actions for cases under all statutes. Furthermore, the CCDS Guidance does not reflect the recent change to a media-based problem-solving approach in reporting OECA results under the Government Performance and Results Act (GPRA). These limitations impede the counting of all environmental benefits accrued from an enforcement action.

To overcome these limitations so that all environmental benefits can be counted, OECA is revising the CCDS Guidance in 2011 effective beginning in FY2012. The FY2012 CCDS Guidance restructures the way that environmental benefits are counted so that it is the complying action and not the statute that determines the benefits. It also includes new standardized methodologies that count benefits for the first time for some complying actions, and considers multi-media benefits where appropriate for complying actions. Together, these changes allow Regions to provide a more complete accounting of the benefits accrued from their enforcement actions, and allow OECA to portray a more robust picture of environmental benefits to the public.

1. INTRODUCTION

1.1 Background

The Case Conclusion Data Sheet (CCDS) is a manual data collection tool HQ implemented in FY 1996 to collect information on concluded federal enforcement cases including the case name and identification number, injunctive relief, environmental benefits (including environmental benefits from Supplemental Environmental Projects [SEPs]), and assessed penalties. The CCDS data are entered into the Integrated Information and Compliance System (ICIS). OECA uses data obtained from the CCDS via ICIS to assess the environmental outcomes of its enforcement program. Quality reporting of CCDS data is important, as these data provide the necessary information for reporting on OECA's annual accomplishments to the public, Congress, and Office of Management and Budget (OMB).

1.1.1 How CCDS Data Are Used

The data from completed CCDS forms are entered into ICIS by the EPA regions. The data are used to:

- Report OECA's accomplishments under the Government Performance and Results Act (GPRA) annually;
- Serve as a management tool to assess OECA and regional case performance; and
- Describe the results of EPA's enforcement program to the public, Congress, and others.

OECA emphasizes the environmental benefits of its compliance and enforcement activities in order to assess their impact on, and benefit to, human health and the environment. Assuring the quality and consistency of CCDS data is critical for achieving this objective. Regions are required to certify that the estimated environmental benefits from their enforcement cases are calculated using current guidance and methodologies, and are complete and entered into ICIS in a timely manner.

1.1.2 FY2005 CCDS Guidance

In FY1996, OECA implemented the CCDS to collect information on the results achieved from concluded federal enforcement cases, including environmental benefits. In 2001, in order to ensure a standard methodology for estimating environmental benefits and national consistency in reporting, OECA issued the first CCDS guide for calculating benefits. An expanded version of the guidance was issued in FY2005 to capture additional benefits associated with various preventative programs such as RCRA.

The FY2005 CCDS Guidance was not intended to cover outcome reporting scenarios for all OECA enforcement programs. Its primary focus was to expand the types of cases for which outcomes could be measured but also was limited by focusing on scenarios where calculating environmental benefits was practical. However, since issuance of the guidance, numerous questions have arisen about how to apply methodologies described in the guidance to fact scenarios that were not directly covered by, or contemplated by, the guidance. In addition, the approaches and methodologies for calculating pollutant reductions have steadily evolved, driven in part by inclusion of "non-traditional" types of remedies in EPA cases. As a result, the need for revised guidance, including a standard approach for estimating environmental benefits without the need for scenario-specific instruction, became increasingly apparent. The result is this revised guidance.

The approach taken in the FY2005 CCDS Guidance for determining how to calculate environmental benefits for a particular situation was based on the statute under which the enforcement action had been taken, as illustrated in Figure 1-1.

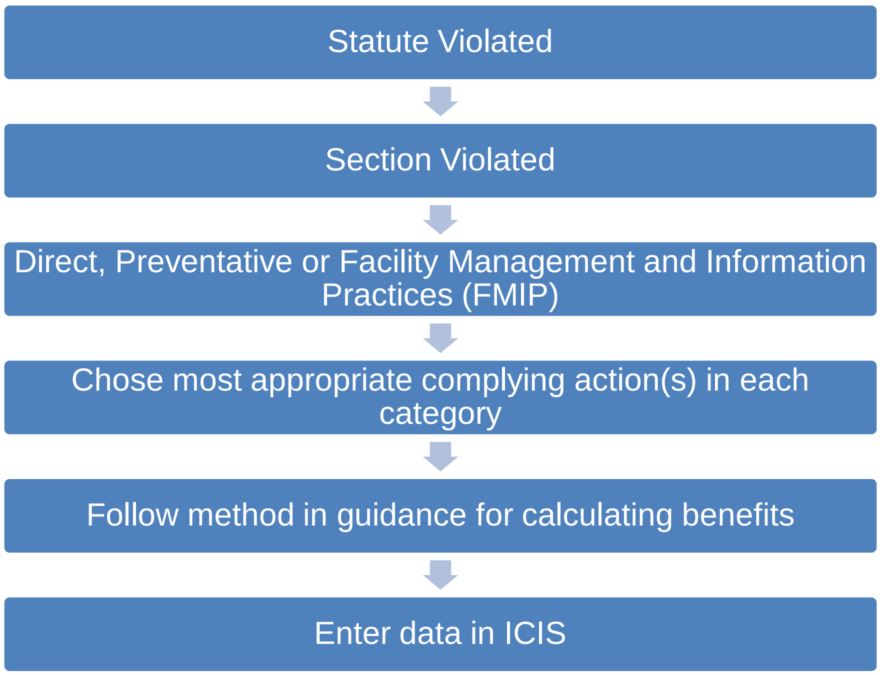

Figure 1-1. FY2005 CCDS Guidance Decision Making Flow Diagram for Statute Approach

ICIS was modified to support the FY2005 CCDS guidance by limiting data entry to only complying actions[1] and associated units applicable to a specific statute and section. This modification increased the data quality of the pollutant reduction entries in ICIS but has limited data entry to only those methodologies outlined in the FY2005 CCDS guidance.

1.1.3 Limitations of FY2005 Guidance

Under the FY2005 CCDS Guidance, the main emphasis was on one category of environmental benefits, "pounds of pollution reduced" and, as a result, many enforcement actions with many other types of significant environmental benefits were not adequately covered by the guidance.

The "FY2005 CCDS Guidance" was not intended to cover outcome reporting scenarios for all OECA enforcement programs. The FY2005 CCDS Guidance primarily focused on calculating pounds of pollutants reduced by statute. Since FY2005, the approach and

[1] **Complying Action.** For the purposes of this document, a complying action is an action that is taken by a Respondent or Defendant in response to a formal EPA enforcement action that helps to return a facility to compliance, reduce or eliminate current or future threats to human health or the environment, or may result in better management of environmental programs.

methodologies for calculating pollutant reductions has steadily evolved as "non-traditional" types of case remedies are being used across programs. These "non-traditional" case remedies have presented a challenge to finding better ways to calculate and report environmental outcome data. It has become apparent that, without an expansion to the environmental benefit methodologies, some environmental benefits will not be calculated or counted.

In revising the FY2005 Guidance to focus on a nature of remedy concept, EPA's goal is to achieve accurate reporting of environmental benefits for more types of enforcement cases, even those which at one time were considered unique but have become increasingly more common. Built upon previous versions, the FY2012 CCDS Guidance relies on the experience gained from practical application of the methodologies and insights gathered from staff with responsibility for reporting CCDS environmental benefits data. Thus, the FY2012 CCDS Guidance provides solutions for the challenges encountered with the previous reporting structure that limited the use of certain complying action types and units for some media program areas.

It is important to note that as the FY2012 CCDS Guidance is implemented, OECA plans to continue to expand the guidance as needed based on feedback from regional and HQ enforcement staff. Requests to add new reporting measures and methodologies are to be directed to OECA's National Planning and Measures Branch, Planning, Measures, and Oversight Division.

1.2 Development of the FY2012 CCDS Guidance

1.2.1 Principles Used

The FY2005 CCDS Guidance had rules for calculating and reporting environmental benefits, but many of the rules were not easy to identify. To address this issue, a set of science-based principles for determining the environmental benefits of concluded enforcement actions have been developed. These principles will guide consistent decision making for determining the various outcomes from federal enforcement actions. The principles will also help to characterize and quantify environmental outcomes of EPA's federal enforcement actions in a way that is consistent, implementable, defensible and understandable to the general public. These principles should be followed for each CCDS entry:

1. Focus on the Nature of the Remedy

   Determine the benefit category (removal and restoration, reduction of ongoing releases, prevention of future releases, work practices) for the complying action required by the enforcement action (without regard for the statute violated) (see section below).

2. Treat Each of the Four Benefit Categories as Important, Unique and Mutually Exclusive:

   a. Removal and Restoration
   b. Reduction of Ongoing Releases
   c. Prevention of Future Releases
   d. Work Practices

3. Report Environmental Benefits from Concluded Formal Civil and Administrative Enforcement Actions and Notices of Determination Only

   The CCDS guidance covers environmental benefits from concluded formal civil and administrative enforcement cases, and from notices of determination (NODs), only**.** Outcomes and information from other enforcement and compliance activities, such as informal enforcement actions, inspections and criminal enforcement cases, are not covered by this guidance.

4. Count Environmental Benefits for Each Media (air, water, land)

   One complying action may produce environmental benefits in more than one media area (air, water, land). Calculate the environmental benefits for each media area affected by the complying action (but assure that there is no double counting). (For example, an action requiring closure of a hazardous waste landfill can result in reduced leachate and methane gas emissions which impact both water and air.)

5. Complying Actions

   a. An enforcement action can have more than one complying action.
   b. Complying actions are statute-neutral (e.g., following the nature of the remedy principle, enforcement actions under different statutes can require similar complying actions).
   c. Selection of a complying action is not limited by choice of enforcement instrument.
   d. Complying actions can have outcomes in more than one medium.
   e. A single complying action can address multiple pollutants.
   f. If different complying actions address the same material, waste stream, volume, etc., the associated outcome is only to be counted once (i.e., a pollutant reduction amount should have only one complying action associated with it).
   g. Where multiple complying actions may be associated with a single environmental benefit, the pollutant reduction(s) should be associated with the "highest order" complying action.
   h. For complying actions that compel a facility to properly manage a waste to prevent its future release, report the total potential amount or volume of waste that would have been released if preventative action(s) had not been taken.

6. Conservative Approach to Quantification of Benefits

   EPA strives to be transparent and accurate when counting environmental benefits derived from the Agency's enforcement actions. EPA's numbers need to be credible and defensible, minimizing the risk of any exaggeration. Recognizing that all methodologies for quantification are not perfect, are estimates, and include some margin for error, when quantifying environmental benefits from enforcement actions the rule is to underestimate rather than overestimate the environmental benefits.

1.2.2 Significant Changes from FY2005

Overall, the changes reflected in the FY2012 CCDS guidance establish a framework for more consistent use of methods for calculating environmental benefits from concluded cases. The most significant changes are the 1) nature of remedy reporting approach, 2) discontinuation of the hierarchical distinction between the direct and preventative reporting categories, 3) greater multimedia benefits reporting options 4) new methodologies to capture environmental benefits not previously reported and electronic tools for easier calculation of benefits, and 5) performance measures reporting changes to coincide with the way environmental benefits will be reported based on the nature of remedy approach.

Nature of Remedy. The new approach focuses on the enforcement action remedy rather than the statutory authority by which the enforcement action was taken.

The FY 2012 revised CCDS Guidance changes the fundamental approach to environmental outcome reporting. Instead of beginning the process of determining the environmental benefits associated with an enforcement action by starting with the statute under which an action is taken, the new guidance starts by examining the nature of the remedy that corrects the environmental problem.

In contrast, the nature of the remedy approach set forth in this FY2012 CCDS Guidance focuses on the complying actions that result from the enforcement action, without regard to the statute under which the case was brought. The methods for calculating the benefits are now based on the enforcement action remedy (e.g., what activities the facility must implement as a result of the enforcement action), rather than the statutory authority by which the action was taken. Since this approach is based on the actions required by the enforcement action, regardless of statute, the calculations and reporting will be more apparent and understandable. This approach is also advantageous because it helps to ensure consistency across programs and is more transparent to the public.

With this new principle, the first step in the decision-making process is determining what types of complying actions and benefits result from the enforcement action. Figure 1-2 presents the decision making process for determining how to calculate environmental benefits using the “nature of remedy” principle.

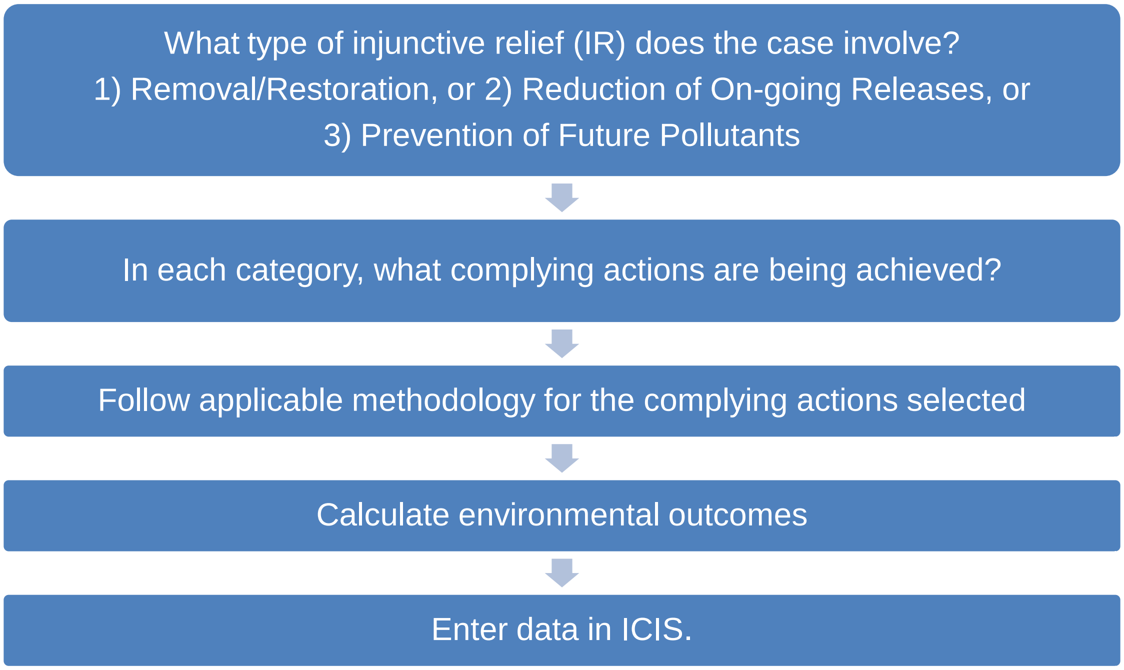

Figure 1-2. FY2012 CCDS Guidance Decision Making Flow Diagram for Nature of Remedy Principle

The new FY2012 CCDS Guidance improves on the three categories previously used to describe the counting of environmental benefits, which were called Direct, Preventative, and Facility/site Management and Information Practices (FMIP). The FY2012 CCDS Guidance uses four new remedy categories to describe the environmental benefits that result from a particular complying action for each case. The four remedy categories are referred to as (1) Removal and Restoration, (2) Reduction of On-going Releases, (3) Prevention of Future Releases, and (4) Work Practices. The definitions for the categories are:

Removal and Restoration – Benefits derived from a complying action that result in a pollutant, contaminated media or structure, already in the environment, being eliminated or treated to a level required by the enforcement action.

Reduction of On-going Releases – Benefits derived from a complying action that reduces or eliminates an ongoing discharge, emission or release of pollutant(s) into the environment.

Prevention of Future Releases – Benefits derived from a complying action that reduces or eliminates the potential for a future discharge, emission or release of pollutant(s) not already in the environment.

Work Practices – Benefits derived from a complying action for which environmental benefits are not readily quantifiable.

Challenges for Calculating Benefits from FIFRA Cases. These four remedy categories may present a challenge for enforcement actions addressing FIFRA violations. Pesticides are products that are designed to be applied to the environment within legal constraints. Once manufactured and labeled, pesticides leave control of the manufacturer and enter commerce where they are either purchased and applied by a licensed applicator or purchased and applied by individuals. For the purposes of this guidance, an “on-going discharge, emission or release of pollutants” is defined to apply to pesticides at the point where the pesticide leaves the manufacturer and enters into commerce.

Discontinuation of Hierarchy of Direct and Preventative Environmental Benefits. There is no longer a “higher order” distinction in terms of environmental significance between environmental benefits resulting from actions that address existing (e.g. ongoing) pollutant releases and actions that prevent the likelihood of future releases. The enforcement benefits in each category are recognized as equally important enforcement program accomplishments and both are to be counted in a single action where they are achieved.

Greater Multimedia Benefits Reporting Options. Greater flexibility is provided for calculating and reporting environmental benefits across all impacted media areas for a given case irrespective of the primary statutory program driving the enforcement action.

In accordance with the nature of the remedy approach, the FY2012 CCDS Guidance recognizes and accounts for multimedia benefits from concluded enforcement cases. When the media impacted by a remedy is different from the media usually addressed by the enforcement authority associated with a case, all media benefits should be reported even though some of the benefits achieved may not be within the usual statutory purpose of the program. For example, when Hazardous Air Pollutants (HAPs) reductions result from RCRA hazardous waste minimization, these benefits are appropriate for counting even though the air medium benefits may not have been directly addressed through the enforcement action. Other examples where multimedia environmental benefits are relevant could include mercury abatement in waters deposited from coal combustion air emissions, or reduction in air emissions from capping a RCRA regulated landfill.

New Methodologies and Calculator Tools. New enforcement complying actions and revised methodologies have been developed to capture environmental benefits for programs not previously reported. A list of FY2012 complying actions is shown in Table 1-1. Additional electronic tools have also been developed for easier calculation of benefits. The list of calculator tools may be found in Appendix F.

Performance Measures Reporting Changes. The revised reporting guidance reflects OECA’s recent shift to a media-based approach in reporting results under the Government Performance and Results Act (GPRA). Generally, the revised guidance does not alter the way we calculate and report environmental benefits for most enforcement cases with the following exceptions:

- UST Cathodic Protection benefits previously reported under the FMIP category, will now be counted in the new “Prevention of Future Releases” category.
- Pound of FIFRA Pesticides – Labeling, Formulation and Use Reduction actions previously counted as preventative benefits will now be counted in the “Reduction of On-going Releases” category.
- CWA 311 Oil Spill clean-ups previously counted as pounds of water pollutants reduced will now be reported in cubic yards under the “Removal and Restoration” category.
- Activities such as Lead-based Paint Disclosures and RCRA Hazardous Waste Identification, Labeling, Manifesting for which environmental benefits were previously

calculated will be reported with no quantitative benefits in the “Work Practices” category.

A summary of possible National Performance Measures reporting impacts includes:

- An overall increase in “Direct” pounds of pollutants reduced as follows:
    - “Estimated Air Pollutants Reduced, Treated or Eliminated” as a result of the addition of mobile source emissions reductions
    - “Estimated Water Pounds of Pollutants Reduced, Treated or Eliminated” as a result of additional CAFO and Brine pollutant reductions being reported and loss of CWA 311 pounds
    - “Estimated Toxics and Pesticides Reduced, Treated or Eliminated” resulting from additional pesticide products reporting in the new “Reduction of Ongoing Releases” category

- An overall increase in “Direct” cubic yards of water/aquifer cleaned up:
    - Oil spill clean-ups previously reported in the “Estimated Water Pounds of Pollutants Treated, Reduced or Eliminated” category will now be counted in the “Volume of Contaminated Water/Aquifer Cleaned -up” metric

- An overall decrease in “Preventative” pounds of pollutant reduced as follows
    - No reporting of “people protected” for Lead-Based Paint Disclosures; activity will be reported under “Work Practices”
    - No reporting of RCRA labeling, manifesting and waste identification benefits; activity will be reported under “Work Practices”

- A realignment of “Direct” environmental benefits in new reporting categories:
    - Realignment of Wetlands actions to include Stream Miles Restored/Created in the “Removal and Restoration” category
    - Realignment of Stream Miles Preserved in the “Prevention of Future Releases” Category

- A new Metric Categories/Names under the “Prevention of Future Releases” category
    - Toxic Substance Contamination Prevented (# Housing Units/Schools/Buildings)
    - Underground Storage Capacity Prevented from Release (Gallons)
    - Hazardous Waste Prevented From Release (Pounds)
    - Volume of Oil Spills Prevented (Gallons)
    - Emissions Prevented from CAA Stationary Source (Pounds)
    - Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (Pounds)

1.3 Guidance on Counting Environmental Benefits

1.3.1 What to Report

1. Claim Credit for Violator Actions Prior to Settlement or Order –

   Credit should be claimed for the violator's actions taken as a result of an enforcement action. Credit may also be taken for beneficial actions taken by a violator prior to the conclusion of the enforcement action (even prior to official initiation of the enforcement action if those actions were taken in response to the enforcement action or in reasonable anticipation of an enforcement action (e.g., following an inspection in which violations were identified and communicated to the violator).

2. Report Benefits Only Once -

   Report benefits only once for the first enforcement action. No double counting is allowed if a second enforcement action is issued for the same or similar remedy as the first action. For example, if benefits were counted for an administrative order that later is followed by a judicial referral (because the violator did not comply with the order), those benefits cannot be counted a second time when that referral is concluded. Similarly, if separate administrative penalty and/or compliance orders are issued in connection with the same violation(s), the environmental benefits should be reported for only one of the orders to avoid duplicate reporting of benefits.

3. Count Net Increase When there is More than One Action-

   Count the <u>net increase</u> in benefits achieved through a subsequent enforcement action that addresses the same situation/violations, e.g, an amended consent decree or other action to enforce a prior enforcement action. If the net change is a decrease, report zero benefits.

1.3.2 When to Report

1. Timing of When to Report Environmental Outcomes-

   CCDS information must be provided and entered into ICIS whenever any formal enforcement case is "concluded" or Notice of Determination (NOD) is issued. For civil judicial cases, the information is reported when a consent decree or court order, or judgment is entered (not lodged). For administrative cases, information is reported when an administrative order or final agreement is signed. [To ensure good data quality, several regions do not sign off on a final administrative order unless the CCDS is attached and has been reviewed.] For NODs, the information is reported when the NOD is issued.

For Big Cases, Regions/headquarters should enter a case into the ICIS Big Case Projection Screen if the case meets any element of the definition for a Big Case and there is at least a 50% chance that the case will be concluded in the current fiscal year. Regions/headquarters should fill in each of the data fields on the Big Case Projection Screen for which a case is expected to produce results, even if the case only meets one of the Big Case criteria. Regions/headquarters should use the comment field on this screen to identify national cases (i.e., multi-regional cases), and any case that is expected to produce more than one final order. The Big Case data should be entered to this screen either when the case is initiated or as early as it is possible to estimate the case results and determine the case is a Big Case. (If the case is not determined to be a Big Case until the case is lodged or the final order is issued, the results data should be populated into the ICIS Final Order screens and not into the Big Case Projection Screen.) For OECA's current Big Case definition and criteria, please refer to correspondence forwarded by John Dombrowski, Director of the Enforcement Targeting and Data Division, Office of Compliance, dated March 14, 2011, entitled "FY2011 Big Case Projections." The criteria remain the same for FY2012. Specific questions regarding OECA Big Case projections may be directed to Sara Ager, ager.sara@epa.gov.

Once a Big Case is lodged (judicial) or a final order is issued (administrative), the data should be entered into the ICIS Final Order screens. This data should be entered into the ICIS within 10 days of lodging of the CD/issuance of the final order.

2. Period for Calculating Environmental Benefits

Environmental benefits should be reported in the year the case is concluded, regardless of when the benefits will actually occur. Calculate the environmental benefits after the CD is lodged (big cases) or entered (non-big cases), or when the final administrative order is signed by the Region.

OECA has conservatively chosen to use one year as the period of time over which environmental benefits are to be calculated. OECA is requesting that the annual benefits be calculated based on the amount of the benefits that will be achieved ONCE the complying actions have been fully implemented. Thus, if the environmental benefit is a continuous action (e.g., implementation of newly installed treatment technology), one year's worth of pollutant removal benefits would be calculated based on the year when that equipment will have been fully installed and operational. If the complying action will include the addition of new treatment technology over several years at a facility, then the benefit would be calculated based on a one year period once the required technology has been installed and is operating fully. If the pollutant reduction occurs as a one time (or short term) action then the total pollutant removal benefit is reported (e.g., a one month cleanup of an oil spill). Similarly, when reporting volume of contaminated media addressed (VCMA) the entire volume to be addressed should be reported regardless of the time frame in which it will be addressed.

1.3.3 How to Determine Remedy Category

The four remedy categories are:

Removal and Restoration – Benefits derived from a complying action that results in a pollutant, contaminated media or structure, already in the environment, being eliminated or treated to a level required by the enforcement action.

Reduction of Ongoing Releases – Benefits derived from a complying action that reduces or eliminates an ongoing discharge, emission or release of pollutant(s) into the environment.

Prevention of Future Releases – Benefits derived from a complying action that reduces or eliminates the potential for a future discharge, emission or release of pollutant(s) not already in the environment.

Work Practices – Benefits derived from a complying action for which environmental benefits are not readily quantifiable.

Remember that for each enforcement action, there may be more than one complying action associated with it and more than one media that benefits from the action. Also remember that each complying action associated with an enforcement action may produce environmental benefits in more than one of the four remedy categories. Each environmental benefit from each complying action should be counted as long as the benefits are mutually exclusive. Therefore, you may need to walk through this decision diagram more than once for each complying action and multiple times for each enforcement action. In other words, once it is determined under which category a complying action’s environmental benefit qualifies, repeat the decision process for the same complying action if the complying action produces a different environmental benefit that could fall into another category. If the complying action produces benefits in only one category, then move on to the next complying action to see what type of environmental benefits that complying action produces. As shown in Figure 1-3, there is a three step decision process to this approach. List each of the complying actions required by the enforcement action and apply these steps for each complying action.

<u>Step 1 of the Decision Process</u>

Begin the decision process by asking what the enforcement action does. Ask whether the complying action requires remediation or removal of pollutants that have already entered the environment or whether the complying action restores or mitigates wetlands. If yes, then this is a Removal and Restoration benefit. Repeat the process for the next environmental benefit or next complying action. If not, then move to step 2.

Step 2 of the Decision Process

Ask whether the complying action requires the reduction, elimination or containment of an on-going release of pollutant(s) or requires the removal of a pesticide product from commerce. If yes, then this is a Reduction of On-going Releases benefit. Repeat the process for the next environmental benefit or next complying action. If not, then move to step 3.

Step 3 of the Decision Process

Ask whether the complying action requires activities that may result in the reduction or elimination of future releases of pollutants into the environment. If yes, then ask if the reduction or elimination can be readily measured. If yes, then this is a Prevention of Future Releases benefit. Repeat the process for the next environmental benefit or next complying action. If the reduction or elimination cannot be readily measured, then this is a Work Practices benefit. Repeat the process for the next environmental benefit or next complying action. If the complying action does not require activities that may result in the reduction or elimination of future releases of pollutants into the environment, then it is also a Work Practices benefit. Repeat the process for the next environmental benefit or next complying action.

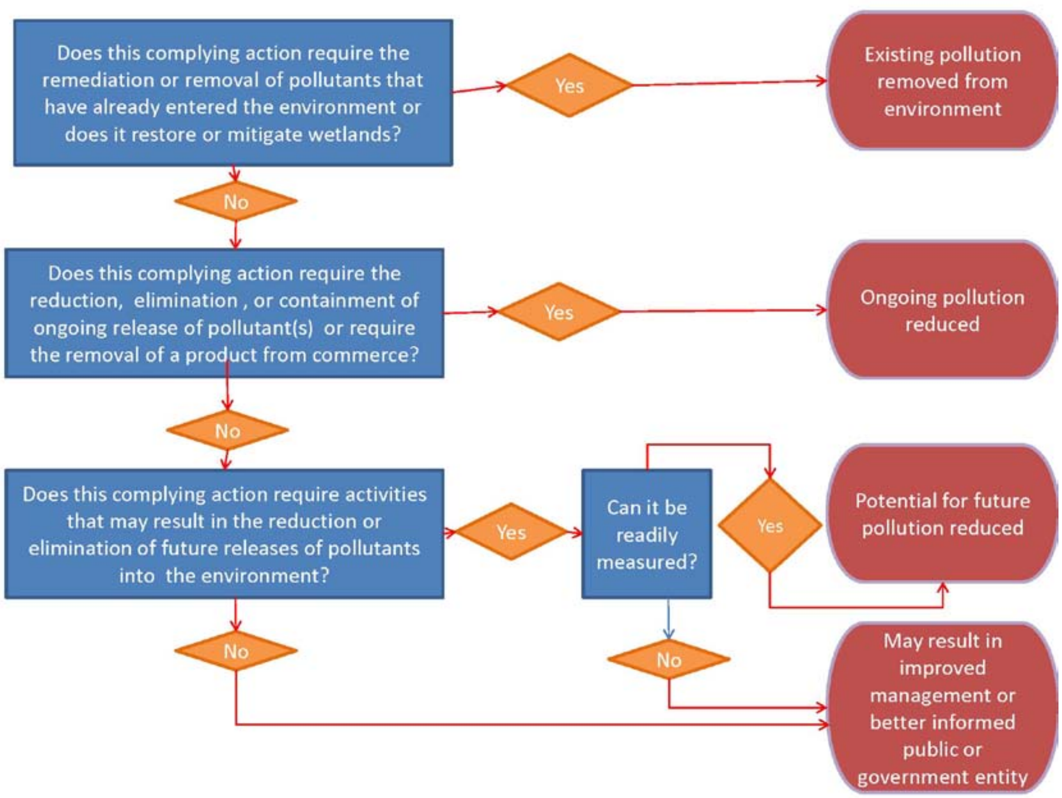

Figure 1-3. Remedy Category Decision Making Process

Examples

Removal and Restoration Examples:

- Removal of contaminated media or structures (includes treatment in place and materials sent for off-site treatment); e.g., remediation of Anytown PCB Superfund site – removal of 2.65 M cubic yards of PCB- contaminated sediment from river;
- Destruction of pollutants in contaminated media, or removal of contaminated structures from the environment; and
- Restoration/creation of wetlands/environment.

Reduction of Ongoing Releases Examples:

- Reduction or elimination of **current** discharge/emission/release of pollutant(s);
- Containment (e.g., capping, encapsulation, pozzolanic immobilization, installation of slurry wall);
- Product/device/material already manufactured or available in the marketplace removed from commerce; and
- Chemical Company X – installation of state-of-the-art air pollution control devices to eliminate 90% of sulfur dioxide and nitrogen oxide emissions.

Prevention of Future Releases Examples:

- Reduction or elimination of **future** discharge/emission/release of pollutant(s);
- Halt production, manufacture or assembly of product/device/material not already in the commerce; and
- XYZ Electronics – ceasing all future manufacture and sale of catalytic converter defeat devices (note: the devices already in commerce would fall into the On-going Releases Category).

Work Practices Examples:

- Prepare, develop or submit plan, report, permit application, certification, or notification (includes revision of existing documents);
- Implement (or improve existing) recordkeeping, labeling, manifesting, placarding, marking, signage;
- Monitor, test, audit, inspect, assess, characterize, sample; and
- Implement (or improve existing) training, procedures, practices.

Table 1-1. Complying Actions for Each Category

Category	Complying Actions
Removal and Restoration	Removal of Carcass Debris In-Situ Treatment Ex-Situ Treatment Removal of Contaminated Media Removal of Released Pollutants (includes oil spills) Wetlands Restoration Wetlands Creation

Table 1-1. Complying Actions for Each Category

Category	Complying Actions
Reduction of Ongoing Releases	Implement BMP : Surface Water Runoff Implement BMP : Lagoon/Storage Pond Leak or Spill Implement BMP : Manure Over Application Implement BMP : Animal Bedding Leachate Implement BMP : Silage Leachate Implement BMP : Proper Carcass Disposal Use Reduction HW Use Reduction Treatment HW Treatment Disposal Change HW Disposal Change Storage Change HW Storage Change Waste Containment HW Waste Containment Heat Reduction NPDES Discharge Change NPDES Process Change Implement BMP: Stormwater Construction Activities Implement BMP: Industrial Stormwater Implement BMP: Separate Municipal Stormwater Systems (MS4s) Implement BMP: Other CSO Flow Reduction CSO Primary or Secondary Treatment SSO CMOM SDWA Process Change Biosolids Process Change Pesticide Destroyed – In Commerce Import Pesticide Returned to Foreign Origin Pesticide Returned to Compliance by Manufacturer/Producer (Domestic) Proper Pesticide Use Cease Pesticide Sale, Distribution Pesticide Advertising Claim Removed Pesticide Secondary Containment Change (on-going) Pesticide Container Change (on-going) Offset Project (mobile sources) Retire Pollution Credits (mobile sources) Replace or Remediate Engines/Vehicles (in commerce) Retire Pollution Credits (stationary sources) Source Reduction Emissions Change Leak Repair (LDAR) Abatement (non-removal remediation) Implement Asbestos Management Plan Handling PCBs – Disposal Change UIC Plug and Abandon (w/ Leaks) Tank Repair Tank Removal Tank Storage Change

Table 1-1. Complying Actions for Each Category

Category	Complying Actions
Prevention of Future Releases	Proper Waste Transport Proper Waste Storage Proper Waste Containment Proper Waste Disposal Proper Waste Export Cathodic Protection System Maintenance/Repair Oil Storage Change Compliance/Warranty Schedule Change Replace/ Remediate Engine or Vehicle (Future Production) Plan Implementation Pesticide Production Ceased Pesticide Label Revised (Future Production) Pesticide Advertising Claim Removed (Future Production) Pesticide Manufacturing Change Pesticide Container Change Pesticide Secondary Containment Change Leak Detection (LDAR) Risk Management Plan Implemented Industry Standards Adopted Toxic Material Abatement (without existing release) Preventative Management Plan Implemented Plug and Abandon UIC (w/o leaks) Secondary Containment Implement Corrosion Protection System Implement Tank Overfill/Spill Protection Implement Release Detection System (UST) Tank Closure Wetlands Preservation
Work Practices	Training Certification and Accreditation Labeling - Identification Labeling – Material Management Auditing Cease Activity Work Practices Record-keeping Testing/Sampling Reporting Environmental Management Review Monitoring Planning Information Letter Response Notification Permitting Financial Responsibility Requirements Provide Site Access Institutional Controls Hazardous Waste Identification Manifesting **UST Release Detection** RI/FS or RD (CERCLA) Site Assessment/ Characterization (CERCLA) Stormwater Site Inspections

Table 1-1. Complying Actions for Each Category

Category	Complying Actions
	Asbestos Inspections Develop CMOM Program (CWA) FIFRA Establishment Registration Obtained FIFRA Establishment Terminated Product Registration UIC Demonstrate Mechanical Integrity General Duty CAA 112(r)(1)

1.3.4 Changes to CCDS Form

The generic CCDS form (Appendix A) has been revised to reflect the changes to environmental benefit reporting that have been incorporated in this guidance. Regions have the option of using the generic version of the CCDS form provided or tailoring it to better meet their region's specific needs. The CCDS form outline is as follows:

- Case and Facility Background (Questions 1-12);
- Penalty Information (Questions 13-15);
- Cost Recovery (Question 16);
- Supplemental Environmental Project (SEP) Information (Questions 17-21);
- Injunctive Relief/Compliance Actions Information, including costs (Question 22); and
- Quantitative Environmental Impacts (Questions 23-24).

The guidance provided herein specifically addresses the quantification of environmental benefits that are obtained from EPA enforcement actions. The environmental benefit information is reported under the following sections of the form:

- Categories of supplemental environmental projects (SEP(s)) (Q. 19);
- Quantitative environmental impacts of these SEP activities (Q. 21);
- Injunctive relief/Compliance actions (non- SEP) (Q. 23); and,
- Quantitative environmental impacts of these activities (Q. 24).

1.3.5 Reporting Policy and Guidance

See Appendices B and C for reporting policy and guidance.

1.3.6 Getting Assistance

OECA expects that there may be questions about how to categorize and calculate environmental benefits using the nature of the remedy approach. A review of the prior six sections of this chapter should help to clarify the new reporting approach and guiding principles. If a particular scenario has not been discussed in those sections, the steps outlined for the new decision making process should be followed and should lead to the correct result. If there are still questions after consulting with your Regional Enforcement Coordinator, the questions may be directed to Donna Inman of the National Planning and Measures Branch, Planning Measures and Oversight Division, Office of Compliance/OECA Headquarters (email: inman.donna@epa.gov, 202-564-2511).

2. REMOVAL AND RESTORATION CATEGORY

2.1 Overview and Complying Actions Included in the Category

This category applies to cases in which a pollutant release has already occurred and will require treatment/restoration, removal and/or mitigation as part of a cleanup effort. Many cases include complying actions that fall into both the removal, restoration and/or mitigation category and the on-going releases category. You can report environmental benefits associated with each, for example you may report the amount of pollutant treated or removed as part of a cleanup action under the Removal and Restoration Category and the reduction of pollutant releases (from an on-going release) under the On-going Releases Category - provided that you do not double-count the same benefit.

Based on the "nature of remedy" concept (which groups similar types of actions irrespective of the enforcement authority under which the activity occurs), complying action types from all media programs are included in this reporting category. Thus, enforcement actions brought under differing statutory authorities that have similar remedies will make use of the same complying action. Table 2-1 presents the complying actions included in the Removal and Restoration Category along with their definition. The following subsections discuss each of these complying actions in more detail.

Table 2-1. Removal and Restoration Category Complying Actions and Definitions

Program Category	Complying Action	Definition
CAFO	Removal of Carcass Debris	Removal of animal carcasses. Note: The proper carcass disposal methodology and example is located in the On-going Releases Category section since the complying action will result in reductions to the release of contaminated leachate. If a CAFO case includes proper disposal of animal carcasses **and** removal and/or treatment of existing contaminated groundwater, then the "Waste Management – Treatment" complying action will also apply.
Waste and Pesticides Management	In-Situ Treatment	Restoration activities in which a contaminated medium is treated in place, stabilized in-place or otherwise addressed. The treatment may be any method, technique, or process designed to physically, chemically, or biologically change the nature of the waste.
Waste and Pesticides Management	Ex-Situ Treatment	Restoration activities in which a contaminated medium is treated off-site, stabilized off-site or otherwise addressed. The treatment may be any method, technique, or process designed to physically, chemically, or biologically change the nature of the waste.
Waste and Pesticides Management	Removal of Contaminated Media	Removal of wastes or contaminated material to address acute threats to humans, environment, or property. Applicable to underground storage tank spill cleanups and corrective action cleanups under RCRA, response actions under CERCLA where the contaminated media is removed and placed into a proper disposal unit, pesticide contaminated structures, and closure of UIC Class V wells where all contamination caused by the well must be removed.

Table 2-1. Removal and Restoration Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Waste and Pesticides Management	Removal of Released Pollutants (includes oil spills)	Removal of spilled or released pollutants that are not part of a contaminated media (e.g., recovery or collection of spilled gasoline). Includes removal of asbestos, PCBs, and pesticide residues.
Wetlands	Wetlands Restoration	Re-establishment or rehabilitation of a wetland area with the goal of returning natural or historic functions and characteristics to a former or degraded wetland.
Wetlands	Wetlands Creation	The development of a wetland area where a wetland did not previously exist through manipulation of physical, chemical and/or biological characteristics of the site.

2.2 Waste, Pesticides, and Toxics Management

2.2.1 Background and Calculation Methodology

Solid and hazardous wastes are generally regulated by the Resource Conservation and Recovery Act (RCRA) and cleaned up under the RCRA Corrective Action Program or CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act; also known as Superfund). Under Section 104 of CERCLA, EPA is authorized to respond to the release or threat of release of hazardous substances, pollutants or contaminants using removal or remedial processes outlined under the National Contingency Plan (NCP). In addition, under this section, EPA is authorized to enter into settlement with or issue orders to Potential Responsible Parties, to perform removal or remedial response actions in response to the release or threat of release of hazardous substances, CERCLA response actions take many forms including, but not limited to 1) containment of hazardous substances (generally media) in place to prevent exposure and further migration and 2) removal and or treatment of hazardous substances (including contaminated media or containers of hazardous substances or known hazardous materials) for disposal. Methodologies for reporting benefits related to containment of hazardous substances and/or media are discussed in Section 4. This section will provide the most common methodologies related to the removal and or treatment of hazardous substances and contaminated media.

The Removal and Restoration Category complying actions that impact cleanup of wastes that are in the environment include:

- Removal of Carcass Debris;
- In-Situ Treatment;
- Ex-Situ Treatment;
- Removal of contaminated media; and
- Removal of released pollutants (includes oil spills).

In the case of waste treatment or removal of contaminated media, report the type of contaminated media (e.g., contaminated soil, contaminated water (ground and surface), contaminated sediment, or contaminated debris). If case information includes further identification of specific pollutants that are in the contaminated media (e.g., brine, fuel oil, benzene), you can report those pollutants in ICIS as well. However, you must enter zero for the specific pollutant amounts so that you do not double count the volume of waste. In the case of spills or removal of specific pollutants (not contained in a media), report the volume of the material spilled/removed (e.g., gasoline, fuel oil, toluene etc.).

Environmental benefits that accrue from cleanup actions are to be reported in ICIS in terms of the volume of contaminated media addressed by the action (referred to as VCMA). These types of cases will be quantified based on the physical state of the medium that is addressed by the response action. For example, for soil remedies, the volume of contaminated media measured will be the volume of soil subject to removal or treatment. For groundwater remedies, the volume of contaminated media is the volume of physical aquifer (not only the water fraction, but the entire formation) that will be addressed by the response action. For specific pollutants (not contained in a media) report the volume of the material. If needed, use the density of the material to convert from weight to volume. Table 2-2 presents common densities for a range of specific chemicals.

Table 2-2. Common Densities

Pollutant	Density Conversion (lbs/gallon)	Pollutant	Density Conversion (lbs/gallon)
Triethylamine	6.054	Spent Hydrochloric Acid	9.163
Gasoline/Petroleum hydrocarbons/PAHs	6.092	Acrylic Polymer	9.2
Acetone	6.609	Spent Nitric Acid	9.305
Methyl Ethyl Ketone (MEK)	6.718	Antifreeze	9.346
Toluene	7.227	Hydrogen Peroxide	9.597
Fuel Blend/Xylene	7.260	Sodium Hypochlorite	9.722
Benzene	7.335	Dodecylbenzene Sulfonic Acid (DDBSA)	10.014
Ammonium Hydroxide	7.489	1,1,1-Trichloroethane	11.057
Styrene Resin	7.536	Methylene Chloride	11.149
Waste oil/Diesel fuel/Crude oil/Asphaltic oil	7.594	Sodium Hydroxide	11.683
Water	8.345	PCBs	12*
o-Toluidine	8.412	Tetrachloroethylene/ Perchloroethylene	13.552
Salt water/Brine	8.762	Sulfuric Acid	15.021

* As per the PCB penalty policy.
Sources: CRC Handbook of Chemistry and Physics, Perry and Chilton's Chemical Engineers' Handbook, and selected Material Data Safety Sheets.
Note: Densities will vary based on the concentration of the solution and its temperature. The values included in this table are approximate.

Table 2-3 identifies the types of volume of media that should be estimated for various types of response actions and the typical reporting units that apply. More than one type of medium may be addressed and thus reported for a given response action.

Table 2-3. Response Actions and Volume of Media to Report in ICIS

Type of Response Action	Volume of Media to be Estimated	Unit to Report in ICIS
Soil (including mine tailings)	Volume of soil, fine debris, or tailings that are being addressed (treated, removed) by the response action.	Cubic Yards
Groundwater/NAPL hydraulic containment	Volume of aquifer formation (not just the water) that is contaminated above Record of Decision (ROD) cleanup standards and will be subject to treatment.	Cubic Yards
Landfill/Dump/Waste Pile/Impoundment	Volume of soil, waste, or debris that is being addressed (treated, removed) by the response action.	Cubic Yards
Soil vapor extraction (SVE)	Total volume of soil that will be subject to a concentration reduction from SVE or volume of soil subject to vacuum to achieve vapor recovery with SVE.	Cubic Yards
Vapor intrusion (point of entry control)/Landfill gas collection	Volume of air/vapor which will be diverted or treated by the vapor intrusion control system over its expected lifetime.	Cubic Yards
Non-aqueous phase liquid (NAPL) recovery	Volume of formation impacted with NAPL that will be subject to the recovery technology. This volume may also be the zone in which NAPL is known to occur and in which a remedy will be applied to address it.	Cubic Yards
Sediment	Volume of sediment to be addressed by the response action.	Cubic Yards
Surface water	Volume of water, in-situ, within the surface water body that is contaminated and that will be addressed by the response action.	Cubic Yards
Mine drainage diversion and/or treatment (point of entry control)	Volume of drainage water that will be diverted or treated by the mine drainage diversion and/or treatment system over its expected lifetime.	Cubic Yards
Container (e.g., drum) and large debris removal	Volume of material removed in containers or volume of large-scale material removed or disposed.	Cubic Yards

For cleanup actions that involve a non-hazardous or hazardous waste that is not mixed with an environmental media, report the pounds of waste impacted by the action. For spill clean-up actions, report the volume of spilled material in cubic yards for both solid and liquid wastes. Table 2-4 below summarizes when to use which units:

Table 2-4. Summary of Waste Management Reporting Units

Complying Action	Units	When to Use Which Units
Treatment (in-situ and ex-situ)	Cubic Yards or Pounds	Use VCMA cubic yards when the waste is a contaminated media (soil, sediment, ground water aquifer); use pounds when the waste is not mixed with an environmental media and can be containerized (e.g., solvent waste or electroplating sludge, F006).
Removal of Contaminated Media	Cubic Yards or Pounds	
Removal of Released Pollutants	Cubic Yards	Use cubic yards for solid and liquid wastes

Calculation Methodology by Media Response Type

The following calculation methodologies apply to the media-specific response actions identified above:

Soil Methodology

Use the following approach for response actions including soil removal or treatment; landfills, dumps, waste piles, and impoundments; and Soil Vapor Extraction (SVE) treatment:

Step A Identify the area and depth of soil (or landfill waste) within which contamination resides. Convert to volume by multiplying the area by the depth.

Step B Determine the subset of this volume that will be addressed by the response action.

Step C Convert to units of cubic yards and report that volume in ICIS.

Notes:
1. Depending on the nature of the contaminated site, you may want/need to determine multiple sub-volumes and will then sum these to make a total volume.
2. For landfill capping, calculate the volume of waste beneath the cap based on best available information.
3. You can use either in-situ or after excavation volumes - which ever data are more readily available.

Groundwater Methodology

Step A Compile plume maps for each aquifer layer and collect information on the thickness of each aquifer unit.

Step B For each aquifer layer, calculate the area that will be addressed by the response action remedy (based on the contaminant plume).

Step C For each aquifer layer, multiply the area by the average thickness of the aquifer unit with contamination above cleanup levels to determine a volume.

Step D Add up the volume(s) calculated in Step C to determine a total volume.

Step E Convert to units of cubic yards and report that volume in ICIS.

Notes:
1. If the thickness of an aquifer layer varies by more than 50% across the area, do not use the average thickness. Instead, divide the area up into smaller areas with similar thicknesses.

Vapor Intrusion and Mine Drainage Diversion/Treatment Methodology

Step A Determine the expected average volumetric flow rate of the system over the duration it will run (for vapor intrusion this is usually represented as cubic feet per second (cfs); for mine drainage this is usually represented as gallons per minute (gpm)).

Step B Estimate the amount of time the system is expected to run (maybe in months or years).

Step C Multiply the flow rate by time and convert to units of cubic yards of air/vapor or cubic yards of mine drainage to be diverted or treated.

Notes:
1. Best professional judgment may need to be used to determine/estimate the volumetric flow rate of the system and the expected system running time.
2. 1 Cubic yard is equivalent to 202 U.S. gallons.

Non-Aqueous Phase Liquid (NAPL) Recovery Methodology

Step A Determine the volume within which the NAPL recovery technology will be applied (area × depth).

Convert to units of cubic yards and report that volume in ICIS.

Notes:
1. The remedial action will be applied to an overall area within which it is known that the NAPL occurs. This is NOT the volume of NAPL itself.
2. For disjointed NAPL areas on a large scale, you can sum smaller distinct volumes.
3. If a hydraulic groundwater remedy is also subject to the response action, then the NAPL volume should be counted and reported separately from the groundwater volume. This is because NAPL recovery and groundwater pump and treat are focused on two different phases of contaminant and usually require entirely separate feasibility study analysis and response. It is appropriate to report both volumes, even though one lies within the other in physical space.

Sediment Methodology (for Rivers, Streams, Shoreline, Drainage, and Drainage Conveyances)

Step A Determine the average downstream cross-sectional area of sediment subject to the response action.

Step B Determine the length of the overall reach of sediment subject to the response action.

Step C Multiply the cross-sectional area by length of reach to determine sediment volume and convert to units of cubic yards.

Notes:
1. For multiple reaches, calculate a volume of sediment for each and sum the volumes.
2. For lake bottoms or wetlands not along a reach, use best professional judgment to determine the area and depth of sediment to be subject to the response action.

Surface Water Methodology

Due to the wide variety of surface water bodies, there is no single calculation that will address all of them. The volume of surface water that is contaminated and will be addressed by the enforcement action will therefore need to be determined using best professional judgment. If soil or sediment lying under the water is contaminated and will also be subject to the response action, a separate volume estimate for the soil or sediment should be made using the methodologies above.

Container/Large Debris Methodology

Step A Determine the volume of each container addressed by the action.

Step B Sum all volumes.

Notes:
1. If numerous containers are impacted by the action, you may be able to use volumes from manifests or billing records from bulk shipments to determine the volume of material that will be impacted by the response action.

2.2.2 Pesticides and Toxics

The term pesticide includes many kinds of ingredients in products, such as insect repellants, weed killers, disinfectants, and swimming pool chemicals which are designed to prevent, destroy, repel or reduce pests of any sort. Pesticides are found in nearly every home, business, farm, school, hospital and park in the United States. EPA must evaluate pesticides thoroughly before they can be marketed and used in the United States to ensure that they will meet federal safety standards to protect human health and the environment. Pesticides that meet the requirements are granted a license or "registration" which permits their distribution, sale, and use according to specific use directions and requirements identified on the label.

TSCA Section 402 requires training/certification and work practice standards related to lead-based paint. EPA's most current rule requiring the use of lead safe practices was issued on April 22, 2008. The Lead Renovation, Repair, and Painting Rule includes these updated certification and work practice requirements. Under these regulations, all persons (including school employees) that perform lead-based paint activities in pre-1978 housing and "child-occupied facilities" must be trained and certified to conduct this work. They must also adhere to certain work practice requirements. This applies to persons inspecting for lead-based paint, those involved in abating lead-based paint hazards, and any renovation, repair and painting activities that result in the disturbance of lead-based paint surfaces. Enforcement actions related to resolution of violations of the Disclosure Rule (1018) and the Pre-renovation Education Rule (406(b)) may also result in lead-based paint removal activities. This category applies to painted components (e.g., windows or doors) or painted structures that may be removed during an abatement or restoration. For lead-based paint enforcement actions that include removal of material, report the quantity of material impacted by the action as "contaminated debris" and report the volume of material in cubic yards.

2.2.3 Oil and Hazardous Substance Cleanup/Removal

Section 311 of the CWA addresses pollution from oil and hazardous substance releases and provides EPA with the authority to establish programs for preventing, preparing for, and responding to oil spills that occur in navigable waters of the U.S. In addition, in August 1990, the Oil Pollution Act (OPA) was signed into law. The OPA, enacted largely in response to public concern after the Exxon Valdez incident, improved the nation's ability to prevent and respond to oil spills by requiring facility owners or operators to prepare facility response plans addressing a worst-case discharge of oil. The statute prohibits oil discharges to navigable waters and requires the notification of authorities of oil or hazardous substance discharges.

The statute provides the federal government with the authority to order removal of spilled or hazardous substances into or on navigable waters or the adjoining shorelines, to impose penalties, and to address imminent and substantial threats to the public health or welfare. The statute also provides that EPA may initiate a civil judicial or administrative penalty action when an oil spill has occurred. When a penalty action is brought by EPA it typically does not compel clean-up of any oil spilled and, hence, no environmental benefits would be calculated. However, in some instances EPA may issue a CWA 311 order to recover any oil spilled, including any oil-contaminated soil on the adjoining shoreline. The amounts of contaminated water and/or soil cleaned up should be counted in the "Removal and Restoration" environmental benefit.

2.2.4 Examples

Example 1. Hazardous Waste Ex-situ Treatment

ABC Chemical Company is required under an enforcement action to address an existing impoundment identified as containing characteristic hazardous waste (D002 corrosive waste with a pH <2). The site will perform on-site neutralization as treatment. The impoundment contents cover a volume that is 20 ft. by 30 ft. by 10 ft. deep and the density is 8.345 lbs/gallon.

$$20 \text{ ft.} \times 30 \text{ ft.} \times 10 \text{ ft.} = 6{,}000 \text{ cu.ft.} \times 7.48 \text{ gallons/cu.ft.} \times 8.345 \text{ lbs/gallon} = 374{,}524 \text{ lbs.}$$

Input for ICIS:

- **Complying Action:** Ex-Situ Treatment
- **Pollutant:** Hazardous Waste
- **Amount and Unit:** 374,524 pounds
- **Media:** Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

AND you may also input

- **Complying Action:** Ex-Situ Treatment
- **Pollutant:** D002
- **Amount and Unit:** 0 pounds
- **Media:** Land

Example 2. Contaminated Soil In-situ Treatment

A hazardous waste site is subject to a CERCLA order requiring treatment of soil contaminated with low level organics. The site will be treating the soil in-situ using injection of microorganisms to degrade the organic content of the soil. The area impacted by the treatment is 300 feet by 100 feet by 15 feet deep. The volume of soil impacted by in-situ treatment is estimated as follows:

300 ft. × 100 feet × 15 feet = 450,000 cu.ft. × 1 cu.yd./27 cu.ft. = 16,667 cu.yds.

Input for ICIS:

- **Complying Action**: In-Situ Treatment;
- **Pollutant**: Contaminated Soil
- **Amount and Unit**: 16,667 cubic yards; and
- **Media**: Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 3. Mine Drainage Diversion

An abandoned mine Superfund site is currently undergoing cleanup. Activities at the site have resulted in a release of highly acidic mine drainage to a stream on the site. As part of a Superfund response action, the mine drainage will be diverted and treated prior to discharge to the stream. The amount of drainage for diversion is estimated to have a volumetric flow rate of 244 gpm. The diversion of the stream is expected to occur throughout the duration of the Superfund cleanup action, i.e., 2 years.

Step A The estimate of the volumetric flow rate is 244 gpm.

Step B The estimate of running time for the diversion and treatment system is 2 years.

Step C The total volume of mine drainage impacted by the response action is:

244 gal/min. × 60 min./1 hr. × 24 hr./1 day × 365 days/yr. × 2 years × 1 cu.yd./202 gallons = 1,269,766 cu. yd.

Input for ICIS:

- **Complying Action:** Ex-Situ Treatment;
- **Pollutant:** Contaminated wastewater;
- **Amount and Unit:** 1,168,000 cu. yd.; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Contaminated Water/Aquifer to be Cleaned Up (cubic yards)

Example 4. Pesticide Contaminated Groundwater Ex-situ Treatment

Farmlands in Washington frequently use FLYBY Incorporated to apply pesticides and fertilizers in their agricultural fields. The majority of the farms are located along the Washington River which extends approximately 5 miles. The farms' agricultural fields are also located less than one mile from a drinking water well. Samples taken from the drinking water well and from designated points along the Washington River revealed a significant concentration of methyl bromide in the drinking water well. The owner of FLYBY Incorporated hired a remediation company to investigate and determine the extent of contamination.

The investigation report revealed a methyl bromide plume extending from the drinking water well in the direction of the Washington River for a distance of 2,000 feet with a plume width of approximately 100 feet. The aquifer of the impacted area is located 20 to 25 feet below the ground surface and has an average aquifer thickness of 20 feet.

The remediation company conducted a corrective measures study and recommended that FLYBY Incorporated should cleanup the groundwater contamination via pump and treat process. As a result, a pump and treat process was used to remove the contaminant in the water.

The determination of these volumes is shown below:

For Groundwater:

Step D The average thickness of the aquifer impacted by this response action is 20 feet.

Step E The area to be impacted by the action includes the methyl bromide plume area which is estimated to be 2,000 feet × 100 feet = 200,000 sq. ft.

Step F The volume of aquifer impacted by the action will be 200,000 sq. ft. × 20 feet = 4,000,000 cu. ft.

Step G Convert to cu. yds. as follows:

4,000,000 cu. ft. × 1 cu. yd./27 cu. ft. = 148,148 cu. yd.

Input for ICIS:

- **Complying Actions:** Ex-Situ Treatment;
- **Pollutant:** Contaminated Groundwater;
- **Amount/Unit:** 148,148 cubic yards; and
- **Media:** Water (ground)
  Counted Under Reporting Measure: Estimated Contaminated Water/Aquifer to be Cleaned Up (cubic yards)

AND may also input

- **Complying Actions:** Ex-Situ Treatment;
- **Pollutant:** Pesticides;
- **Amount/Unit:** 0; and
- **Media:** Water (ground)

Example 5. CERCLA Abandoned Site

Under CERCLA, an abandoned waste site has been identified and a response action authorized for the cleanup of hazardous debris, waste drums, and contaminated soil. The site includes contaminated waste bricks and 100 abandoned drums containing known and/or unknown hazardous waste (assuming a density of material in the drums of 8.345 lbs/gallon). In addition, the cleanup will include removal and proper disposal of contaminated soil from underneath the abandoned drums. The volume of contaminated waste bricks is estimated to include 50 cubic yards of material. The amount of contaminated soil to be removed from underneath the abandoned drums is estimated at 25 cubic yards and will be containerized prior to disposal.

Step A Determine the volume of each waste addressed by the action. For this case this includes:

50 cubic yards of contaminated debris

100 drums × 55 gallons/drum × 8.345 lbs/gallon = 45,898 pounds of hazardous waste

25 cubic yards of contaminated soil

Input for ICIS:

- **Complying Action:** Removal of Contaminated Media
- **Pollutant:** Contaminated Debris;
- **Amount and Unit:** 50 cubic yards; and
- Media**:** Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

AND

- **Complying Action:** Removal of Contaminated Media
- **Pollutant:** Hazardous Waste;
- **Amount and Unit:** 45,898 pounds; and
  Media: Land
  Counted Under Reporting Measure: Estimated Hazardous Waste Treated, Minimized, or Properly Disposed Of (pounds)

AND

- **Complying Action:** Removal of Contaminated Media
- **Pollutant:** Contaminated Soil;
- **Amount and Unit:** 25 cubic yards; and
  Media: Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Note: Whether the contaminated soil is removed in bulk or contained in drums and then removed does not change the units for reporting, which are cubic yards.

Example 6. Waste Tire Pile

A landfill owner responsible for a pile of used/discarded tires that had previous fires and insect vector issues has been ordered to properly dispose of the materials through a rubber recycling process. The removal and proper management of the tires results in a cleanup of 103,557 cubic yards of material.

Input for ICIS:

- **Complying Action**: Removal of Contaminated Media;
- **Pollutant**: Contaminated Debris
- **Amount and Unit**: 103,557 cubic yards; and
- Media: Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 7. Underground Storage Tank - Spill Clean-up (Removal of Contaminated Media)

An enforcement action has been lodged against Ajax Service Station for release of gasoline from their underground storage tanks (USTs) into the surrounding soil. The station will be required to decommission the existing three tanks (which were non-compliant with the UST regulations) and remediate the site. The amount of gasoline leaked is estimated at 900 gallons from the three tanks and it is estimated that 400 cubic yards of soil will be removed from the site.

Input for ICIS:

- **Complying Action**: Removal of Contaminated Media;
- **Pollutant**: Contaminated Soil
- **Amount and Unit**: 400 cubic yards; and

- Media: Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Note: The tank closure activity will be reported under the Preventative Category (see Section 4).

Example 8. Lead-based Paint – Removal of Contaminated Media

Under the lead-based paint disclosure rule (1018), an apartment complex built prior to 1978 failed to provide the required pamphlet and failed to inform tenants if they were aware or not of the presence of lead-based paint or lead-based paint hazards. As part of the settlement of the violation, the complex owner is required to abate chipping lead-based paint in the apartment units. Abatement activities will be performed on 100 units in the apartment complex and it is estimated that 3 cubic yards of contaminated debris (containing lead-based paint) will be generated per unit.

The total volume of contaminated debris removed by the case is 100 units × 3 cu.yd./unit = 300 cubic yards.

Input for ICIS:

- **Complying Action**: Removal of Contaminated Media;
- **Pollutant**: Contaminated Debris
- **Amount and Unit**: 300 cubic yards; and
- Media: Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 9. Corrective Action for Contaminated Groundwater and Soil

XYZ Industrial Company is a hazardous waste storage facility with a RCRA permit. During a routine EPA inspection, the Agency discovered contamination in XYZ Industrial's tank storage area. Soils under the area were contaminated by wastes spilled during pumping and by leaking tanks. The soil exhibited high levels of trichloroethylene, benzene, and toluene, which are volatile organic compounds that can migrate through the soil into the groundwater. Additionally, the investigation of the site discovered that a municipal drinking water well located within a mile of the facility was also contaminated with trichloroethylene and toluene. None of this contamination was detected in the initial permitting process.

EPA conducted a RCRA facility assessment (RFA) to compile information on the types of hazardous wastes managed at the facility in the past, areas where these wastes were managed, and possible exposure pathways. The owner and operator of XYZ Industrial then conducted a RCRA facility investigation (RFI), with EPA oversight, to estimate the health and environmental problems that could result if the contamination was not cleaned up, and to determine the extent of the contamination. These investigations showed a groundwater volatile organic (VOC) plume extending from the facility in the direction of the drinking water well for a distance of 4,000 feet with a plume width of approximately 100 feet. The aquifer of the impacted area is located 20 to 25 feet below the ground surface and has an average aquifer thickness of 20 feet.

A corrective measures study (CMS) determined that the company should cleanup the groundwater contamination via a pump and treat process and excavate the soil for disposal off-site at a permitted landfill. The area of soil to be remediated by the response action includes selected sections underneath the surface area where outdoor chemical storage occurred which is equal to 2,400 sq. ft. Two 20 ft. by 20 ft. sections of soil will be removed to a depth of 10 feet. The recommendations of the CMS were incorporated into an administrative order imposed on the facility by the Agency in its enforcement action.

The total remediation volumes of trichloroethylene and benzene for the facility based on the adopted corrective action will include the volume of aquifer impacted by the groundwater pump and treat system and the volume of contaminated soil removed.

The determination of these volumes is shown below:

For Groundwater:

Step A The average thickness of the aquifer impacted by this response action is 20 feet.

Step B The area to be impacted by the action includes the VOC plume area which is estimated to be 4,000 feet by 100 feet = 400,000 sq. ft.

Step C The volume of aquifer impacted by the action will be 400,000 sq. ft. × 20 feet = 8,000,000 cu. ft.

Step D Convert to cu. yds. as follows:

8,000,000 cu. ft. × 1 cu. yd./27 cu. ft. = 296,296 cu. yd.

For Soil:

Step A The area of contamination is equivalent to the soil storage area of 2,400 sq. ft. to 10 feet of soil depth = 24,000 cu. ft.

Step B The remediation effort will include soil removal of two 20 feet by 20 feet areas, each with a 10 foot depth. 20 ft. × 20 ft. × 10 ft. × 2 areas = 8,000 cu. ft.

Step C 8,000 cu. ft. × 1 cu.yd./27 cu.ft. = 296 cubic yards of soil removed.

Input for ICIS:

For Groundwater

- **Complying Actions:** Ex-Situ Treatment;
- **Pollutant:** Contaminated Groundwater;
- **Amount/Unit:** 296,296 cubic yards; and
- **Media:** Water (ground)
  Counted Under Reporting Measure: Estimated Contaminated Water/Aquifer to be Cleaned Up (cubic yards)

AND you can also input

- **Pollutant:** Trichloroethylene;
- **Amount/Unit:** 0; and
- **Media**: Water (ground).

AND

- **Pollutant:** Toluene;
- **Amount/Unit:** 0; and
- **Media:** Water (ground).

For Soil

- **Complying Actions:** Removal of contaminated media;
- **Pollutant:** Contaminated Soil;
- **Amount and Unit:** 296 cubic yards; and
- Media: Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

AND

- **Pollutant:** Trichloroethylene;
- **Amount and Unit:** 0; and
- **Media:** Soil.

AND

- **Pollutant:** Benzene;
- **Amount and Unit:** 0; and
- **Media:** Soil.

AND

- **Pollutant:** Toluene;
- **Amount and Unit:** 0; and
- **Media:** Soil.

Example 10. Corrective Action for Contaminated Sediment

A Naval Air Base has been listed on the National Priorities List (NPL). The site includes a maintenance facility for the repair of aircraft and military vehicles. The facility utilizes trichloroethylene (TCE) as a solvent for grease removal of metal parts. Spent solvent is transferred to a holding tank for subsequent removal to an off-site hazardous waste disposal facility.

A Record of Decision (ROD) has been signed for this facility based on finding high TCE levels in stream sediment bordering on the naval base. Based upon the tendency for TCE to adhere to water particles, as well as the proximity of the holding tank to the stream, the surrounding area was investigated for possible contamination. Two areas of soil surrounding the holding tank were also determined to contain TCE levels above the allowable limits. Groundwater from the same area was determined not to contain TCE levels of concern.

The Remedial Investigation (RI) concluded that the on-site holding tanks did not have sufficient containment measures in place to prevent leaching of solvent into soil and groundwater. These leaks pose a risk to human health and the environment. The sediment contamination in the stream is determined to be a half-cylinder area 4 ft in diameter and 300 ft in length. The first area of soil contamination downstream of the holding tank is a 1,250 sq. ft. section at a depth of 10 ft. The second area is the soil immediately surrounding the tank of 1,600 sq. ft by 20 ft. The area proposed for excavation is will be a 25 ft by 20 ft section of the first contamination site, and a 10 ft by 10 ft section of the second contamination site.

From the ROD, the proposed remedy includes removal of stream sediment, excavation of the soil for off-site disposal at an approved landfill, and implementation of Land Use Control (LUC) Objectives. These controls include prohibiting development and use of contaminated sites until risks are mitigated, and prohibiting digging and other ground disturbances at all sites. These controls will stay in place until such time as periodic monitoring assesses the success of the remedies.

The total remediation volumes that should be reported for this ROD include the volume of contaminated sediment and the volume of contaminated soil removed. The determination of these volumes is shown below.

For Sediment

Step A The average downstream diameter of sediment impacted by this response action is 4 ft, the resulting cross-sectional area (assuming that the stream sediment has a half cylinder shape) is: $\pi r^2 /2$ or $\pi(\text{diameter}/2)^2 /2 = [\pi \times (4\text{ ft}/2)^2] / 2 = 6.3$ sq. ft.

Step B The length of overall reach of sediment impacted by the action is estimated to be 300 ft.

Step C The half cylinder volume estimate of sediment impacted by the action will be 6.3 sq. ft. × 300 ft. = 1,890 cu. ft.

Step D Convert to cu.yds as follows:

1,890 cu. ft. × 1 cu. yd/27 cu. ft. = 70 cubic yards

For Soil

Step A The volume of contamination is equivalent to the sum of the volumes of contamination: 44,500 cu. ft.

Area 1: 1,250 sq. ft times a 10 foot soil depth = 12,500 cu. ft.

Area 2: 1,600 sq. ft times a 20 foot soil depth = 32,000 cu. ft.

Step B The remediation effort will include excavation of two sections totaling 15,000 cu. ft. as follows:

Area 1: 12 ft. by 35 ft. section to a depth of 10 ft = 4,200 cu. ft.

Area 2: 30 ft. by 30 ft. section to a depth of 12 ft = 10,800 cu. ft.

Step C 15,000 cu ft × 1 cu.yd/27 cu. ft. = 556 cu. yds. of soil removed.

Input for ICIS is as follows:

For Sediment

- **Complying Action:** Removal of Contaminated Media;
- **Pollutant:** Contaminated Sediment
- **Amount and Unit:** 70 Cubic Yards; and
- **Media:** Sediment
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

For Soil

- **Complying Action:** Removal of Contaminated Media;
- **Pollutant:** Contaminated Soil
- **Amount and Unit:** 556 Cubic Yards; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 11. Pesticide Residue (Removal of Contaminated Media)

Fifty residences in a rural Midwestern community are contaminated with the pesticide methyl parathion. The pesticide was illegally sprayed by an unlicensed pesticide applicator inside residential buildings for cockroaches. Methyl parathion is a “restricted use” organophosphate pesticide in the U.S. for use only on agricultural crops by certified applicators. Methyl parathion breaks down in the outdoors within a few days through degradation and contact with water; however, it can remain un-degraded inside homes for years. The case involved identification of the extent of the contamination within the residences sprayed with the pesticide and decontamination of the affected residences. Decontamination activities included removal of contaminated wall board, carpet, and other building materials from 50 homes with an estimate of 30 cubic yards of contaminated debris per home.

Step A The volume estimate of contaminated debris containing pesticide residue is = 30 cubic yards/home × 50 homes = 1,500 cubic yards.

Input for ICIS:

- **Complying Action:** Removal of Contaminated Media
- **Pollutant:** Contaminated Debris;
- **Amount and Unit:** 1,500 cubic yards; and
- **Media:** Land

Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 12. Spill Cleanup Removal of Released Oil or Hazardous Substances

ABC oil storage company has been cited for an oil spill release from one of their tanks which has reached and contaminated a nearby navigable water. Under CWA 311(c), EPA issued an order to the company requiring them to recover the spill. An estimated 10,000 gallons of the spilled No. 5 Fuel Oil and stream water was recovered. In addition, the order required the company to remove oil-contaminated soil from the adjoining shoreline. The impacted shoreline area is estimated to be 3 miles x 1,760 yard/mile x 1 yard in width and approximately 2 yards in depth = 10,560 cubic yards.

Gallons of oil spilled is the unit used to calculate the volume of pollutant removed and water treated. To convert gallons of recovered oil and treated stream water to cubic yards use a conversion factor of 202 gallons = 1 cubic yard. So, 10,000 gallons x 1 cubic yard/202 gallons = 49.5 cubic yards.

Input for ICIS:

- **Complying Action:** Removal of Released Pollutants;
- **Pollutant:** Fuel Oil, No. 5;
- **Amount and Unit:** 49.5 cubic yards; and
  Media: Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Contaminated Water/Aquifer to be Cleaned Up (cubic yards)

AND

- **Complying Action:** Removal of Contaminated Media;
- **Pollutant:** Contaminated Soil;
- **Amount and Unit:** 10,560 cubic yards; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 13. CWA 311(b) Administrative Penalty

ABC oil storage facility had an oil spill release from one of their tanks which has reached and contaminated a nearby stream. The facility reported the spill to the National Response Center and estimated that 10,000 gallons of No. 5 Fuel Oil were released in the spill. In this example, EPA did not issue an order for clean-up of the oil. Rather, EPA brought a CWA 309(g) penalty only action with the Coast Guard issuing the order for clean-up of the spilled oil. In this case no environmental benefits would be calculated because the clean-up did not result from the EPA action.

Input for ICIS: n/a

This is a "penalty only action and no information on environmental benefits are reported into ICIS.

2.3 Removal of Released Pollutants with Specific Removal and Remediation Requirements

2.3.1 Background and Calculation Methodology

Common toxic and pesticide materials with specific removal and remediation requirements under EPA's regulatory statutes are asbestos, PCBs, and pesticides.

Asbestos. The EPA's authority to regulate asbestos is provided under both the Toxic Substances Control Act (TSCA) and the Clean Air Act (CAA). Under TSCA, EPA enforces the requirements of the Asbestos Ban and Phase-Out Rule (ABPO) and the Asbestos Hazard Emergency Response Act (AHERA). The ABPO Rule phases out and bans production of five specific types of asbestos-containing products including corrugated paper, rollboard, and flooring paper, as well as new uses of asbestos. AHERA prescribes asbestos management practices and abatement standards for public schools and private, not-for-profit schools. In addition, the EPA is authorized under the CAA at 40 CFR Part 61 Subpart M to enforce the requirements of the National Emissions Standards for Hazardous Air Pollutants regulations dealing with asbestos (Asbestos NESHAP). [***Note: asbestos was delisted under 40 CFR Part 63 as a source category but is still regulated under 40 CFR Part 61 Subpart M.]***

PCBs. TSCA Section 6 regulates certain hazardous chemical substances and mixtures and authorizes EPA to take regulatory action to protect against unreasonable risk to human health or the environment. EPA has promulgated regulations under Section 6 of TSCA applicable to polychlorinated biphenyls (PCBs). The final rules applicable to the disposal of PCBs were published on June 29, 1998. The rules provided, among other things, flexibility in selecting disposal technologies for PCB wastes, expansion of the list of available decontamination procedures, and modification of the requirements regarding the use and disposal of PCB equipment.

Pesticides. The "removal of released pollutants" can also apply to pesticide residues.

The Removal of Released Pollutants complying action type applies where asbestos friable material, PBCs, or pesticide residues that have been released into the environment are removed for proper disposal as part of a remediation action. For reporting to ICIS it is necessary to determine the cubic yards of solid wastes and liquid wastes remediated in the cleanup.

2.3.2 Examples

Example 1. Asbestos – Removal of Released Pollutants (Release into the Environment)

Under a clean-up enforcement action, one school within the Monroe County School District will undergo asbestos abatement to remove friable asbestos-based insulation from school property. An estimate of the volume of material to be removed is 50 cubic yards. Input for ICIS would include the following:

- **Complying Action:** Removal of Released Pollutants;
- **Pollutant:** Asbestos;
- **Amount and Unit:** 50 cubic yards; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

Example 2. PCBs – Removal of Released Pollutants (Release into the Environment)

A utility company possessed multiple PCB transformers that have leaked PCB transformer fluid onto the storage area floor. An enforcement action was issued requiring the removal and proper disposal of the leaked PCB transformer fluid. The amount of fluid to be removed and disposed is 200 gallons. To convert from gallons to cubic yards use 202 gallons = 1 cubic yard.

200 gallons x 1 cubic yard/202 gallons = 1 cubic yard

Input for ICIS would include the following:

- **Complying Action:** Removal of Released Pollutants;
- **Pollutant:** PCB transformer fluid;
- **Amount and Unit:** 1 cubic yard; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yards)

2.4 Wetlands Restoration or Creation

2.4.1 Background and Calculation Methodology

Section 404 of the CWA establishes a program to regulate the discharge of dredged fill material into waters of the U.S., including wetlands. The activities regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry.

The purpose of the program is to ensure that alternatives that are less damaging to the aquatic environment are evaluated and implemented where possible. Permittees must show that they have taken steps to avoid wetlands impacts where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or create wetlands. The program is administered by the Army Corp of Engineers through individual or general permits and both the Army Corp of Engineers and EPA enforce the Section 404 provisions.

The Removal and Restoration Category complying actions that apply to wetlands cases are “Wetlands Restoration” or “Wetlands Creation”. For wetlands restoration or creation efforts, you should report the acres of wetlands and/or linear feet of stream subject to the restoration or planned for creation. Identify “fill material” as the pollutant and the media impacted will be ”Water (wetlands)”.

For restoration efforts where the wetlands area impacted will be along a stream or river, report the environmental benefit as linear feet of stream or river restored. In the identification of units, you should indicate the size of the stream or river using the following options:

- Linear feet of small stream (defined as < 10 feet in width);
- Linear feet of medium stream (defined as 10-20 feet in width); or
- Linear feet of large stream (defined as > 20 feet in width).

2.4.2 Examples

Example 1. Wetlands Restoration

For a case involving the restoration of 1,000 feet of wetlands along a stream bed (where the stream size is considered small) you would report in ICIS the following:

- **Complying Action:** Wetlands Restoration;
- **Pollutant:** Fill Material;
- **Amount and Unit:** 1,000 linear feet of small stream; and
- **Media:** Water (wetlands)
  Counted Under Reporting Measure: Steam Miles Restored/Created (Linear Feet)

Example 2. Wetlands Creation

Under a wetlands case, where enforcement implementation will include creation of 20 acres of wetlands as part of a mitigation settlement, you would report in ICIS the following:

- **Complying Action:** Wetlands Creation;
- **Pollutant:** Fill Material;
- **Amount and Unit:** 20 acres and
- **Media:** Water (wetlands)
  Counted Under Reporting Measure: Wetlands Restored/Created (Acres)

3. REDUCTION OF ON-GOING RELEASES CATEGORY

3.1 Overview and Complying Actions Included in the Category

This section discusses the enforcement actions that produce environmental benefits from a complying action that reduces or eliminates an on-going discharge, emission, or release of pollutant(s) into the environment. Where the removal and restoration category of actions is focused on pollutants that have been released into the environment, the On-going Releases Category of actions applies to cases where a facility has an on-going release into the environment either by design (through a permitted discharge point) or by accident or neglect (e.g., through a leak or fugitive emission). Many cases may include complying actions that fall under the removal and restoration category and the on-going releases category. Where this is the case, you can report environmental benefits associated with each (provided you are not double counting the same benefit). In those cases, part of the enforcement action remedy would call for cleanup of an existing environmental release and/or remediation of the consequences of that release and the other part of the enforcement action remedy would call for treatment, reduction, or elimination of on-going releases.

Again, based on the "nature of the remedy" approach taken in this guidance, a single complying action type can apply to the actions required under various statutes. Table 3-1 presents the complying actions included in the reduction or elimination of on-going releases category along with their definition.

Table 3-1. Reduction of On-going Releases Category Complying Actions and Definitions

Program Category	Complying Action	Definition
CAFOs	Implement BMP: Surface Water Runoff	Stormwater management practices at CAFOs to reduce or eliminate discharge of pollutants as part of stormwater runoff.
CAFOs	Implement BMP: Lagoon/Storage Pond Leak or Spill	Actions that eliminate spills and/or leaks of animal waste from lagoons and/or storage ponds at a CAFO site.
CAFOs	Implement BMP: Manure Over Application	Actions that reduce or eliminate runoff of manure that has been over applied to an agricultural field.
CAFOs	Implement BMP: Animal Bedding Leachate	Actions that reduce or eliminate the release of contaminated leachate from animal bedding storage.
CAFOs	Implement BMP: Silage Leachate	Actions that reduce or eliminate the release of contaminated leachate from silage storage.
CAFOs	Implement BMP: Proper Carcass Disposal	Actions and practices that correct improper animal carcass disposal and reduce or eliminate contaminated drainage from animal carcass disposal areas.
Hazardous Waste Management	HW Use Reduction	Actions that reduce or eliminate the generation of hazardous waste by reducing the use of chemicals or other input materials at the beginning of an industrial process.
Hazardous Waste Management	Use Reduction	Actions that reduce or eliminate the generation of substances/materials by reducing the use of chemicals or other input materials at the beginning of an industrial process.

Table 3-1. Reduction of On-going Releases Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Hazardous Waste Management	HW Treatment	Actions that reduce or eliminate the discharge or release into the environment of hazardous waste through the use of pollution control technologies.
Hazardous Waste Management	Treatment	Actions that reduce or eliminate the discharge or release into the environment of substances/materials through the use of pollution control technologies.
Hazardous Waste Management	HW Disposal Change	Actions impacting the disposal of hazardous waste, action generally requires proper disposal of hazardous waste that was either disposed of improperly or is being stored and should be disposed. The action may also include cases where a material that was formerly disposed improperly is now being properly managed in another manner in lieu of improper disposal.
Hazardous Waste Management	Disposal Change	Actions impacting the disposal of substances/materials, action generally requires proper disposal of waste that was either disposed of improperly or is being stored and should be disposed. The action may also include cases where a material that was formerly disposed improperly is now being properly managed in another manner in lieu of improper disposal.
Hazardous Waste Management	HW Storage Change	Actions impacting the storage of hazardous waste, action generally requires a change in the storage location, storage unit, or procedures associated with the storage of the hazardous waste.
Hazardous Waste Management	Storage Change	Actions impacting the storage of substances/materials, action generally requires a change in the storage location, storage unit, or procedures associated with the storage of the waste.
Hazardous Waste Management	HW Waste Containment	Actions that encapsulate, cover, or create physical forces (e.g., hydraulic gradients) to keep hazardous waste contaminants in place and therefore reduce or eliminate their release into the environment.
Hazardous Waste Management	Waste Containment	Actions that encapsulate, cover, or create physical forces (e.g., hydraulic gradients) to keep waste contaminants in place and therefore reduce or eliminate their release into the environment.
Industrial Processes	Heat Reduction	Action where heat is removed from a wastewater or cooling water stream to minimize or eliminate environmental impact at the outfall.
Industrial Processes	NPDES Discharge Change	Actions where wastewater discharge pollutant concentrations are reduced or eliminated through the use of pollution control technologies.
Industrial Processes	NPDES Process Change	Actions where wastewater pollutant discharge concentrations are reduced or eliminated through process-based activities including changes to an industrial process and/or procedure (other than pollution control equipment).
Industrial Processes	Implement BMP: Stormwater Construction Activities	Stormwater management practices to reduce or eliminate discharges of solids/sediment from construction sites through stormwater runoff.

Table 3-1. Reduction of On-going Releases Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Industrial Processes	Implement BMP: Industrial Stormwater	Stormwater management practices to reduce or eliminate discharges of solids and/or toxic pollutants from industrial sites through stormwater runoff.
Municipalities	Implement BMP: Separate Municipal Stormwater Systems (MS4s)	Stormwater management practices to reduce or eliminate the discharge of pollutants in stormwater from Municipal Separate Storm Sewer systems (MS4s).
Municipalities	Implement BMP: Other	Actions and practices that correct or eliminate contamination from entering other surface waters.
Municipalities	CSO Flow Reduction	Actions resulting in the reduction or elimination of combined sewer overflows through flow reduction practices.
Municipalities	CSO Primary or Secondary Treatment	Actions that involve the addition or upgrade of primary or secondary treatment for combined sewer overflows resulting in reduced pollutant discharges.
Municipalities	SSO CMOM	Actions impacting Capacity, Management, Operation, and Maintenance (CMOM) practices resulting in the reduction or elimination of sanitary sewer overflows.
Municipalities or Other Public Drinking Water Systems	SDWA Process Change	Actions (including changes to treatment processes) that correct or eliminate existing contamination in public water systems.
Municipalities	Biosolids Process Change	Action addressing stormwater run-off from sewer overflows resulting in the reduction or elimination of biosolid pollutant discharges.
Pesticides	Pesticide Destroyed - In Commerce	Actions where a pesticide manufacturer/producer destroys noncompliant pesticides and/or pesticidal devices already in commerce.
Pesticides	Import Pesticide Returned to Foreign Origin	Actions where a pesticide being imported into the U.S. has been denied entry into the U.S. and is returned to its foreign origin.
Pesticides	Pesticide Returned to Compliance by Manufacturer/Producer (Domestic)	Actions where a pesticide product in commerce is returned to the manufacturer/producer to bring the product back into compliance. Actions include: products relabeled in the field and products brought back to the manufacturing/producer for relabeling, repackaging, and/or reformulation.
Pesticides	Proper Pesticide Use	Actions where an applicator or other person continues to use a pesticide but returns to a compliant use pattern. This involves cases of improper application of a pesticide.
Pesticides	Cease Pesticide Sale, Distribution	Actions where a person/company ceases distribution of a pesticide product which is in violation of FIFRA or has been canceled or suspended. (i.e., actions to comply with a FIFRA SSURO or other compliance order)
Pesticides	Pesticide Advertising Claim Removed	Actions where a person or company making advertising claims, either verbal or written, that are substantially different from any claims made in connection with it registration. The individual or company agrees to cease the verbal claims and/or remove the written pesticidal claims. [Note: Label claims that differ are covered under “Pesticide Returned to Compliance by Manufacturer/Producer”]

Table 3-1. Reduction of On-going Releases Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Pesticides	Pesticide Secondary Containment Change (on-going)	Actions requiring installation for intercepting and containing on-going spills and leaks of pesticides in areas where stationary containers are stored and where refillable containers are refilled or cleaned. Includes actions related to traditional secondary containment for pesticides as well as pesticide dispensing areas such as containment pads.
Pesticides	Pesticide Container Change (on-going)	Actions that correct or fix containers that fail to meet the Pesticide Management and Disposal Rule standards. Addresses on-going releases and product already in commerce.
Mobile Sources	Offset Project (mobile sources)	Actions include projects implemented by the respondent as a result of a settlement.
Mobile Sources	Retire Pollution Credits (mobile sources)	Actions include the buying of pollution credits available under cap and trade programs and then retiring them from use (e.g., NO_x and possibly CO_2 in the future). The credits are turned over to EPA which retires them from use – thus diminishing the pool of credits that are available for trading.
Mobile Sources	Replace or Remediate Engines/Vehicles (in commerce)	Actions including the export or destruction of non-compliant or uncertified vehicles or engines; recalling or replacing non-compliant vehicles, engines, parts or equipment; restoring non-compliant vehicles or engines to their certified condition; stopping sale or non-compliant parts from non-road equipment (such as weed whackers, chainsaws, off-road motorcycles, all-terrain vehicles, mobile generators, construction equipment, trains, and ships). The complying action applies to engines/vehicles that are already in commerce and recalled for replacement or remediation.
Stationary Sources	Retire Pollution Credits (stationary sources)	Actions include the buying of pollution credits available under cap and trade programs and then retiring them from use (e.g., NO_x and possibly CO_2 in the future). The credits are turned over to EPA which retires them from use – thus diminishing the pool of credits that are available for trading.
Stationary Sources	Source Reduction	Actions that reduce or change the use of chemicals or other input materials (e.g., fuel substitution) at the beginning of an industrial process, thereby reducing or eliminating air pollutant emissions produced by the process.
Stationary Sources	Emissions Change	Actions where an air emission is reduced or eliminated through the use of pollution control technologies.
Stationary Sources	Leak Repair (LDAR)	Process piping and equipment repair activities that reduce or eliminate fugitive emission leaks from process equipment.
Toxics (Asbestos/Lead/PCBs)	Abatement (non-removal remediation)	Asbestos NESHAP/AHERA and TSCA lead-based paint actions that reduce or eliminate exposure to asbestos or lead-based paint materials. Excludes abatement activities that involve the removal and disposal of asbestos or lead-based paint material (which are covered under Removal and Restoration Category).
Toxics (Asbestos/Lead/PCBs)	Implement Asbestos Management Plan	Actions and practices taken to properly manage asbestos containing materials (with on-going releases into the environment) to prevent the likelihood of future release.

Table 3-1. Reduction of On-going Releases Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Toxics (Asbestos/Lead/PCBs)	Handling PCBs – Disposal Change	Actions that require proper disposal of PCB-contaminated material.
UIC	Plug and Abandon (w/ leaks)	Underground injection well plug and abandon actions where the well(s) are causing contamination between aquifer layers.
UST	Tank Repair	Action that requires repair of underground storage tanks that are actively leaking.
UST	Tank Removal	Action that requires proper disposal or handling of material from an underground storage tank prior to its removal.
UST	Tank Storage Change	Actions and practices taken to prevent the release of harmful pollutants from commercial and industrial storage tanks, which may include tank decommission or replacement.

Reporting units for the on-going releases category will vary depending on the program category and complying action. The common reporting units that apply are summarized in Table 3-2 below.

Table 3-2. Summary of On-going Release Reporting Units

Program Category	Units	When to Use Which Units
CAFOs	Pounds	Report pounds of pollutant reduced per year
Hazardous Waste Management	Cubic yards, Pounds, Gallons	See Table 3-4 for more guidance
Industrial Processes	Pounds, BTUs	For the Heat Reduction complying action, report reductions in BTUs discharged. For all other complying actions report lbs of pollutant reduced
Municipalities	Pounds	Report pounds of pollutants reduced
Pesticides	Pounds	Report pounds of pesticide impacted by the action (amount destroyed, amount refused entry, amount stopped for distribution or sale)
Public Drinking Water Systems	People Protected	Report number of people served by the PWS on an annual basis.
Mobile Sources	Pounds	Report pounds of air emission pollutants reduced per year
Stationary Sources	Pounds	Report pounds of air emission pollutants reduced per year
Toxics (Asbestos/Lead/PCBs)	Cubic yards, Gallons, or Housing Units	Cubic yards and gallons should be used when referring to volume of material reduced by the action; Housing units is used when referring to non-removal abatement of asbestos or lead-based paint structures
UIC	Number of Wells	Report the number of leaking wells subject to plug and abandon
UST	Cubic Yards	Report the volume of material or contaminated soil impacted by the tank repair or removal.

3.2 Concentrated Animal Feeding Operations (CAFOs)

3.2.1 Discharge Violations for CAFOs

3.2.1.1 Background

EPA has promulgated regulations to reduce the amount of water pollution from Concentrated Animal Feeding Operations (CAFOs). The final rule updates regulations that are more than 20 years old and will result in more effective, nationally consistent regulations to protect water resources.

CAFO cases are expected to include the following types of discharge violations:

- Contaminated surface runoff from CAFO areas which do not have runoff storage and control;
- Releases from storage lagoons or runoff ponds which are caused by storm event spills or lagoon leaks; and
- Releases due to over application of manure wastes
- Releases from animal bedding and silage; and
- Releases from animal carcasses that are disposed of improperly.

The typical complying actions that will apply to these cases are:

- Implement BMP: Surface Water Runoff;
- Implement BMP: Lagoon/Storage Pond Leak or Spill;
- Implement BMP: Manure Over Application;
- Implement BMP: Animal Bedding Leachate; and
- Implement BMP: Silage Leachate
- Implement BMP: Improper Carcass Disposal.

For CAFO cases, you can calculate pollutant reductions for BOD_5, COD, TSS, nitrogen, phosphorus, and potassium using information from the case file on the type of animal operation, areas impacted by the action, and the volumes of manure or wastewater handled/released. If manure or wastewater characterization data are not known, Tables E-1 through E-6 (located in Appendix E at the end of this guide) can be used.

Tables E-1 and E-2 present typical pollutant concentrations in manure as excreted based on animal type. Table D-1 covers beef and dairy cattle and Table D-2 covers swine. To find manure characteristics for other animal types see USDA's Agricultural Waste Management Field Handbook at: www.ftw.nrcs.usda.gov/awmfh.html, Chapter 4. These tables include information for the following pollutants, Total Solids (TS), Chemical Oxygen Demand (COD), 5-day Biochemical Oxygen Demand (BOD_5), Nitrogen (N), Phosphorus (P), and Potassium (K).

Table D-3 presents typical pollutant concentrations for stored manure supernate. Since manure storage often occurs in lagoons, these values are useful for enforcement actions where a facility has had spills or overflows from their storage lagoons. A storage lagoon will have sludge accumulate at the bottom and a liquid supernate will rest above the sludge layer. Spills and leaks are most likely to have supernate characteristics. Since not all manure that is excreted at a CAFO is available for collection, storage, treatment or transfer, there are typically some losses associated with these operations. Table D-4 presents typical recoverability factors for manure based on the animal type. In addition, nitrogen and phosphorus volatilization losses also occur during collection, storage, treatment, or transfer. These losses are also presented in Table D-4. Table D-5 presents manure density by animal type. Table D-6 presents typical crop uptake values for nitrogen and phosphorus.

For calculations from animal bedding or silage leachate scenarios, Tables D-7 through D-12 (located in Appendix D at the end of this guide) can be used.

Table D-7 presents nutrient concentrations in animal bedding and presents typical percentages of nutrients that are lost as leachate. Table D-8 presents typical weights of various types of animal bedding. Table D-9 provides estimates for leachate generation based on the moisture content of silage. Table D-10 presents storage capacities for tower silos. Table D-11 presents storage capacities for horizontal silos. Table D-12 presents silage leachate characterization data for total solids, BOD_5, nitrogen, phosphorus, and potassium.

3.2.1.2 Calculation Methodology

The calculation of pollutant reductions for CAFOs will depend on the type of discharge violation. Step-by-step instructions are provided below for surface runoff violations, storage lagoon spills or leaks, and over application violations.

Surface Runoff Violation

This approach applies to those cases where the CAFO has no storage or control of feedlot runoff and assumes that approximately 1.5% of the annual runoff volume is solids. *(Based on the Livestock Waste Facilities Handbook, Second Edition, 1985)* This approach also assumes that the composition of solids in the runoff is the same as in the facility's manure as excreted.

Surface Runoff Violation

Step A Determine the type(s) of animals at the facility.

Step B Using local annual rainfall data and the area of the CAFO site, determine the volume of surface runoff generated over one year.

Annual runoff volume (cu.ft./yr) = Runoff coefficient × Annual precipitation (inches/yr) × CAFO facility area (sq. ft.) × 1 ft./12 inches

Note: The runoff coefficient that you use should take into account the type of soil, percent of impervious area, and the ground slope. If you have sufficient case information to develop a specific runoff coefficient you should, otherwise you can use a default value of 0.4 which assumes that 40% of the total precipitation will runoff a drylot that is 20% paved. (Shuyler, 1999). The following table provides runoff coefficients for various surface types at a 1 to 2% slope:

Type of Surface	***Runoff coefficient***
For macadam or other impervious materials	*0.70 to 0.95*
For gravel or crushed stone or s	*0.35 to 0.70*
For impervious soils (heavy)	*0.40 to 0.65*
For impervious soils, with turf	*0.30 to 0.55*
For slightly pervious soils	*0.15 to 0.40*
For slightly pervious soils, with turf	*0.10 to 0.30*
For moderately pervious soils	*0.05 to 0.20*
For moderately pervious soils, with turf	*0 to 0.10*

Values for average rainfall can be found on the Internet at http://www5.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl.

Step C Since an enforcement action will result in storage and/or control of the facility's surface runoff, you can assume that manure releases will no longer occur in the surface runoff after the compliance action is completed. Therefore, assume that all of the manure that was being released in surface runoff annually will now be reduced. *[Note: Sites may still be allowed to have some runoff discharges due to 25 or 100-year storm events.]*

Manure Reduction (lbs/yr) = Annual runoff volume (cu.ft./yr) × 0.015 (manure volume/runoff volume) × manure density (lbs/cu.ft.)

Manure density by animal type is provided in Table D-5.

Step D Using the characterization data from Table D-1 or Table D-2, determine pollutant reductions as:

Pollutant reduction (lbs/yr) = Manure reduction (lbs/yr) × [Pollutant characterization from Table D-1 or Table D-2 (lbs/d/1000#)/ Manure characterization from Table D-1 or Table D-2 (lbs/d/1000#)]

Step E Report the total pollutant reduction (for one year) in pounds in ICIS. Identify "Water (navigable/surface)" as the impacted media.

Lagoon/Storage Pond Spill or Leak

This approach applies to those cases where the CAFO operation uses a waste storage pond or lagoon. Spills are assumed to occur during a wet weather event where the storage pond or lagoon has insufficient freeboard and overflows. Leaks are assumed to be the result of poor maintenance or damage.

Lagoon/Storage Pond Spill or Leak

Step A Determine the type of animal operation at the facility and the facility's manure management practices (i.e., type of storage lagoon or runoff pond).

Step B Determine the volume of stored waste released in gallons.

For a spill due to a storm event this may be determined from the storm event data (rainfall in inches) × the surface area of the storage lagoon (sq.ft.) × 1 ft/12 inches × 7.481 gal/1 cu.ft.).

[Note: This calculation assumes that the storage lagoon has no freeboard. If the site's lagoon is maintained with some freeboard, then you should subtract from the storm event volume the free board volume.]

For a leak this may be determined from the storage lagoon liquid height before and after the leak (height change (ft.) × the surface area of the storage lagoon (sq.ft.) × 7.481 gal/1 cu.ft.)

Step C Determine the pollutant concentration in the lagoon

If this information is not known you can use typical values from Table D-3.

Step D Assume that the enforcement action will result in no further spills or releases and that the losses from the spill/leak will no longer occur. Determine the reduction in pollutant as:

Pollutant Reduction (lbs) = Volume of spill/leak released (gal) × Pollutant concentration (lbs/1000 gal)

Report the total pollutant reduction in pounds in ICIS. Identify "Water (navigable/surface)" as the impacted media.

Over Application Violation

CAFOs may use land application of manure as a beneficial reuse option in lieu of or in addition to manure storage and treatment. In this process, manure is applied to crop or pasture lands through various types of application devices depending on the nature of the manure (i.e., manure is applied as a dry solid, a slurry, or a wastewater). A CAFO should determine proper application rates of manure based on the amount of land available for manure application, specific crops that are grown on that land, and the expected crop yields and soils analysis.

Enforcement actions have occurred against CAFOs that land apply manure in amounts that exceed the agronomic rates specified in a CAFO's Nutrient Management Plan (NMP). An enforcement authority may determine that over application is occurring by checking actual manure application rates against the application rates required in the NMP or it may be evident from visible manure releases from cropland into nearby water bodies or by elevated levels of nutrients in water bodies adjacent to land application areas. In these cases, an enforcement action against a CAFO may include the requirement that the facility implement a NMP.

Over Application Violation

The methodology described below is a simplified evaluation of manure application vs. crop uptake. This calculation methodology has the following flaws:

- It assumes that manure application for nutrient needs will not exceed the hydraulic capacity of the soil. If the hydraulic capacity of the soil is more limiting than the nutrient capacity then the hydraulic flow rate becomes the determining factor.
- This approach does not take into account the manure decomposition rate. Since it may take more than a year for applied manure to breakdown into its component nutrients, manure may be applied at a greater rate so that sufficient nutrients are available for crop uptake the first year. This issue should be considered when you evaluate the specifics of the enforcement case.

The nitrogen and phosphorus pollutant reductions that would occur from an enforcement action against over application of manure can be estimated using the following steps:

Step A Determine the type of animal operation and land application information (amount of land available for application, crops grown on that land, expected crop yields)

Step B Identify the current manure application rate (lbs manure applied/yr).

This rate should be known or can be calculated if the facility land applies all of the manure generated onsite.

Manure generated onsite (lbs/year) = number of animals × avg. weight/animal (from Table D-5) × lbs manure generated as excreted (from Table D-1 or D-2 expressed as lbs manure/d/1000#) × days/yr the animal is onsite × recoverability factor (from Table D-4)

Step C Using the current manure application rate, calculate the equivalent amount of nitrogen and phosphorus that is being land applied.

Nitrogen land applied (lbs/yr) = Quantity of manure land applied (lbs/yr) × [Nitrogen characterization data from Table D-1 or Table D-2 (lbs/d/1000#)/ Manure characterization data from Table D-1 or Table D-2 (lbs/d/1000#)] × ((100 - typical % nitrogen loss factor from Table D-4)/100)

Phosphorus land applied (lbs/yr) = Quantity of manure land applied (lbs/yr) × [Phosphorus characterization data from Table D-1 or Table D-2 (lbs/d/1000#)/ Manure characterization data from Table D-1 or Table D-2 (lbs/d/1000#)] × ((100 - typical % nitrogen loss factor from Table D-4)/100)

Step D	Using the land application information, calculate the amount of nitrogen and phosphorus that will be taken up by the crops grown. Crop nitrogen requirements (lbs) = Crop yield (tons/acre) × Crop uptake (lbs nitrogen/ton of crop) × area of crop land (acres) Crop phosphorus requirements (lbs) = Crop yield (tons/acre) × Crop uptake (lbs phosphorus/ton of crop) × area of crop land (acres) Typical crop yields can be found by state and county at www.nass.usda.gov:81/ipedb. Typical crop uptake values for nitrogen and phosphorus are shown in Table D-6.
Step E	If more than one crop is grown on a field per year, determine the total annual nitrogen and phosphorus land application needs. *For example, if two crops are grown on the land for the year(corn in summer and winter wheat in the winter) then the total annual nitrogen needs will be the sum of the corn crop nitrogen needs + the winter wheat crop nitrogen needs)*
Step F	Determine the annual amount of nitrogen and/or phosphorus removal that will occur once the CAFO comes into compliance with proper land application rates. The ratio of nitrogen to phosphorus in the manure will determine the reduction of the non-limiting nutrient. Whether nitrogen or phosphorus is the limiting nutrient will depend on whether the land application area is susceptible to phosphorus leaching (primarily karst terrain). If it is, then the manure should be applied to meet the crop's phosphorus requirements and the nitrogen from the manure should be supplemented with commercial nitrogen fertilizer. If the land application area is not susceptible to phosphorus leaching then the manure should be applied to meet the crop's nitrogen requirements and there will be a slow build up of excess phosphorus in the soil. Nitrogen or Phosphorus removal (lbs/yr) = Total nitrogen or phosphorus land applied (lbs/yr) - Annual crop nitrogen or phosphorus needs (lbs/yr) Non-limiting nutrient removal (lbs/yr) = limiting nutrient reduction (lbs/yr) × ratio of non-limiting nutrient/limiting nutrient in the manure.
Step G	Report the total pollutant reduction (for one year) in pounds in ICIS. Identify "Water (navigable/surface)" as the impacted media.

Animal Bedding Leachate

CAFOs use bedding mostly for housing of dairy cattle, poultry, and horses. Bedding may also be used for beef cattle, goats, sheep, and swine. Typical bedding materials include straw, shavings, saw dust, hay, paper, and dried manure. As the bedding becomes contaminated with manure, it needs to be removed and replaced with fresh bedding. Besides providing comfort for animals, the purpose of animal bedding is to absorb moisture and nutrients from animal waste. As a result, fouled bedding contains high concentrations of nitrogen, phosphorus, and potassium, which can be used as fertilizer. Therefore, it is beneficial for facilities to properly manage animal bedding to reduce runoff and leaching of nutrients.

Fouled bedding that is removed from animal housing should be stockpiled in drainage areas so that leachate from the bedding piles is captured and controlled at the facility's storage lagoon. Improper storage of bedding occurs when stockpiles are stored outside of the controlled drainage area. In these cases, leachate from the stockpiles can contaminate groundwater and surface water.

The amount of leachate produced is a function of the amount of rainfall, the surface area of the bedding pile, and whether the bedding is stored in a covered area or exposed to rainfall. The type of covering, if any, will determine the amount of leachate generated. Facilities can estimate the volume of leachate using the area of exposed bedding and annual rainfall data. To account for evaporation, it is assumed that 45 percent of the rainfall will be discharged as runoff.

Animal Bedding Leachate

The total solids, BOD_5, nitrogen, phosphorus, and potassium pollutant reductions that would occur from an enforcement action against animal bedding leachate can be estimated using the following steps:

Step A Determine the type of bedding and the tons of bedding stored per year (tons/yr).

Step B Determine the surface area of exposed bedding (ft^2).

Step C Calculate the volume of leachate using annual rainfall data:

[exposed bedding surface area (ft^2)] × [annual rainfall (inches/yr)] × [1 ft/12 inches] × [evaporation factor (0.45)] = [volume of leachate (ft^3/yr)]

Step D Calculate tons of bedding exposed that generates leachate using unit weight of bedding (see Table D-8):

[volume of leachate (ft^3/yr)] × [bedding unit weight (lb/ft^3)] × [1 ton/2,000 lbs] = [tons of exposed bedding (ton/yr)]

Step E Calculate baseline annual loads for BOD_5, TSS, nitrogen, phosphorus, and potassium using either the volume of leachate or the tons of exposed bedding and bedding pollutant characteristics (see Table D-7):

[Baseline BOD_5 lb/yr] = [volume of leachate (ft^3/yr)] × [pollutant concentration (mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]

[Baseline TSS lb/yr] = [volume of leachate (ft^3/yr)] × [15 percent solids] × [bedding unit weight (lb/ft^3)]

Step F [Baseline Nutrients (N, P, and K) lb/yr] = [tons of exposed bedding (ton/yr)] × [bedding characteristics (lb/ton)]

Step G Check reasonableness of nutrient loads using information for typical nutrient losses from bedding leachate (see Table D-7):

[Typical Nitrogen (lbs/yr)] = [annual tons of bedding stored (tons/yr)] × [bedding characteristics (lb/ton)] × [0.35]

[Typical Phosphorus (lbs/yr)] = [annual tons of bedding stored (tons/yr)] × [bedding characteristics (lb/ton)] × [0.20]

[Typical Potassium (lbs/yr)] = [annual tons of bedding stored (tons/yr)] × [bedding characteristics (lb/ton)] × [0.20]

Step H Apply upper limit for nutrient loads so that the nutrient load is not more than 1.5x the typical nutrient losses from leachate:

IF [nutrient load] > 1.5x [typical nutrient load], then
[nutrient load] = 1.5x [typical nutrient load];

IF [nutrient load] < 1.5x [typical nutrient load], then
[nutrient load] = [nutrient load].

Step I Calculate pollutant reductions from enforcement action assuming that proper handling of bedding leachate will result in zero discharge of leachate to receiving waters:

[pollutant reductions (lbs/yr)] = [baseline pollutant load (lbs/yr)] **–** [post modification pollutant loads (0 lbs/yr)]

Step J Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Animal Bedding Leachate
- **Pollutant, Amount and Unit:** Total Solids and pounds
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and pounds
- **Pollutant, Amount and Unit:** Nitrogen and pounds

- **Pollutant, Amount and Unit:** Phosphorus and pounds
- **Pollutant, Amount and Unit:** Potassium and pounds
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Silage Leachate Violation

Silage is a livestock food made from corn, sorghum, grasses and other plants that is stored in tower silos, sock silos, or horizontal bunkers. Tower silos and sock silos are covered storage structures. Horizontal bunkers may be concrete-lined or earthen pits, and may be covered or uncovered. During storage, the moisture contained in the silage will drain from the crops and produce a leachate. This leachate can contain significant levels of BOD (200 times higher than the typical BOD content in human sewage), and therefore, proper handling of silage leachate is needed to ensure that it does not contaminate groundwater or surface waters.

The amount of leachate produced from silage seepage depends primarily on the moisture content of the ensiled crop and the amount of crop stored. Other factors include pressure and the size of the silage. If moisture content is not known, facilities typically assume 1 cubic foot of leachate storage volume will be needed per ton of ensiled crop.

Horizontal bunkers are exposed to precipitation, and therefore, will have additional leachate generated from rainfall. The type of covering, if any, will determine the amount of contaminated runoff generated. Facilities can estimate the amount of leachate generated from rainfall using the area of exposed silage and annual rainfall data. To account for evaporation, it is assumed that 45 percent of the rainfall will be discharged as runoff. Estimating leachate from runoff using annual rainfall data may overestimate discharges since:

- Smaller scattered storms will produce less leachate than larger storm events because the rain will have time to evaporate between events; and
- Silos may not be used year-round and rainfall events may not be continuous over the course of the year. As a result the "wet seasons" may not correspond to the seasons when silos are in use.

Therefore, to avoid overestimating leachate from rainfall, the estimation methodology applies an upper limit so that leachate from rainfall cannot be more than two times the volume of leachate produced from seepage.

Calculations to establish environmental benefits may be made based on silo type and capacity, rainfall contribution (where applicable), tons of silage stored, and moisture content of silage stored.

Silage Leachate Violation

The total solids, BOD5 , nitrogen, phosphorus, and potassium pollutant reductions that would occur from an enforcement action controlling silage leachate discharges can be estimated using the following steps:

Step A Determine the type of silo.

Step B Determine the storage capacity of the silo and estimate the amount of silage in the storage silo (tons/yr) (see Table D-10 or D-11). Assume silo capacity equals one year's storage of silage.

Step C Calculate gallons of leachate generated from seepage using one of the following equations:

a. If moisture content is known, then use an estimate of the moisture content of the silage to determine the silage leachate generation rate (gallons of leachate/ton of silage) (see Table D-9):

[tons silage/yr] × [gallons leachate /ton silage] = [leachate from seepage (gal/yr)]

b. If moisture content is not known, then assume 1 ft^3 of leachate per ton of silage:

[tons silage/yr] × [1 ft^3 leachate/ ton silage] × [1 gallon/0.1337ft^3] = [leachate from seepage (gal/yr)]

Step D Calculate the gallons of leachate from rainfall for uncovered silage:

- Identify the annual average rainfall for county.
- Determine the area of uncovered silage in square feet (ft^2).
- Use inches of precipitation per square foot to determine volume of leachate, assuming 45 percent runoff:

[average rainfall (inches/yr)] × [1 ft/12 inches] × [area of uncovered silage (ft^2)] × [1 gallon/0.1337 ft^3] × [0.45] = [leachate from rainfall (gal/yr)]

Step E Apply upper limit for rainfall leachate so that the leachate from rainfall is not more than two times the volume of leachate from seepage:

IF [leachate from rainfall] > 2x [leachate from seepage], then
[leachate from rainfall] = 2x [leachate from seepage];

IF [leachate from rainfall < 2x [leachate from seepage], then
[leachate from rainfall] = [leachate from rainfall].

Step F Calculate the total leachate in liters per year (L/yr):

([leachate from seepage (gal/yr)] + [leachate from rainfall (gal/yr)]) × [3.785 L/gal] = [total leachate (L/yr)]

Step G Calculate baseline annual loads for total solids, BOD_5, nitrogen, phosphorus, and potassium using total leachate volume and typical leachate concentrations (see Table D-12).

[total leachate (L/yr)] × [pollutant concentration (mg/L)] × [1 lb/454,000 mg] = [baseline pollutant load (lbs/yr)]

Step H Calculate pollutant reductions from enforcement action assuming that proper handling of silage leachate will result in zero discharge of leachate to receiving waters:

[pollutant reductions (lbs/yr)] = [baseline pollutant load (lbs/yr)] – [post modification pollutant loads (0 lbs/yr)]

Step I Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Silage Leachate
- **Pollutant, Amount and Unit:** Total Solids and pounds
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and pounds
- **Pollutant, Amount and Unit:** Nitrogen and pounds
- **Pollutant, Amount and Unit:** Phosphorus and pounds
- **Pollutant, Amount and Unit:** Potassium and pounds
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Proper Carcass Disposal

Animal mortalities can occur as a result of natural causes, weather, or illness. Proper carcass disposal involves layering the carcass with composting materials to achieve full aerobic decomposition of the soft tissues. Compost piles should be located a safe distance from water bodies and areas where live animals are kept. In addition, proper drainage of the compost pile is needed to avoid water pooling and to ensure that runoff is collected and properly managed.

Improper carcass disposal occurs when carcasses are buried too close to the ground surface and can be exposed and subject to scavengers. In addition, if the proper composting materials are not used, then any compost pile for carcass disposal will not achieve the ideal carbon to nitrogen ratio needed for decomposition. Carcass leachate forms when carcasses are exposed to rainfall. If leachate is not properly managed, then the leachate may contaminate groundwater and surface water. Table 3-3 presents pollutant concentrations measured in carcass leachate.

Table 3-3. Animal Carcass Leachate Characteristics

Parameter	Typical Concentration (mg/L)
BOD	31,000
COD	72,000
Chloride	270
Potassium	430
Ammonia	2,100
Dissolved Solids	5,100

Source: *Livestock Euthanasia and Disposal*. 2006 Ontario Livestock and Poultry Conference. SVS Contingency Planning Division. Gordon Hickman.

Enforcement actions have addressed discharges of leachate from carcass burial areas to surface waters. Facilities are required to implement proper disposal (e.g., composting) of animal carcasses and management practices to protect ground and surface waters from contamination. Leachate from the area should be collected and directed to the facility's holding lagoon for treatment.

The amount of leachate produced is a function of the amount of rainfall, the surface area of the burial site, and the decomposition time for the carcass. Facilities can estimate the volume of leachate using the burial site surface area and annual rainfall data. To account for evaporation, it is assumed that 45 percent of the rainfall will be discharged as runoff.[2]

Carcasses that are exposed to the elements and scavengers can decompose in as little as two weeks. However, carcasses buried in ordinary soil can take several years to fully decompose. In addition, the burial site can continue to produce leachate after decomposition is complete. The UK Environment Agency estimated that mass burial sites can continue to produce leachate for up to 20 years.[3] Therefore, to account for slower decomposition rates for improperly disposed carcasses and the potential for continuous leachate formation, it is assumed that burial sites can discharge leachate for an entire year.

Calculations to establish environmental benefits may be made based on the number of burial sites, burial site surface area, and rainfall contribution. Table 3-3 provides carcass leachate characteristics; precipitation data can be pulled using the CAFO calculator tool or accessed from a local weather station close to the site.

The methodology for calculating environmental benefits from improper carcass disposal cases is shown below.

[2] *Base Flow Silage Leachate Control.* USDA NRCS. Paper No. 94-25 60. Peter E. Wright, and Peter L. Vanderstappen. December 1994.

[3] **Carcass Disposal:** A Comprehensive Review. National Agricultural Biosecurity Center Consortium. USDA APHIS Cooperative Agreement Project. Carcass Disposal Working Group. Abbey Nutsch; Mark Spire. August 2004.

Proper Carcass Disposal

The BOD_5, COD, chloride, potassium, ammonia, and dissolved solids pollutant reductions that would occur from an enforcement action against improper carcass disposal can be estimated using the following steps:

Step A Determine the number of burial sites in the case.

Step B Determine the average surface area of each burial site (ft^2).

Step C Calculate the volume of leachate generated at each burial site per year using annual rainfall data:

[burial site surface area (ft^2)] × [annual rainfall (inches/yr)] × [1 ft/12 inches] × [evaporation factor (0.45)] = [volume of leachate (ft^3/yr)]

Step D Calculate pollutant loads per burial site for BOD_5, COD, chloride, potassium, ammonia, and dissolved solids using the volume of leachate and carcass leachate characteristics (see Table 3-3):

[Pollutant load per burial site (lb/yr)] = [volume of leachate (ft^3/yr)] × [pollutant concentration (mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]

Where the pollutants are BOD_5, COD, chloride, potassium, ammonia, and dissolved solids.

Step E Calculate the total baseline annual loads by summing the pollutant loads across all burial sites:

[Total baseline pollutant load (lb/yr)] = sum of individual burial site pollutant load (lb/yr)

Step F Calculate pollutant reductions from the enforcement action assuming that proper disposal of carcasses will result in zero discharge of leachate to receiving waters:

[pollutant reductions (lbs/yr)] = [Total baseline pollutant load (lbs/yr)] - [post modification pollutant loads (0 lbs/yr)]

Step G Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Proper Carcass Disposal
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and pounds
- **Pollutant, Amount and Unit:** COD and pounds
- **Pollutant, Amount and Unit:** Chloride and pounds
- **Pollutant, Amount and Unit:** Potassium and pounds

- **Pollutant, Amount and Unit:** Ammonia and pounds
- **Pollutant, Amount and Unit:** Dissolved solids and pounds
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.2.1.3 Examples

Example 1. CAFO Surface Runoff Violation

EPA visited a beef cattle CAFO in response to fish kills downstream of the feedlot. A review of operations at the site identified that the feedlot facility had no control or storage of site runoff and the topography of the site resulted in runoff flowing to the affected stream. The facility is the subject of an enforcement action resulting in the operation installing runoff controls (using berms and grading) and storage in a runoff storage pond. The operation has the capacity for 1,500 head of beef cattle and has continuous turnover of cattle to stay at capacity throughout the year. The area of the CAFO is 690,000 sq. ft. Local meteorological data for the area indicate that the average annual rainfall for the past year was 26 inches.

Step A The operation handles beef cattle

Step B Using the local annual rainfall data and the size of the feedlot, the volume of surface runoff generated over one year is:

Annual volume of runoff (cu. ft./yr) = 0.4 × 26 inches/yr × 690,000 sq. ft. × 1 ft./12 inches
= 598,000 cu. ft./yr

Step C Since the compliance action will result in the elimination of feedlot runoff, the reduction in manure discharge will equal the current level of manure discharge in runoff.

Manure reduction (lbs/yr) = 598,000 cu. ft./yr × 0.015 × 62 lb/cu. ft.

(Beef cattle manure density) = 556,140 lbs/yr

Step D Pollutant reductions (using characterization data from Table D-1) are:

Total Solids reduction (lbs/yr) = 556,140 lbs manure/yr × (7.30/63.00)
= 64,442 lbs/yr

COD reduction (lbs/yr) = 556,140 lbs manure/yr × (6.00/63.00)
= 52,966 lbs/yr

BOD_5 reduction (lbs/yr) = 556,140 lbs manure/yr × (1.20/63.00)
= 10,593 lbs/yr

Nitrogen reduction (lbs/yr) = 556,140 lbs manure/yr × (0.33/63.00)
= 2,913 lbs/yr

Phosphorus reduction (lbs/yr) = 556,140 lbs manure/yr × (0.12/63.00)
= 1,059 lbs/yr

Potassium reduction (lbs/yr) = 556,140 lbs manure/yr × (0.26/63.00)
= 2,295 lbs/yr

Step E Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Surface Water Runoff;
- **Pollutant, Amount and Unit:** TSS and 64,442 pounds;
- **Pollutant, Amount and Unit:** COD and 52,966 pounds;
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 10,593 pounds;
- **Pollutant, Amount and Unit:** Nitrogen and 2,913 pounds;
- **Pollutant, Amount and Unit:** Phosphorus and 1,059 pounds;
- **Pollutant, Amount and Unit:** Potassium, 2,295 pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2. Lagoon/Storage Pond Spill or Leak

A large swine operation located in North Carolina is the subject of an enforcement action. The site's anaerobic storage lagoon located next to a tributary of Pamlico Bay was found to be overflowing and a spill of lagoon supernate is believed to have occurred during a recent intense 24-hour storm event. The facility lagoon is 500 feet by 250 feet in size and the recent storm event totaled 2.5 inches of rain. The enforcement action will result in the facility building additional manure storage and lowering of the current lagoon level to allow for sufficient freeboard in the storage lagoon.

Step A The facility is a swine operation and uses an anaerobic storage lagoon.

Step B Assuming that the storage lagoon was maintained with no freeboard, waste discharged from the lagoon is equal to the volume of lagoon supernate displaced by the rainfall:

The volume of stored waste released (gallons) = 2.5 inches of rainfall × 500 feet × 250 feet × 1 ft/12 inches × 7.481 gal/1 cu.ft. = 194,800 gallons

Step C Typical pollutant concentrations in the lagoon supernate (using Table D-3) are:

Total solids = 20.83 lbs/1,000 gal
COD = 10.00 lbs/1,000 gal
BOD_5 = 3.33 lbs/1,000 gal
Nitrogen = 2.91 lbs/1,000 gal
Phosphorus = 0.63 lbs/1,000 gal

Potassium = 3.16 lbs/1,000 gal

Step D Pollutant amounts brought under proper management after compliance is achieved will be:

Total solids = 20.83 lbs/1,000 gal × 194,800 gal = 4,058 lbs TS
COD = 10.00 lbs/1,000 gal × 194,800 gal = 1,948 lbs COD
BOD_5 = 3.33 lbs/1,000 gal × 194,800 gal = 649 lbs BOD_5
Nitrogen = 2.91 lbs/1,000 gal × 194,800 gal = 567 lbs Nitrogen
Phosphorus = 0.63 lbs/1,000 gal × 194,800 gal = 123 lbs Phosphorus
Potassium = 3.16 lbs/1,000 gal × 194,800 gal = 615 lbs Potassium

Step E Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Lagoon/Storage Pond Leak or Spill;
- **Pollutant, Amount and Unit:** Total Solids and 4,058 pounds;
- **Pollutant, Amount and Unit:** COD and 1,948 pounds;
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 649 pounds;
- **Pollutant, Amount and Unit:** Nitrogen and 567 pounds;
- **Pollutant, Amount and Unit:** Phosphorus and 123 pounds;
- **Pollutant, Amount and Unit:** Potassium and 615 pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 3. Over Application Violation

EPA has completed an administrative order for a dairy facility located in central Indiana. An investigation into the dairy operation found that the facility was disposing of all manure generated onsite by land application onto 200 acres of nearby cropland. An evaluation of the land application rates revealed that the owner was over applying and excess manure appears to be washing off of the cropland and into a stream that runs through the area. The facility handles 800 head of mature dairy cows during the year. The cropland on which land application is occurring is used to grow corn during the spring/summer and winter wheat during the fall/winter. In response to the administrative order, the facility will reduce its land application rates to agronomic rates (as specified in its NMP) that meet the crop’s nitrogen requirements. Any extra manure will require storage or composting for sale.

Step A The CAFO is a dairy cow facility whose manure management practices consist of land application of all manure generated onsite. The facility handles 800 head of mature dairy cows throughout the year. The farm land available for land application is 200 acres. The crops grown on that farm land are corn for grain in the spring/summer and winter wheat in the fall/winter.

Using www.nass.usda.gov:81/ipedb; the expected crop yields for 2000 in Indiana are 147 bushels of corn/acre and 69 bushels of winter wheat/acre.

Step B The current manure application rate is equal to the amount of manure generated at the site by the dairy cows.

Lbs manure generated at the site = # of cows × avg. weight/cow (from Table D-5) × lbs manure/d/1000# (from Table D-1) × days/year × recoverability factor (from Table D-4)

Lbs manure applied/yr = [800 dairy cows × 1,350 lbs/cow × 80 lbs manure/d/1000# × 365 d/yr] × 0.98
= 30,900,000 lbs manure/yr

Step C The equivalent amount of nitrogen and phosphorus that is being land applied is:

N land applied (lb/yr) = 30,900,000 lbs manure/yr × [(0.45 lbs. N/d/1000#)/(80 lbs. manure/d/1000#)] × [(100 - 59.8)/100]
= 69,900 lbs. N/yr

P land applied (lb/yr) = 30,900,000 lbs manure/yr × [(0.07 lbs. N/d/1000#)/(80 lbs. manure/d/1000#)] × [(100 - 14.1)/100]
= 23,200 lbs. P/yr

Step D Nitrogen and phosphorus that will be taken up by the crops grown is:

From Table D-6 the nitrogen and phosphorus uptake in the two crops grown at the land application site are:

Corn for grain: N = 0.80 lbs/bushel
P = 0.15 lbs/bushel

Winter Wheat: N = 1.02 lbs/bushel
P = 0.20 lbs/bushel

Crop nitrogen requirements (lbs/yr) =
Corn: 0.80 lbs N/bushel × 147 bushels/acre × 200 acres = 23,520 lbs/yr
Wheat: 1.02 lbs N/bushel × 69 bushels/acre × 200 acres = 14,076 lbs/yr

Crop phosphorus requirements (lbs/yr) =
Corn: 0.15 lbs P/bushel × 147 bushels/acre × 200 acres = 4,410 lbs/yr
Wheat: 0.20 lbs P/bushel × 69 bushels/acre × 200 acres = 2,760 lbs/yr

Step E The total annual nitrogen and phosphorus land application needs are:

Nitrogen needs = 23,520 + 14,076 = 37,600 lbs/yr
Phosphorus needs = 4,410 + 2,760 = 7,170 lbs/yr

Comparing these numbers to the amounts of nitrogen and phosphorus that are currently being land applied, shows that nitrogen and phosphorus are being applied substantially over the rates that are required.

(69,900 lbs N applied - 37,600 lbs N needed)/ 69,900 lbs N applied × 100 = 46% over application of nitrogen

(23,200 lbs P applied - 7,170 lbs P needed)/ 23,200 lbs N applied × 100 = 69% over application of phosphorus

Step F The annual amounts of nitrogen and phosphorus that will be reduced once the manure is properly managed and land applied at agronomic rates are:

69,900 lbs N currently applied - 37,600 lbs N needed = 32,300 lbs N reduction/yr.

The manure containing this excess nitrogen will be either land applied onto additional farmland or might be composted for sale.

For dairy manure the ratio of phosphorus to nitrogen (from Table D-1) is:
(0.07 lb P/d/1000#)/(0.45 lb N/d/1000#) = 0.16

Therefore the amount of phosphorus that will be reduced is:
32,300 lbs N reduction/yr × 0.16 lbs P/lbs N = 5,168 lbs P reduction/yr.

Step G Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Manure Over Application;
- **Pollutant, Amount and Unit:**: Nitrogen and 32,300 pounds;
- **Pollutant, Amount and Unit:** Phosphorus and 5,168 pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 4. Animal Bedding Leachate Violation

A poultry farm located in Hancock County, MS uses wood shavings for bedding in its broiler and rooster houses. The facility cleans out fouled bedding between flocks and completely cleans out the bedding once annually. The facility stores the used bedding in an uncovered pile outside of the housing area. The facility estimates that it cleans out approximately 6 tons of wood shavings per year and that the bedding pile measures 10 feet in diameter on average.

During an inspection, EPA observed that the bedding pile was stored outside of the facility's drainage area. As a result, the bedding pile leachate was contaminating a nearby stream. EPA issued a notice of violation and the follow-up enforcement action required the farm to implement several management practices for controlling bedding leachate, including collecting all leachate and runoff from the bedding storage area to prevent surface water contamination.

Step A Six tons of wood shavings per year

Step B Surface area of exposed bedding:

The bedding pile is 10 ft. in diameter, the area of a circle is πr^2 where r is the radius of the circle (or one half of the diameter) and π is approximately 3.14:
[10 ft diameter/2]^2 × [3.14] = 78.5 ft^2

Step C Volume of leachate using annual rainfall data for Hancock County, MS (64.9 inches/yr rainfall):

[78.5 ft^2] × [64.9 inches/yr] × [1 ft/12 inches] × [evaporation factor (0.45)] = 191 ft^3/yr

Step D Tons of bedding exposed to leachate using unit weight for wood shavings (9 lb/ft^3 from Table 2-2):

[191 ft^3/yr] × [9 lb/ft^3] × [1 ton/2,000 lbs] = 0.860 tons/yr

Step E Baseline annual loads for BOD_5, TSS, nitrogen, phosphorus, and potassium using either the volume of leachate (191 ft^3/yr) or the tons of exposed bedding (0.860 tons/yr) and bedding characteristics from Table D-7:

Total BOD_5 = [191 ft^3/yr] × [20,000 mg/L] × [28.3 L/ft^3] × [1 lb/454,000 mg] = 238 lb/yr
Total Solids = [191 ft^3/yr] × [15 percent solids] × [9 lb/ft^3] = 258 lb/yr
Total Nitrogen = [0.860 tons/yr] × [21.3 (lb N/ton)] = 18.3 lb/yr
Total Phosphorus = [0.860 tons/yr] × [23.2 (lb P/ton)] = 20.0 lb/yr
Total Potassium = [0.860 tons/yr] × [24.8 (lb K/ton)] = 21.3 lb/yr

Step F Check reasonableness of nutrient loads using information for typical nutrient losses from bedding leachate (Table D-7):

Typical Nitrogen = [6 tons bedding/yr)] × [21.3 (lb N/ton)] × [0.35] = 44.7 lb/yr
Typical Phosphorus = [6 tons bedding/yr)] × [23.2 (lb P/ton)] × [0.20] = 27.8 lb/yr
Typical Potassium = [6 tons bedding/yr)] × [24.8 (lb K/ton)] × [0.20] = 29.8 lb/yr

Step G Apply upper limit for nutrient loads so that the nutrient load is not more than 1.5x the typical nutrient losses from leachate:

Total Nitrogen = [18.3 lb/yr] $<$ 1.5 × [44.7 lb/yr] = 18.3 lb/yr
Total Phosphorus = [20.0 lb/yr] $<$ 1.5 × [27.8 lb/yr] = 20.0 lb/yr
Total Potassium = [21.3 lb/yr] $<$ 1.5 × [29.8 lb/yr] = 21.3 lb/yr

Step H Pollutant Reductions:

[pollutant reductions (lbs/yr)] = [baseline pollutant load (lbs/yr)] – [post modification pollutant loads (0 lbs/yr)]

Total BOD_5 = 238 lb/yr
Total Solids = 258 lb/yr
Total Nitrogen = 18.3 lb/yr
Total Phosphorus = 20.0 lb/yr

Total Potassium = 21.30 lb/yr

Step I Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Animal Bedding Leachate
- **Pollutant, Amount and Unit:** Total Solids and 258 pounds
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 238 pounds
- **Pollutant, Amount and Unit:** Nitrogen and 18.3 pounds
- **Pollutant, Amount and Unit:** Phosphorus and 20.0 pounds
- **Pollutant, Amount and Unit:** Potassium and 21.3 pounds
- **Media:** Water (surface water)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 5. Silage Leachate Violation

A cattle farm located in Wood County, WV stores silage (80 percent moisture content) in an uncovered horizontal trench silo measuring 160ft × 30ft × 10ft . The structure is located adjacent to a local creek.

During a fishing expedition to the creek, sportsmen reported a significant fish kill event in this area. EPA inspected the cattle farm and found that the farm had no controls in place for silage leachate or stormwater runoff from the silage storage area. EPA issued a notice of violation and a follow-up enforcement action which resulted in the farm owner implementing several management practices for controlling silage leachate, including covering the silage piles and collecting all leachate to prevent direct discharges to the creek.

Step A Horizontal Bunker Silo

Step B Storage capacity for silo dimensions (Table D-11): 1,080 tons silage per year

Step C Leachate generated from seepage (gallons per year):

Leachate generation rate for silage with 80 percent moisture (Table D-9): 25 gallons/ton.

[leachate from seepage (gal)] = [25 gallons leachate/ton silage] × [1,080 tons silage/yr] = 27,000 gal/yr

Step D Leachate generated from rainfall (gallons per year):

Average annual rainfall for county = 40.50 inches/yr
Area of uncovered silage= 160ft × 30ft = 4,800 ft^2
Runoff coefficient = 0.45

[leachate from rainfall (gal/yr)] = [40.50 inches/yr] × [4,800 ft^2] × [0.45] × [1ft/12 inches] × [1 gallon/0.1337 ft^3] = 54,525 gal/yr

Step E Apply upper limit for leachate from rainfall:

[leachate from rainfall (54,525 gal/yr)] > [2x leachate from seepage (54,000 gal/yr)], therefore

[leachate from rainfall (gal/yr)] = 54,000 gal/yr

Step F Total leachate in liters per year (L/yr):

[total leachate (L/yr)] = ([leachate from seepage (27,000 gal/yr)] + [leachate from rainfall (54,000 gal/yr)]) × [3.785 L/gal] = 307,000 L/yr

Step G Baseline pollutant loads using total leachate and concentrations from Table D-12:

Total Solids	5 percent (density 1.6 lb/L)
BOD_5	50,000 mg/L;
Nitrogen	3,000 mg/L;
Phosphorus	450 mg/L;
Potassium	4,300 mg/L;

Total Solids (lbs/yr) = [0.05] × [307,000 L/yr] × [1.6 lb/L] = 24,600 lb/yr

Total BOD_5 = [50,000 mg/L] × [307,000 L/yr] × [1 lb/454,000 mg] = 33,800 lbs/yr

Total Nitrogen = [3,000 mg/L] × [307,000 L/yr] × [1 lb/454,000 mg] = 2,030 lbs/yr

Total Phosphorus = [450 mg/L] × [307,000 L/yr] × [1 lb/454,000 mg] = 304 lbs/yr

Total Potassium = [4,300 mg/L] × [307,000 L/yr] × [1 lb/454,000 mg] = 2,910 lbs/yr

Step H Pollutant Reductions:

[pollutant reductions (lbs/yr)] = [baseline pollutant load (lbs/yr)] – [post modification pollutant loads (0 lbs/yr)]

Total Solids = 24,600 lb/yr
Total BOD_5 = 33,800 lb/yr
Total Nitrogen = 2,030 lb/yr
Total Phosphorus = 304 lb/yr
Total Potassium = 2,910 lb/yr

Step I Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Silage Leachate
- **Pollutant, Amount and Unit:** Total Solids and 24,600 pounds
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 33,800 pounds
- **Pollutant, Amount and Unit:** Nitrogen and 2,030 pounds
- **Pollutant, Amount and Unit:** Phosphorus and 304 pounds

- **Pollutant, Amount and Unit:** Potassium and 2,910 pounds
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 6. Proper Carcass Disposal - Cattle Burial

A cattle feedlot located in Washington County, IA experienced 5 mortalities in one year due to illness. The cattle carcasses were buried in a shallow soil grave without drainage or runoff controls. The size of the burial site is estimated at 10 feet by 20 feet.

During an inspection, EPA observed that the burial site did not have proper controls for drainage and as a result illegal discharges were contaminating a nearby stream. EPA initiated an enforcement action which resulted in the feedlot owner implementing proper carcass composting techniques, including collecting all leachate and runoff from the composting area to prevent illegal discharges to the stream.

Calculation of pollution reductions:

Step A Determine the number of burial sites [1 site].

Step B Determine the average surface area of each burial site (10 ft × 20 ft = 200 ft^2).

Step C Calculate the volume of leachate per mortality using annual rainfall data (annual rainfall for Washington county Iowa is 35.997 inches/yr):

[burial site surface area (200 ft^2)] × [annual rainfall (35.997 inches/yr)] × [1 ft/12 inches] × [evaporation factor (0.45)] = [volume of leachate (269 ft^3/yr)]

Step D Calculate pollutant loads per mortality for BOD_5, COD, chloride, potassium, ammonia, and dissolved solids using the volume of leachate and carcass leachate characteristics (see Table 3-3):

[BOD_5 load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (31,000 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 520 lb/yr

[COD load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (72,000 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 1,210 lb/yr

[Chloride load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (270 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 4.53 lb/yr

[Potassium load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (430 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 7.21 lb/yr

[Ammonia load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (2,100 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 35.2 lb/yr

[Dissolved solids load per site (lb/yr)] = [volume of leachate (269 ft^3/yr)] × [pollutant concentration (5,100 mg/L)] × [28.3 L/ft^3] × [1 lb/454,000 mg]
= 85.5 lb/yr

Step E Calculate the total baseline annual loads by summing the pollutant loads across all burial sites:

Since there is only one burial site for this case the total baseline loads are equal to those estimated under Step D:

[Baseline BOD_5 load (lb/yr)] = 520 lb/yr

[Baseline COD load (lb/yr)] = 1,210 lb/yr

[Baseline Chloride load (lb/yr)] = 4.53 lb/yr

[Baseline Potassium load (lb/yr)] = 7.21 lb/yr

[Baseline Ammonia load (lb/yr)] = 35.2 lb/yr

[Baseline Dissolved solids load (lb/yr)] = 85.5 lb/yr

Step F Calculate pollutant reductions from enforcement action assuming that proper disposal of carcasses will result in zero discharge of leachate to receiving waters:

[pollutant reductions (lbs/yr)] = [total baseline pollutant load (lbs/yr)] – [post modification pollutant loads (0 lbs/yr)]

Step G Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Proper Carcass Disposal;
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 520 pounds;
- **Pollutant, Amount and Unit:** COD and 1,210 pounds;
- **Pollutant, Amount and Unit:** Chloride and 4.53 pounds;
- **Pollutant, Amount and Unit:** Potassium and 7.21 pounds;
- **Pollutant, Amount and Unit:** Ammonia and 35.2 pounds;
- **Pollutant, Amount and Unit:** Dissolved Solids and 85.5 pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.3 Hazardous Waste

3.3.1 Hazardous Waste Management

3.3.1.1 Background

Hazardous wastes are generally regulated by the Resource Conservation and Recovery Act (RCRA) and cleaned up under the RCRA Corrective Action Program or CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act; also known as Superfund). RCRA is comprised of three major programs: Subtitle C (the hazardous waste management program), Subtitle D (the solid waste program), and Subtitle I (the UST program). Under Subtitle C, EPA has developed a comprehensive program to ensure that all hazardous waste is safely managed from the time it is generated to its final disposition at a Treatment, Storage, or Disposal (TSD) facility. The objective of the “cradle-to-grave” management system is to ensure that hazardous waste is handled in a manner that protects human health and the environment. To this end, there are Subtitle C regulations for the generation, transportation, and treatment, storage, or disposal of hazardous wastes.

Through the RCRA Corrective Action Program, EPA requires the investigation and cleanup, or in-situ or ex-situ treatment of hazardous releases at RCRA facilities. The corrective action program is structured around elements common to most cleanups under other EPA programs: an initial site assessment, characterization of the contamination, and the evaluation and implementation of cleanup alternatives, both immediate and long-term. Components of a cleanup action can impact all media types, including releases to the air, surface or groundwater, and cleanup of contaminated soil.

On-going Releases Category complying actions that would impact the management of hazardous and non-hazardous waste include:

- HW Use reduction;
- Use reduction;
- HW Treatment;
- Treatment;
- HW Disposal change;
- Disposal change;
- HW Storage change;
- Storage change;
- HW Waste containment; and
- Waste containment

As described in Section 2.2 for Removal and Restoration Category actions, many RCRA corrective action and CERCLA related cases will involve cleanup of contaminated media or material that is already in the environment. It is also possible that RCRA subtitle C actions, RCRA corrective actions and/or CERCLA cleanups may also include use reduction, treatment, storage, disposal, or containment of on-going releases as well. In these cases, On-going Releases Category complying actions apply and should be reported using the following types of units:

Table 3-4. Categorization of Wastes Addressed through Enforcement

Type of Material Addressed, Remediated, Cleaned up	*Performance Measure in which Benefits are Counted*	*Applicable Unit*	*Impacted Medium*
Hazardous waste material that meets the regulatory definition of "hazardous waste" and is not mixed with an environmental medium.	**"Hazardous Waste Treated, Minimized or Properly Disposed of"**	**Pounds**	**Land or Soil**
Hazardous or toxic materials/substances that: **a) contain hazardous or toxic constituents,** **b) do <u>not</u> meet the regulatory definition of "hazardous waste" and,** **c) are not mixed with an environmental medium.**	**Depending on the medium impacted -**		
	"Estimated Toxics and Pesticides Reduced, Treated or Eliminated"	**Pounds**	**Land**
	"Estimated Air Pollutants Reduced, Treated or Eliminated"	**Pounds**	**Air**
	"Estimated Water Pollutants Reduced, Treated or Eliminated"	**Pounds**	**Water**
"Hazardous Waste" or other hazardous or toxic materials/substances that have contaminated an environmental medium such as groundwater aquifer, soil or sediment, and structures or debris such as wood, plastic, synthetic material or decommissioned equipment that is contaminated with "hazardous waste" or other hazardous or toxic material/substance.	**Depending on the medium impacted –**		
	"Estimated Contaminated Water/Aquifer to be Cleaned Up"	**Cubic Yards**	**Water**
	"Estimated Contaminated Soil/Debris to be Cleaned Up"	**Cubic Yards**	**Land or Soil**

Note that hazardous waste cases involving disposal or storage changes are On-going Releases Category only when there are on-going releases to the environment from the current storage or disposal practice. Hazardous waste disposal or storage changes are Prevention of Future Releases Category when there are not on-going releases and the enforcement action is required to prevent potential releases.

When reporting volume of contaminated media addressed by the action, the preferred units to report in ICIS are cubic yards. The volume of media that should be estimated for various types of response actions is shown in Table 3-5.

Table 3-5. Volume of Media to Be Estimated for Various Types of Response Actions

Type of Response Action	Volume of Media to be Estimated	Unit to Report in ICIS
Soil (including mine tailings)	Volume of soil, fine debris, or tailings that are being addressed (treated, removed, capped, stabilized) by the response action.	Cubic Yards
Groundwater/NAPL hydraulic containment	Volume of aquifer formation (not just the water) that is contaminated above Record of Decision (ROD) cleanup standards and will be subject to the response action.	Cubic Yards
Landfill/Dump/Waste Pile/Impoundment	Volume of soil, waste, or debris that is being addressed (treated, removed, capped, stabilized) by the response action.	Cubic Yards
Soil vapor extraction (SVE)	Total volume of soil that will be subject to a concentration reduction from SVE or volume of soil subject to vacuum to achieve vapor recovery with SVE.	Cubic Yards
Vapor intrusion (point of entry control)/Landfill gas collection	Volume of air/vapor which will be diverted or treated by the vapor intrusion control system over its expected lifetime.	Cubic Yards
Non-aqueous phase liquid (NAPL) recovery	Volume of formation impacted with NAPL that will be subject to the recovery technology. This volume may also be the zone in which NAPL is known to occur and in which a remedy will be applied to address it.	Cubic Yards
Sediment	Volume of sediment to be addressed by the response action.	Cubic Yards
Surface water	Volume of water, in-situ, within the surface water body that is contaminated and that will be addressed by the response action.	Cubic Yards
Mine drainage diversion and/or treatment (point of entry control)	Volume of drainage water that will be diverted or treated by the mine drainage diversion and/or treatment system over its expected lifetime.	Cubic Yards
Container (e.g., drum) and large debris removal	Volume of material removed in containers or volume of large-scale material removed, stabilized, or disposed.	Cubic Yards

3.3.1.2 Calculation Methodology

The calculation methodology to determine hazardous waste reductions includes the following steps:

Step A Identify the complying action applicable to the hazardous media/waste impacted by the action.

Step B For hazardous waste cases involving on-going releases that will be addressed through use reduction, treatment, storage or disposal changes and/or containment changes, report either the volume (in cubic yards) or pounds of hazardous waste.

3.3.1.3 Examples

Example 1. Hazardous Waste Management - Use Reduction

ABC Chemical Company is currently generating a waste ash in their process which contains dioxins formed during a process combustion step. The facility has been cited for improper storage and disposal of this material. In response to a RCRA Subtitle C Order, the facility is proposing to eliminate this waste by incorporating a change in their production process and the pre-cursor chemicals used, thereby, eliminating the possible formation of dioxin in the waste ash. Currently, the facility generates one ton of ash per month. To determine the environmental benefit from this waste minimization (use reduction) activity, use the current ash production rate and scale the amount of hazardous material eliminated to one year's worth of benefits.

Step A Complying action is use reduction

Step B Since the hazardous waste is not contaminated environmental media, report the annual amount of hazardous waste impacted by the action in pounds as follows:

1 ton ash/month × 12 months/year × 2,000 lbs/ton = 24,000 lbs waste ash

Input for ICIS:

- **Complying Action:** HW Use Reduction;
- **Pollutant:** Hazardous Waste;
- **Amount and Unit:** 24,000 lbs; and
- **Media:** Land
Counted Under Reporting Measure: Hazardous Waste Treated, Minimized, or Properly Disposed of (pounds)

Example 2. Hazardous Waste Management – Off-site Treatment

ABC Chemical Corporation is subject to a RCRA Subtitle C Order requiring treatment of an F001 solvent waste (containing methylene chloride) that is currently stored at the facility. The facility will send out ten 55-gallon drums of material for incineration treatment. The density of methylene chloride is 11.149 lbs/gallon.

Step A Complying action is treatment

Step B Since the hazardous waste is not contaminated environmental media, report the annual amount of hazardous waste sent off-site for treatment in pounds as follows:

10 drums F001 × 55 gallons/drum × 11.149 lbs/gallon = 6,132 pounds of F001.

Input for ICIS:

- **Complying Action:** HW Treatment;
- **Pollutant:** F001;

- **Amount and Unit:** 6,132 lbs; and
- **Media:** Land
  Counted Under Reporting Measure: Hazardous Waste Treated, Minimized, or Properly Disposed of (pounds)

Example 3. Hazardous Waste Management – On-site Treatment

ABC Company is a furniture manufacturer that generates solvent degreaser (1,1,1 trichloroethane; hazardous waste code F002) from painting and refinishing operations. The facility generates approximately 55 gallons of spent 1,1,1 trichloroethane each month from its 100-gallon degreasing tank. A RCRA Subtitle C order was issued to the company for the storage of unmarked and unlabeled containers accumulating F002 waste next to the degreasing tank. In response to the Order, the facility properly marked and labeled the storage containers of 1,1,1 trichloroethane and installed a solvent distillation unit to recycle the waste. According to the facility, the F002 will be reduced from 55-gallons per month to 15 gallons.

Step A Complying actions that apply are Treatment and Labeling – Identification (which is a work practices category complying action)

Step B Since the hazardous waste is not contaminated environmental media, report the annual amount of F002 treated on-site in pounds as follows:

40 gallons per month (55 gallons reduced to 15 gallons) × 11.02 lbs/gal = 165.3 lbs/mo × 12 mo/yr = 1,984 lbs of waste minimized by treatment each year

Input for ICIS:

- **Complying Action:** HW Treatment;
- **Pollutant:** F002;
- **Amount and Unit:** 1,984 lbs; and
- **Media:** Land.

Note: You would also report under the Work Practices category the complying action "Labeling – Identification".

Example 4. Open Dump Closure with Containment and Treatment

An order-mandated closure of an open dump will result in significant environmental benefits from the following activities:

- Containment of the dump waste through regrading, slope stabilization and capping of the current dump. The estimated volume of contaminated landfill waste is 10,400,000 cubic yards;
- Collection and treatment of contaminated leachate using interception trenches and French drains and proper treatment of the leachate in either an on-site or off-site location. The estimate of total pollutants reduced through the treatment step was 5,325,114 pounds;

- Control of stormwater at the dump site by requiring design, construction, and maintenance of a runoff collection system to capture and treat stormwater from the 68 acre site. Using the Non-construction Industrial SW calculator, the estimated reduction in stormwater sediment was 527,105 pounds; and
- Capture and incineration of landfill methane where use of the Landfill Gas Emissions Model (LandGEM) identified a peak year methane generation rate of 4.016×10^7 cu.meters/year and an average of 58,940,000 pounds of methane reduction/yr.

Step A Complying actions that apply are Waste Containment and Treatment

Step B The unit that applies for waste containment is cubic yards of the contaminated landfill waste. For the contaminated leachate constituents, contaminated stormwater sediment and landfill methane gas collection and incineration, the units for reporting to ICIS are in pounds.

Input for ICIS:

- **Complying Action:** Waste Containment
- **Pollutant:** Contaminated Landfill Waste;
- **Amount and Unit:** 10,400,000 cu.yd.; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be cleaned up (cubic yards)

AND

- **Complying Action:** Treatment;
- **Pollutant:** Contaminated Leachate;
- **Amount and Unit:** 5,325,114 pounds/year.; and
- **Media:** Water (ground)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Complying Action:** Treatment;
- **Pollutant:** Sediment;
- **Amount and Unit:** 527,105 pounds/year.; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Complying Action:** Treatment;
- **Pollutant:** Methane;
- **Amount and Unit:** 58,940,000 pounds/year.; and
- **Media:** Air

Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

Example 5. Hazardous Waste Management – Disposal Change

ABC University is a teaching college that operates a number of chemistry/diagnostic labs that generate hazardous wastes. A RCRA Subtitle C Order was issued to the facility for improper disposal (in the lab sinks) of spent acetone (F003) generated from glassware cleaning and spent acetonitrile (a D001 solvent solution) generated from High Pressure Liquid Chromatography (HPLC). Both wastes were generated at an estimated rate of 10-gallons per month. In response to the Order, the university took complying actions that resulted in the proper storage of these wastes in 1-gallon containers and proper disposal. The density of the material is estimated as 6.5 lbs/gallon for acetonitrile and 6.6 lbs/gallon for acetone.

Step A Complying action is disposal change

Step B Since the hazardous waste is a liquid, use the density of the material to report the annual weight of hazardous waste impacted by the action as follows:

10-gallons acetonitrile/mo × 12 mo/yr = 120 gallons/yr. x 6.5 lbs/gal = 780 lbs/yr.

10-gallons acetone/mo × 12 mo/yr = 120 gallons/yr. x 6.6 lbs/gal = 792 lbs/yr.

Input for ICIS:

- **Complying Action:** HW Disposal Change;
- **Pollutant:** Hazardous Waste;
- **Amount and Unit:** 1,572 lbs/yr; and
- **Media:** Land

Counted Under Reporting Measure: Hazardous Waste Treated, Minimized, or Properly Disposed of (pounds)

Example 6. RCRA Uncontained Waste Disposal

ABC Company is an auto salvage yard that receives 1,000 used vehicles per month. The facility operated a mobile auto crushing unit that processes, on average, 30 cars per day. The crushing activity was conducted on the open ground which was visibly stained. Based on estimates provided by the operator, each vehicle, on average, contained 0.5-1-gallon of residual gasoline in the gas tank (D001/D018) and approximately 1.5 gallons of oil in the mechanical systems. A RCRA 3008 Order was issued and required ABC Company to remove all fluids from each vehicle prior to crushing and to ship the items off-site for disposal.

Step A Complying action is disposal change

Step B The wastes improperly disposed in the case are liquids, using an estimated density of 6.1 lbs/gallon for gasoline and 7.6 lbs/gallon for oil, report the annual weight of waste impacted by the action as follows:

1,000 Vehicles/month × 0.5 gallon gasoline/vehicle = 500 gallons of gasoline per month × 12 mo/yr = 6,000 gallons of gasoline/year x 6.1 lbs/gallon = 36,600 lbs/yr diverted from improper disposal

1,000 Vehicles/month × 1.5 gallon oil/vehicle = 1,500 gallons of oil per month × 12 mo/yr = 18,000 gallons of oil/year x 7.6 lbs/gallon = 136,800 lbs/yr diverted from improper disposal

Input for ICIS:

- **Complying Action:** Disposal Change;
- **Pollutant:** Gasoline;
- **Amount and Unit:** 36,600 lbs/yr; and
- **Media:** Land

Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

AND

Input for ICIS:

- **Complying Action:** Disposal Change;
- **Pollutant:** Motor Oil;
- **Amount and Unit:** 136,800 lbs/yr; and
- **Media:** Land

Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 7. RCRA Waste Storage

Step A An inspection of ABC Dry Cleaning Company identified improper storage of their perchloroethylene (PERC). The enforcement action will result in proper storage of the material on-site. The amount of material stored on-site is 500 gallons. Complying action is storage change.

Step B Since the waste improperly stored in the case is a liquid, report the annual waste impacted by the action in pounds using the density of the material (From Table 2-2 density of PERC is 13.522 lbs/gallon) as follows:

500 gallons x 13.522 lbs/gallon = 6,761 lbs

Input for ICIS:

- **Complying Action:** Storage Change
- **Pollutant:** Perchloroethylene
- **Amount and Unit:** 6,761 lbs; and
- **Media:** Land

Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated , or Eliminated (pounds)

Example 8. RCRA SWMU Corrective Measures

EPA issued a RCRA 3008(h) administrative order requiring a respondent to conduct a RCRA Facility Investigation to determine whether hazardous waste or hazardous materials had been released from any solid waste management units at the site. EPA also requires the respondent to perform a corrective measures study to identify remedies necessary to prevent and/or remediate any releases of hazardous wastes or hazardous materials. The respondent will be required to take action to remove contaminated debris and address contaminated sludge and other SWMUs waste piles that may be found to contain hazardous constituents. The areas to be addressed are: 12,000 cubic feet of process waste, 365 tons of process sludge and 9,200 cubic yards of contaminated solid waste management piles.

The benefits from this case will be reported in more than one category because they include removal of contaminated media and waste containment as part of an on-going release.

The complying action for the process waste to be removed is "Removal of Contaminated Media" and the pollutant to report is contaminated debris. The volume of material is calculated as:

12,000 cu.ft x 1 cu.yd/27 cu.ft = 444 cu.yds.

The sludge will be contained in place. The complying action is "Waste Containment" and the pollutant to report is Solids, Sludge, tot. lbs. dry weight. The mass of material is calculated as:

365 tons x 2,000 lbs/ton = 730,000 lbs.

The contaminated solid waste management piles will be contained on-site. The piles consist of contaminated solid waste and soil. The complying action to report is "Waste Containment" and the pollutant to report is contaminated soil because the materials are comingled. The volume of the waste management piles is 9,200 cubic yards.

Input for ICIS:

- **Complying Action:** Removal of Contaminated Media
- **Pollutant:** Contaminated Debris
- **Amount and Unit:** 444 cu.yds; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yds)

AND

Input for ICIS:

- **Complying Action:** Waste Containment
- **Pollutant:** Solids, Sludge, tot. lbs. dry weight
- **Amount and Unit:** 730,000 lbs; and

- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

AND

Input for ICIS:

- **Complying Action:** Waste Containment
- **Pollutant:** Contaminated Soil
- **Amount and Unit:** 9,200 cu.yds; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yds)

3.4 Industrial Processes

3.4.1 Heat Reduction

Background and Calculation Methodology

Enforcement actions expected to reduce heat discharges are those associated with changes to cooling water systems. Industrial cooling water systems generally operate as either “once-through” systems or as a “closed-loop” system. Typically, older plants would have once-through cooling water systems that intake cooling water from a stream/river, use it with heat exchangers to absorb heat from a process stream, and then discharge the water that is now at an elevated temperature to the same water body it came from. The discharge of water at elevated temperatures impacts aquatic species survival and breeding patterns. New and upgraded plants will use closed-loop cooling water systems. Closed-loop systems take in less water and re-use it so that the heat is dissipated to the atmosphere through a cooling tower and the water reused. Conversion of a cooling water system from a once-through to a closed-loop system would be expected to reduce the amount of heated cooling water that is discharged, thus resulting in a reduction of heat into the receiving water. For these types of cases, report the change in the total BTUs that would be discharged.

Enforcement actions that will result in reductions of heat into a receiving water body can be reported in ICIS using a British Thermal Unit (BTU) measurement BTU can be calculated using information on water flow and water temperature for fresh water or based on the difference between annual pre-compliance and post-compliance emissions.

Examples

Example 1. Where annual heat load is specified by MOU and Permit

ABC Energy Power Station currently uses a once-through cooling water system and under an old Memorandum of Agreement (MOA) has a specific restriction on the annual heat load the facility can discharge to their receiving water of 42 Trillion BTUs/yr. Under the plant’s new permit (required by an enforcement order), the facility’s discharge of condenser cooling water (cooling tower blowdown) will be restricted to an annual heat load of 1.7 Trillion

BTUs/yr. The change in the heat discharged will be 42 Trillion BTUs/yr – 1.7 Trillion BTUs/yr = 40.3 Trillion BTUs/yr.

Input for ICIS is as follows:

- **Complying Action:** Heat Reduction;
- **Pollutant:** BTU;
- **Amount and Unit:** 40,300,000,000,000 BTUs and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Thermal Pollution Reduced (Water)(BTUs)

Example 2. Where annual heat load is calculated for pre-compliance

XYZ Energy Power Station currently uses a once-through cooling water system that discharges 2 million gallons per day (MGD) of cooling water with an average of a 5°F increase between the water intake temperature and the cooling water outfall temperature. Under an enforcement order, the plant is converting to a closed-loop system with permit restrictions of 1.7 billion BTUs/yr. annual heat load. The plant operates full-time over the year.

To determine the pre-compliance heat load using the fresh water equation:

BTU/hr = Water flow (gallons/min) × (Temperature out – Temperature in °F) × 500
(Source: American Industrial Heat Transfer, Inc.; http://www.aihti.com/pdf/conversions.pdf)

BTU/hr = 2 million gallons/day × 1 day/24 hrs × 1 hr/60 min × 5°F temperature increase × 500 = 3.47 million BTU/hr.

BTU/yr = 3.47 million BTU/hr × 8,760 hours operation/yr = 30.4 billion BTUs/yr

The change in the heat discharged will be 30.4 billion BTUs/yr – 1.7 billion BTUs/yr. = 28.7 billion BTUs/yr.

Input for ICIS is as follows:

- **Complying Action:** Heat Reduction;
- **Pollutant:** BTU;
- **Amount and Unit:** 28,700,000,000 BTUs and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Thermal Pollution Reduced (Water)(BTUs)

3.4.2 NPDES Discharge Change and NPDES Process Change

3.4.2.1 Background

The CWA requires point sources discharging to waters of the United States to obtain a National Pollutant Discharge Elimination System (NPDES) Permit. The NPDES program is implemented through site-specific or general permits that may be as stringent as or more stringent than national regulations. The NPDES program is enforced by comparing actual discharges or discharge conditions to the permitted level of pollutant discharges or discharge conditions.

The NPDES program regulates industrial process discharges from direct and indirect dischargers, municipal sewage treatment plant effluent, and stormwater runoff. Direct dischargers discharge water directly to surface waters while indirect dischargers discharge to a publicly owned treatment works (POTW). Indirect industrial discharges are regulated under the Pretreatment Program. Limitations may be set for indirect dischargers to prevent interference with POTW treatment processes or pass-through of the pollutants to surface waters. EPA's Office of Water, Office of Science and Technology has set effluent limits for various industries. Information can be found on their website at www.epa.gov/waterscience/guide. The regulations are listed in 40 CFR Part 401 through Part 471.

General permits cover several facilities that have the same type of discharge and are located in a specific geographic area. General permits apply the same or similar conditions to all dischargers covered under the general permit. An example would be an industrial facility whose stormwater discharges are covered by a general stormwater permit. Information on general permits can be found on EPA's website at http://cfpub.epa.gov/npdes/permitissuance/genpermits.cfm.

Many NPDES cases will involve complying actions that reduce, eliminate or treat specific pollutants. The pollutant reduction may be realized through application of a treatment technology or process-based activities including, process modifications, chemical use reduction, chemical substitution, or implementation of a best management practice. The typical complying actions that apply to these cases are:

- NPDES Discharge Change; and
- NPDES Process Change.

These complying actions will also apply to brine wastewaters. EPA has seen in recent years a number of large enforcement cases that deal with petroleum-bearing formations which contain brine (altered seawater trapped in sediment pores) and where large volumes of brine usually accompany oil and gas production. High chloride concentrations along with other constituents of brine can be toxic to crops, corrosive to metal, and unsafe to drink. OC has developed a standard methodology (based on the approach presented in Section 3.4.2.2 below) and a calculator tool to assist the regions in calculating brine pollutant reductions. The tool consists of a simple excel spreadsheet with three input fields (brine volume, pre-compliance Total Dissolved Solids (TDS) concentration, and post-compliance TDS concentration). For a given volume of brine, the tool uses case-specific or industry standard concentrations to generate pounds of TDS removed by the action.

3.4.2.2 Calculation Methodology

To calculate pollutant reductions for water, use the difference between the permit limit and the sampled value, expressed as a concentration and/or mass. For cases based on a one-day violation, use the daily maximum concentration as your exceedance concentration and calculate the loadings for one-day pollutant reduction. For cases based on a one- to three-month violation, use the highest monthly average concentration as your initial out-of-compliance concentration and calculate the reductions for that time period.

If facility history indicates that there has been potentially long term non compliance, for example, it has had more than three months of exceedance or is on the EPA Watch List or QNCR Exceptions list, you may want to assume that they would have continued violating throughout the year had the action not stopped. For these cases, use the highest monthly exceedance and calculate one year's worth of reductions.

The following steps outline the general method that should be followed to calculate the pollutant reduction for exceedances that are more than a one day event. This method can be used for all pollutants for which pre-compliance and permit concentrations are known.

Methodology to Calculate Pollutant Reductions for Water

Step A Determine the monthly average "out-of-compliance" concentration of each pollutant in mg/L.

Step B Determine the enforceable limits for each pollutant in mg/L.

[In cases where both a maximum daily and a monthly average limit are given, the pollutant reduction should be calculated using the monthly average. Mass limits can be converted to concentration limits as follows:

Concentration limits (mg/L) = Mass limits (lbs/day)/ [Flow (MGD) × 8.34 lbs/MG/mg/L]

Step C Determine average flow in million gallons per day (MGD).

Step D Determine the concentration by which the pollutant is out of compliance by subtracting the permit limit from the "out-of-compliance" concentration.

Exceeded Concentration (mg/L) = Out-of-compliance concentration - Permit Limit

Step E Determine the exceeded loading in pounds by using the following formula:

Loading (lbs/day) = Exceeded Concentration (mg/L) × Flow (MGD) × 8.34

8.34 (Conversion Factor) = (g/1000 mg) × (lb/454 g) × (3.78 L/gal) × (1×10^{6} gal/MG)

Step F Report the total pollutant reduction in pounds in ICIS. Identify "Water (navigable/surface)" or "Water (wastewater to POTW)" as the impacted media.

3.4.2.3 Examples

Example 1. Permit Violation for Direct Industrial Discharger

The method used to calculate pollutant reductions for a permit violation by an industrial discharger is similar for all industries. The permit limits (either as a concentration or an allowable mass discharge) are compared with the average “out-of-compliance” pollutant concentration (or mass discharge) obtained from sampling. This example calculates a pollutant reduction from a chemical manufacturing plant but could be used for any industry.

NPDES sampling by the Sunburst Chemical Company indicates that the plant has been consistently discharging elevated concentrations of Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) for over four months. Under an enforcement order, the facility is upgrading their end-of-pipe treatment system to bring the plant into compliance. The highest monthly out of compliance average effluent concentrations of BOD and TSS are 100 mg/L and 120 mg/L, respectively, and the mill’s treatment system processes on average 6.0 million gallons per day (MGD). The plant’s permit specifies a BOD limit of 1,000 pounds/day and a TSS limit of 1,500 pounds/day. The plant discharges 365 days per year.

Since this facility has a history of out-of-compliance discharges, use their highest monthly average concentrations as the out-of-compliance concentration and determine one year’s worth of reductions. Since the enforceable limits for this example are mass limits (lbs/day), you can convert the out-of-compliance concentrations to mass using the facility flow and calculate the reduction of mass loading as follows:

Step A Out-of-compliance concentrations:

BOD = 100 mg/L
TSS = 120 mg/L

Converted to mass discharge:

BOD mass discharge = 100 mg/L × 6.0 MGD × 8.34 = 5,000 lbs/day
TSS mass discharge = 120 mg/L × 6.0 MGD × 8.34 = 6,000 lbs/day

Step B Enforceable limits in mass per day:

BOD = 1,000 lbs/day
TSS = 1,500 lbs/day

Step C Flow = 6.0 MGD

Step D BOD Exceeded Mass = 5,000 lbs/day - 1,000 lbs/day = 4,000 lbs/day
and TSS Exceeded Mass = 6,000 lbs/day - 1,500 lbs/day = 4,500 lbs/day

Step E Assume that the chronic nature of the plants exceedances will result in a full years worth of environmental benefit once the compliance action has been implemented. Pollutant Reduction (lbs) = Loading (lbs/day) × Time (days/year) × 1 year

BOD Reduction = 4,000 lbs/day × 365 days/yr. × 1 yr. = 1,460,000 lbs.
TSS Reduction = 4,500 lbs/day × 365 days/yr × 1 yr. = 1,640,000 lbs.

Step F **Input for ICIS is as follows:**

- **Complying Action:** NPDES Discharge Change;
- **Pollutant:** BOD, 5-day, 20 deg. C;
- **Amount and Unit:** 1,460,000 Pounds; and
- **Media:** Water (navigable/surface)
Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Solids, total suspended;
- **Amount and Unit:** 1,640,000 Pounds; and
- **Media:** Water (navigable/surface)
Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2. NPDES Pretreatment Permit Violation for an Indirect Discharger (Industrial Process Change)

[Note: For pretreatment cases, the time frame to use in determining pollutant reductions should be determined based on the nature of the case and best professional judgment. This may be a particular issue with batch processing where exceedances do not occur continuously.]

Sampling at ThinkFast Printed Wiring Board Manufacturing Corporation indicated elevated concentrations of cadmium during a two month period. The average elevated effluent concentration of cadmium for the two month period was 0.39 mg/L. ThinkFast discharges wastewater to the local POTW. Their pretreatment permit limits cadmium at a maximum daily effluent concentration of 0.14 mg/L and a maximum monthly average of 0.09 mg/L. Under an enforcement order, the facility is implementing a process change to bring the plant into compliance. The average annual discharge of the plant is 25 million gallons. The plant operates and discharges wastewater 5 days a week, 24 hours a day.

Step A Actual average concentration:

Cadmium = 0.39 mg/L

Step B Enforceable limit:

Cadmium = 0.09 maximum monthly average

Step C Flow = 25 MG/year

Compute flow in million gallons per day. The site operates 5 days a week.

Flow (MGD) = 25 MG/year × 1year/260 days = 0.0962 MGD

Step D Cadmium Exceeded Concentration = 0.39 - 0.09 = 0.30 mg/L

Step E Pollutant Reduction (lbs/day) = Incremental Concentration (mg/L) × Flow (MGD) × 8.34 (lbs/MG/mg/L)

Cadmium Loading = 0.30 (mg/L) × 0.0962 (MGD) × 8.34 = 0.2407 lbs/day

Step F Since the exceedances were only temporary, only two months of environmental benefit will be reported in ICIS. Therefore, Pollutant Reduction (lbs) = Loading (lbs/day) × 30 days/month × 2 months

Cadmium Reduction = 0.2407 lbs/day × 30 days/mo. × 2 mo. = 14.4 lbs

Input to ICIS is as follows:

- **Complying Action:** NPDES Process Change;
- **Pollutant:** Cadmium;
- **Amount and Unit:** 14.4 Pounds; and
- **Media:** Water (wastewater to POTW)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 3. Produced Water Brine

The methodology for brine cases calculates the pounds of TDS reduced when an enforcement action reduces or suspends on-going brine discharges. The methodology is based on the pre- and post compliance concentration of the brine. Case-specific TDS concentration levels should be used for the pre-compliance concentration when known. Ranges of typical produced water TDS concentrations are available via the US Geological Survey (USGS) database link referenced in the brine calculator tool. A conservative default value for typical produced water is 35,000 mg/l TDS[4]. For the post-compliance concentration, the TDS permit limit concentration should be used. For example, a case impacting a brine discharge of 30 gal/min. over a 6 month period with a pre-compliance concentration of TDS of 4,200 mg/L and a post-compliance concentration of TDS of 200 mg/L will result in the following calculation:

Step A Pre-compliance concentration:

TDS = 4,200 mg/L

Step B Post-compliance concentration:

[4] API, Publication 4758 Strategies for Addressing Salt Impacts of Produced Water Releases to Plants, Soil and Groundwater, September 2006.

TDS = 200 mg/L

Step C Flow = 30 gal/min

30 gal/min x 60 min/hr x 24 hr/day x MG/1,000,000 gal = 0.0432 MGD

Step D TDS Exceeded Concentration = 4,200 – 200 mg/L = 4,000 mg/L

Step E Pollutant Reduction (lbs/day) = Incremental Concentration (mg/L) × Flow (MGD) × 8.34 (lbs/MG/mg/L)

TDS Reduction (lbs/day) = 4,000 (mg/L) × 0.0432 (MGD) × 8.34 = 1,441 lbs/day

Step F Since the exceedances were for half of a year, six months of environmental benefit will be reported in ICIS. Therefore, Pollutant Reduction (lbs) = Loading (lbs/day) × 30 days/month × 6 months

TDS Reduction (lbs) = 1,441 lbs/day × 30 days/mo. × 6 mo. = 259,380 lbs

Input for ICIS is as follows:

- **Complying Action:** NPDES Process Change;
- **Pollutant:** Total Dissolved Solids;
- **Amount and Unit:** 259,380 Pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.4.3 Implement BMP: Stormwater Construction Activities

3.4.3.1 Background

Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat and high volumes of runoff can cause stream bank erosion. The NPDES Stormwater program requires operators of construction sites one acre or larger (including smaller sites that are part of a larger common plan of development) to obtain authorization to discharge stormwater under an NPDES construction stormwater permit. The NPDES stormwater permits for regulated construction activities focus on the development and implementation of stormwater pollution prevention plans. Environmental benefits of stormwater cases at construction sites are to be measured in terms of pounds of sediment reduced.

3.4.3.2 Calculation Methodology

EPA developed a spreadsheet model to estimate sediment reduction at construction sites as a result of the implementation of stormwater best management practices. The model is available as an Excel spreadsheet at http://intranet.epa.gov/oeca/NPMAS. The model utilizes the Revised Universal Soil Loss Equation (RUSLE) to determine soil loss and soil loss reduction. RUSLE was developed by the United States Department of Agriculture (USDA) to estimate erosion. The RUSLE equation uses the erosivity of rainfall, the erodibility of the soil, the length and slope of the land area, and cover and conservation management practices on the land to estimate erosion from a specific area. The RUSLE equation is expressed as:

$$T = RKLSCP$$

Where:

T	=	Predicted Soil Loss (tons per acre per year)
R	=	Annual Rainfall-Runoff Erosivity Factor
K	=	Soil Erodibility Factor
LS	=	Length/Slope Factor
C	=	Cover Management Factor
P	=	Conservation Practice Factor

For the purposes of EPA's model, T will be expressed as tons of sediment loss per construction site (or specified area of a construction site). The equation used in the EPA model is:

$$T = A \times (RF) \times K \times LS \times C \times [1 - (Eff. \times E)]$$

Where:

T	=	Predicted Soil Loss (tons)
A*	=	Area of Construction Site (in acres)
RF*	=	Erosivity Index (which incorporates the annual rainfall-runoff erosivity factor (R) with the time period of construction (F))
K	=	Soil Erodibility Factor
LS	=	Length/Slope Factor
C	=	Cover Management Factor
Eff.*	=	Efficiency of the Conservation Practice
E*	=	Effectiveness Factor for an existing BMP

* The area (A) and time period of construction (F) factors were added to the RUSLE equation to determine soil loss in tons. The conservation practice efficiency (Eff.) is being adjusted by the BMP effectiveness factor (E) to address cases where existing BMPs are improperly maintained. The conservation practice factor (P) is equal to [1 - Eff.]

The following steps outline the general method that should be followed to calculate the sediment reduction for construction stormwater cases:

Methodology to Calculate Sediment Reductions for Construction Stormwater Cases	
Step A	Determine the best method of using the EPA model for the specific site. If appropriate, split up the construction site into drainage areas or areas with specific BMPs.
Step B	Enter the disturbed area of the construction site (in acres) into the model.

Step C	Using the location and a one year time frame for the construction project, determine the location specific RF factor appropriate for the site. See EPA's website for Rainfall Erosivity Factor Calculator at http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm for determining the RF factor.
Step D	Select an appropriate soil type for the site. Alternatively, you can input a specific soil erodibility factor into the model.
Step E	Select an appropriate length and slope for the site. Alternatively, you can input a specific length/slope factor into the model.
Step F	The C factor for the site is being set to 1.0.
Step G	Determine the BMP Eff. factor for the site for pre-compliance conditions and the post-compliance conditions. If there are existing BMPs at the site that are not being maintained or are being used improperly, include an effectiveness factor (E) for the pre-compliance BMP efficiency factor.
Step H	Report the total sediment reduction (in pounds) from the model output into ICIS. Identify "Water (navigable/surface)" as the impacted media.

From an inspection, you should have information on the location, number of acres to be disturbed, existing erosion and sediment control BMPs that are used on site, and BMP changes that are being required as part of the enforcement action. This information is needed to determine the erosivity index (RF) factor, the area of construction (A) factor, and the efficiency of the conservation practice (Eff.) for the model. You may or may not have specific information to determine the other factors in the model. For each of these other factors, the model will present you with a drop down menu of choices. You should use your best professional judgment to select one of the drop down menu choices. If you do not know what menu item to select, then an average value can be used as described in the questions and answers below.

How do I determine the acreage (A) to use in this model?

The disturbed area that is the basis of the enforcement action (in acres) should be estimated and input for the area of construction (A) factor in the model.

How do I determine the rainfall-runoff erosivity (R) factor to use in this model?

Use the Texas A&M Erosivity Calculator located on the internet at http://ei.tamu.edu/index.html to determine the value to input for this factor. Inputs for the Texas A&M Erosivity Calculator are the location of the construction site (the city or county and the state) and a time period for construction. The spreadsheet model will provide you with the Internet link and the output from the erosivity index calculator can then be input into the model.

As an alternative to the Erosivity Calculator, the model includes a drop down menu where you can select the state in which the construction site is located (which will provide the model with a state specific default R factor).

What should the time frame be for calculating pollutant reductions for stormwater cases?

EPA is using an estimated benefit period of one year for construction stormwater cases to correspond with the one-year benefit periods for most other types of cases reported in ICIS. EPA realizes that the benefits from BMPs at construction sites may occur over shorter or longer time frames.

Thus, if you use the Texas A&M Erosivity Calculator, you should input the location of the construction site (using the city or county and the state) and a time period for construction. The time period of construction should be estimated as one year (e.g., input January 1, 2004 to December 31, 2004 into the erosivity index calculator). Or, if you use the drop down menu in the stormwater model as an alternative to the erosivity index calculator, you can select the state in which the construction site is located (which will provide the model with a state specific default R factor) and the model will automatically assume a one year time frame.

*How do I determine the soil erodibility (K) factor to use in this model***?**

Based on your general knowledge of the predominant soil type common in the area in which the construction site is located, you can select a soil type from the model drop down menu. Selection options include sandy loam, clay, loam, or silty clay loam. K values for each of these soil types are included in the spreadsheet model and range from 0.13 to 0.32. If the type of soil is unknown, then you can input an average value of 0.22 for this factor.

How do I determine the length/slope (LS) factor to use in this model?

For the length/slope factor, use your visual observations from the inspection to estimate whether the site slope would be considered predominantly flat, moderate, or steep and estimate an average slope length for the whole site. If there are significantly different grades at the construction site then subdivision of the construction area (modeling each separately) may be appropriate. If you do not have any information about the site to estimate a length/slope factor, then you can input an average value of 6.1, where typical LS factors range from 0.09 (for a 1% slope and 15 foot slope length) to 12.23 (for a 14% slope and a 1,000 foot slope length.)

What cover management (C) factor is used in this model?

EPA expects, for most cases, that the disturbed acreage of a construction site will have been cleared of cover. EPA is therefore assuming a cover factor of 1.0 in the spreadsheet model and no input for this factor is required.

How do I determine the efficiency of the conservation practice (Eff.) to use in this model?

The model will set default efficiency by the type of sediment erosion control practice (or BMP) that you select for current (or pre-compliance) conditions and for post-compliance conditions. The reduction in sediment loss between these conditions is the reduction that should be reported in ICIS. The types of BMPs used on the site or required by the enforcement action will determine which BMP efficiency you pick from the drop down menu. For the current conditions, use observations from the inspection on current erosion control BMPs to determine which item to select from the drop down menu. The requirements of the enforcement action will determine which BMPs are going to be put into place to address deficiencies for the post-compliance conditions.

How do I determine the effectiveness factor (E) of the existing BMPs present on site?

The effectiveness factor would be used in cases where BMPs currently exist at a site and are not working properly. This factor is an estimate of how well the existing BMPS are working. Use best professional judgment to estimate the effectiveness factor based on observations from the inspection. ***Example:*** You visit a site that has a silt fence installed, but about one third of the silt fence is falling down and torn. Because about 30 percent of the fence is not working properly, the effectiveness factor (E) is estimated to be 70 percent. If the site does not have existing BMPs then the E factor should be set to 100%.

Are return inspections required to collect information for the factor values in this model?

No. The sediment reductions calculated for a case and input into ICIS are estimates based on the information that you have for the case and your best professional judgment. The Office of Compliance is developing the construction site sediment reduction spreadsheet model in an effort to standardize the approach used by all the regions in estimating these sediment reductions.

What data should I start collecting at future inspections?

For future inspections, make observations that will help you determine factor values or which drop down menu options to select. For example:

- Request information on the disturbed acreage of the site;
- Request information on the time period for construction;
- Note the soil type common to the site area;
- Observe how steep the site appears to be an estimate average slope lengths; and
- Observe whether there are existing BMPs, and their condition.

What if the construction site has different slope characteristics in different areas?

If your site does not lend itself to one overall slope for the entire area, you can run the model multiple times to capture different slope characteristics present. ***Example:*** A site is 4 acres in area. About half of site has a moderate slope, and the remaining area has a steep slope. Run the model twice: 1) for the 2-acre area with moderate slope and 2) for the 2-acre area with a steep slope. The total amount of sediment loss will be the sum of the sediment loss from those two portions of the construction site.

What if the construction area has or will require multiple management practices?

Where different erosion and/or sediment loss management practices occur at different locations within a construction site, model each area separately and sum the sediment losses to determine the total site sediment loss. Where multiple BMPs are incorporated for the same area, use the cumulative efficiency of the practices in the spreadsheet model. For example, hydroseeding should result in a 50 percent sediment removal efficiency. If the site will also include straw bales then an additional 70 percent removal efficiency can be achieved. Overall the site would experience 50 percent sediment removal from hydroseeding + 70 percent removal of the remaining sediment loss (from the straw bales) = 0.5 + (0.70 × 0.50) = 0.5 + 0.35 = 0.85 or 85 percent total removal efficiency. The model has a separate tab to use if multiple BMPs apply. If a construction site has BMPs and they are not functioning, then the Eff. should be set to 0 as if there were no BMPs on site.

3.4.3.3 Example

Kandle Construction Company is building a shopping mall in Camden, New Jersey. The site is 5 acres in area and construction is occurring from May 1, 2004 through October 1, 2004. A site visit reveals that the site is located on an area with a moderate slope and sandy loam soil. Existing BMPs include a silt fence around approximately 2 acres of the site that slope towards a drainage ditch and no erosion control surrounding the rest of the site. The site visit showed that about one third of the silt fence was falling down and torn. The site will be addressed through an enforcement action requiring that the existing silt fence be repaired and properly maintained and the area of the construction site with no erosion controls will be hydroseeded.

Step A Determine the best method of using the EPA model for the specific site.

The site will be modeled to determine the current (pre-compliance) sediment loss and a post-compliance sediment loss for two areas: Area 1) the three acre area that has no current soil erosion BMP and Area 2) the two acre area that has a silt fence that is not being properly maintained. The post-compliance situation will include hydroseeding on Area 1 and silt fence repair on Area 2. The reduction in sediment loss (from pre-compliance to post-compliance conditions) for the two areas will be summed and reported in ICIS for this case.

Step B Enter the area of the construction site.

Area 1 = 3 acres
Area 2 = 2 acres

Step C Determine the location specific RF factor appropriate for the site from the website link provided in the model. (http://ei.tamu.edu/index.html) This website link is for the Texas A&M Erosivity Index Calculator.

For our example, "Camden, New Jersey" and the start and stop date for the construction project (assuming a one year construction period) are input into the erosivity index calculator and a (RF) value of 124.03 is provided as output from the calculator. This index factor is then input into the EPA spreadsheet model.

Step D Determine the appropriate K factor for the soil type.

For our example, “Sandy Loam” is selected from the drop down menu in the model.

Step E Determine the LS factor for the site. The model user may:

- Select the slope and slope length from a drop-down menu in the model (which will select an LS factor for the site); or
- Determine an LS factor by interpolating the information from an LS table provided in the model.

For this example, a “Moderate” slope with a slope length of “1,000 feet” are selected from the drop-down menus in the model.

Step F The C Factor is set in the model at 1.0.

Step G Determine the Eff. factor of the existing BMPs at the site.

For Area 1, “none” is selected from the list in the model.

For Area 2, “silt fence” is selected from the list in the model. Also, since the silt fence at the site is not being maintained properly, a BMP effectiveness factor will also be input into the model. The model user must use best professional judgment to estimate the effectiveness of the existing BMPs. For this site, because the about one third of the silt fence located on this site is falling down and torn, only two thirds of the fence is effective; the effectiveness factor is about 67 percent. For this example an E factor of 67% is input into the model.

Determine the Eff. factor for the post-compliance conditions at the site. For Area 1 chose “Hydroseeding” and for Area 2 chose “Silt Fence” from the drop down list in the model.

Step H After all inputs are made, the model will estimate the amount of sediment reduction for the construction site (or portion of the construction site modeled) as a result of the BMPs.

In this example the sediment reduction in pounds is:

Area 1 = 159,627 pounds
Area 2 = 49,165 pounds
For a total sediment reduction of 208,792 pounds

Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Stormwater Construction Activities;
- **Pollutant:** Sediment;
- **Amount and Unit:** 208,792 Pounds; and
- **Media:** Water (navigable/surface)

Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.4.4 Implement BMP: Industrial Stormwater

3.4.4.1 Background

EPA has developed a spreadsheet calculator to estimate pollutant reductions at industrial non-construction sites as a result of stormwater enforcement. Individual spreadsheet calculators have been developed for 19 of the 29 industries included in the September 29, 1995 FRN (60 FR 50804) for the Multi-sector General Permit (MSGP). The 1995 MSGP included stormwater characterization data by industry. These data were used as default "out-of-compliance" pollutants and concentrations in the spreadsheet calculators for those situations where specific case data are not available to characterize what is in the industrial stormwater and at what concentrations. The 1995 MSGP also included benchmark concentrations for a list of potential stormwater pollutants where these values "provide an appropriate level to determine whether a facility's stormwater pollution prevention measures are successfully implemented" (September 29, 1995 FRN, pp. 50824-50825). "These levels represent a target concentration for a facility to achieve through implementation of pollution prevention measures at the facility" (September 29, 1995 FRN, p.50825). The benchmark concentrations were used in the spreadsheet calculators as default discharge concentrations after compliance for those situations where a stormwater effluent limit does not exist. For the ten industries that do not have a specific calculator, the spreadsheet entitled "Other_Ind" should be used.

Three steps are necessary for the pollutant reduction estimation:

Step 1: Determine an estimated annual stormwater flow for the site, where:

Annual Stormwater Flow (Gallons/yr) = Size of site (affected acres) × 43,560 sq.ft./acre × average annual rainfall (inches/yr) × 1 ft/12 inches × 7.48 gallons/cu.ft. × runoff coefficient. The average annual rainfall is provided in the model by county and comes from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC). The runoff coefficient is provided in the calculator and is based on an EPA Region 3 Stormwater Pollution Prevention Plan.

Step 2: Determine the pollutant discharge load during "out-of-compliance" conditions, where:

Pollutant load (lbs) = Pollutant concentration (mg/l from the MSGP data or case specific monitoring data if available) × annual stormwater flow from Step 1 (gallons/yr) × 3.785 liters/gallon × 1 g/1000 mg × 1 lb/454 g × 1 yr × (1 – pre-compliance BMP efficiency)

<u>Step 3: Determine the pollutant discharge load after compliance. This can be determined in one of two ways:</u>

If Stormwater Effluent Levels Exist:

Pollutant load after compliance (lbs) = Pollutant effluent limit (mg/l from the stormwater permit) × annual stormwater flow from Step 1 (gallons/yr) × 3.785 liters/gallon × 1 g/1000 mg × 1 lb/454 g × 1 yr

[Note: If a general stormwater permit for an industry category exists and it includes specific stormwater pollutant effluent limits, then those limits could be used to characterize post-compliance pollutant concentrations regardless of whether the facility in the enforcement action has applied for the general permit or not.]

If No Stormwater Permit or Effluent Level Exists:

Pollutant load after compliance (lbs) = Parameter benchmark value (mg/l from the 1995 MSGP benchmark table) × annual stormwater flow from Step 1 (gallons/yr) × 3.785 liters/gallon × 1 g/1000 mg × 1 lb/454 g × 1 yr

The "out of compliance" discharge load and pollutant discharge load after compliance are used to calculate the pollutant load reduction resulting from stormwater enforcement for one year after controls are in place. The parameter benchmark value is the pollutant concentration "above which EPA determined represents a level of concern. The level of concern is a concentration at which a stormwater discharge could potentially impair, or contribute to impairing water quality or affect human health from ingestion of water or fish. The benchmarks are also viewed by EPA as a level, that if below, a facility represents little potential for water quality concern." (September 29, 1995 FRN, pp. 50824-50825) In many cases, the parameter benchmark concentration is higher than the MSGP pollutant characterization concentration so that there is no reduction. In these cases, the final load reduction will result in a "N/A" in the calculator.

3.4.4.2 Calculation Methodology

Methodology to Calculate Pollutant Reductions for Industrial Non-construction Stormwater Cases	
Step A	Select the appropriate calculator to be used.
Step B	Enter the area of the site subject to stormwater runoff, in acres.
Step C	Select the county and state where the site is located.
Step D	Select the appropriate impermeability of surface at the site.
Step E	Select the appropriate pre-compliance BMP efficiency, if applicable.
Step F	If monitoring data is available and/or the stormwater permit includes numeric effluent limits, enter case specific "out-of-compliance" and "in-compliance"

	stormwater pollutant concentrations. If case specific monitoring data are not available, or the permit does not include numeric effluent limits, the spreadsheet calculator will use the default MSGP concentrations and/or bench marks for that industry category. [Note: In the event future MSGP effluent limits are adopted, use those instead.]
Step G	After all inputs are made, the model will estimate the final load reductions as a result of the enforcement action.

The following steps outline the general method that should be followed to calculate the pollutant reduction for industrial non-construction stormwater cases:

From an inspection, you should have information on the size of site subject to stormwater runoff, the city and state of the site, impermeability of the surface, and an estimate of the efficiency of control BMPs that are used on site. The city and state information is needed to determine the average annual rainfall, which is used together with the other factors to estimate annual stormwater flow in gallons per year for the model. For the “out-of-compliance” pollutant concentration, you may or may not have facility specific monitoring data available. If facility specific data are not available, data from the September 29, 1995 FRN for the Multi-sector General Permit (MSGP) are used. Similarly, for the post-compliance pollutant load, you may or may not have an existing stormwater permit that includes pollutant effluent limits. If effluent limits are not available, the MSGP parameter benchmark values are used as the end point of compliance. Additional information on how to determine the model inputs is provided in the questions and answers below.

How do I determine the size of the site subject to stormwater runoff to use in this model?

The size of site should represent the industrial area with buildings, pavement and storage that would potentially contaminate stormwater that ran across it. This area should not necessarily be the size of the whole site.

How do I determine the average annual rainfall to use in this model?

If specific data are available for the average annual rainfall, enter the rainfall amount, in inches per year, in the appropriate cell. If specific data are not available, use the drop down list to select the state and county of the site. The Average Annual Rainfall, in inches per year, will populate according to your selection.

How do I determine the runoff coefficient to use in this model?

Use the drop down list to select the impermeability of the site. Select “High” (80% impermeable) for sites including such things as asphalt, buildings, and paved surfaces. Select “Medium” (50% impermeable) for sites made up mainly of packed soils. Select “Low” (25% impermeable) for sites that are made up mainly of grassy areas.

How do I determine the efficiency of the existing BMPs?

The efficiency would be used in cases where BMPs currently exist at a site. This factor is an estimate of how well the existing BMPS are working. If the site does not have existing BMPs, select “None” from the drop down list. If the site does have existing BMPs, use best professional judgment to estimate the efficiency based on observations from the inspection and select the corresponding entry from the drop down list. ***Example:*** You visit a site that has catch basin inserts, but about one quarter of the inserts are clogged. Because about 25 percent of the inserts are not working properly, the efficiency is estimated to be 75 percent. Select “Some - 75% efficiency” from the drop down list.

How do I determine the case specific “out- of-compliance” pollutant concentration?

Monitoring data may not be available. If it is available, enter it (in mg/L) for the pollutants for which there are data. If it is not available, leave the facility specific data cells blank. Data from the September 29, 1995 FRN for the Multi-sector General Permit will be used as the default. When using the “Other_Ind” calculator, if specific monitoring data are not available, the MSGP values and parameter benchmark values provided in the spreadsheet should be entered as case specific “out-of-compliance” pollutant concentrations and “in-compliance” pollutant concentrations, respectively.

How do I determine the case specific “in-compliance” pollutant concentration?

Effluent limits may not be available. If the facility has an existing stormwater permit that includes pollutant effluent limits, then those limits can be used as the end point of compliance. If there is a general permit that covers the facility’s operations but the facility is not part of the general permit, then the general permit effluent limits can still be applied. This data should be entered (in mg/L) for the pollutants for which there are data. If the facility does not have an existing stormwater permit or the current permit does not include any effluent limits and inspection indicates that the facility is in noncompliance, then the MSGP parameter benchmark values will be used as the end point of compliance.

Are return inspections required to collect information for the factor values in this model?

No. The pollutant reductions calculated for a case and input into ICIS are estimates based on the information that you have for the case and your best professional judgment. The Office of Compliance has developed industrial non-construction pollutant reduction spreadsheet models in an effort to standardize the approach used by all the regions in estimating these reductions.

What data should I start collecting at future inspections?

For future inspections, make observations that will help you determine factor values or which drop down menu options to select. For example,

- Request information on the affected industrial area of the site;
- Request information on the permeability of the site surface;

- Request annual rainfall data specific to the location of the site;
- Observe whether there are existing BMPs, and their condition;
- Request pre-compliance pollutant concentration data; and
- Review permit data if available.

What if I have more specific information for a particular factor than the defaults provided in the model?

In most cases, you have the option to enter your own values into the model instead of using the default values.

3.4.4.3 Examples

Example 1. When No Stormwater Monitoring or Stormwater Permit Effluent Limits Are Available

Ye Olde Auto Salvage Yard operates in Emmaus, Pennsylvania. The auto salvage operations encompass two acres of the site. A site visit reveals that the operations occur primarily on asphalt surfaces. Existing BMPs include catch basin inserts, three-quarters of which are clogged. No stormwater monitoring data for the site are available and the facility permit does not include numeric effluent limits. The site will be addressed through an enforcement action requiring the implementation of BMPs to bring the site into compliance.

Step A Select the appropriate calculator to be used

The Auto Salvage tab of the AllInd_Ver1.2.xls calculator will be used since this is an auto salvage yard.

Step B Enter the area of the site subject to stormwater runoff, in acres.

2 acres

Step C Select the county and state for Emmaus, Pennsylvania.

For our example, "PA Lehigh" is selected from the drop down menu in the model.

Step D Select the appropriate impermeability of surface.

For our example, "High (ex. asphalt, building, paved surfaces)" is selected from the drop down menu in the model.

Step E Select the appropriate BMP efficiency, if applicable.

For this example, "Some – 25% efficiency" is selected from the drop down menu, because 75% of the catch basin inserts are not working properly.

Step F Enter case specific "in-compliance" and "out-of-compliance" concentrations.

Since no monitoring data or stormwater effluent limits are available, no data are entered in the table for case-specific data and the calculator will use default values.

Table 3-6. No Available Permit Data - Example Final Load Reductions

Pollutant	Final Load Reductions (lbs)
Biochemical Oxygen Demand (BOD_5)	**N/A**
Chemical Oxygen Demand (COD)	**N/A**
Nitrate + Nitrite Nitrogen	**18**
Oil & Grease	**N/A**
Total Phosphorus	**N/A**
Total Suspended Solids (TSS)	**4,737**
Total Aluminum	**98**
Total Iron	**119**
Total Lead	**1**

[Note: Load reductions are not calculated for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil & Grease, or total Phosphorus because the parameter benchmark values are higher than the MSGP values.]

Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Industrial Stormwater;
- **Pollutant, Amount and unit:** Nitrate + Nitrite Nitrogen and 18 Pounds
- **Pollutant, Amount and unit:** Total Suspended Solids (TSS) and 4,737 Pounds
- **Pollutant, Amount and unit:** Total Aluminum and 98 Pounds
- **Pollutant, Amount and unit:** Total Iron and 119 Pounds
- **Pollutant, Amount and unit:** Total Lead and 1 Pound; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2. When Monitoring Data Are Available and/or the Permit Includes Numeric Effluent Limits

Miller's Fine Cutlery is located in Chattahoochee, Florida. The production of cutlery takes place in buildings located on the site and there is raw material storage located outside of the buildings. The site covers approximately 0.5 acres. There are no existing stormwater BMPs on site. Recent sampling shows stormwater concentrations for total aluminum, total iron and total zinc are 14.2 mg/L, 6.3 mg/L and 4.0 mg/L, respectively. The facility has an industrial stormwater permit with discharge limits for total aluminum, total iron, and total zinc of 10.5 mg/L, 4.0 mg/L and 3.5 mg/L, respectively. The site will be addressed through an enforcement action requiring the implementation of BMPs to bring the site into compliance with its stormwater permit.

Step A Select the appropriate calculator to be used

The FabricatedMetal tab of the AllInd_Ver1.2.xls calculator is used since this site is involved in the manufacture of cutlery. The "Fabricated Metal Products" tab is selected for data entry.

Step B Enter the area of the site subject to stormwater runoff, in acres.

0.5 acres

Step C Select the county and state for Chattahoochee, Florida.

For our example, "FL   Gadsden" is selected from the drop down menu in the model.

Step D Select the appropriate impermeability of surface.

For our example, "High (ex. asphalt, building, paved surfaces)" is selected from the drop down menu in the model.

Step E Select the appropriate BMP efficiency, if applicable.

For this example, "None – No reductions" is selected from the drop down menu, because there are no BMPs in place.

Step F Enter case specific "in-compliance" and "out-of-compliance" concentrations.

For this example, the Case Specific "Out-of-Compliance" Pollutant Concentration column can be populated with the stormwater sampling data results. In this column, 14.2 is entered for total aluminum, 3.1 is entered for total iron, and 6.3 is entered for total zinc. The case specific "In-Compliance" Pollutant Concentration column can be populated with the facility's stormwater permit limits. In this column, 10.5 is entered for total aluminum, 4.0 is entered for total iron, and 3.5 is entered for total zinc.

Step G After all inputs are made, the model will estimate the final load reductions as a result of the enforcement action.

In this example the pollutant reductions in pounds are:

Table 3-7. Available Permit Data – Example Final Load Reductions

Pollutant	Final Load Reductions (lbs)
Biochemical Oxygen Demand (BOD_5)	**N/A**
Chemical Oxygen Demand (COD)	**N/A**
Nitrate + Nitrite Nitrogen	**4**
Oil & Grease	**N/A**
Total Phosphorus	**N/A**
Total Suspended Solids (TSS)	**386**
Total Aluminum	**21**

Total Iron	**13**
Total Zinc	**3**

[Note: Load reductions are calculated for nitrate + nitrite nitrogen and total suspended solids based on MSGP values and parameter benchmark values since no permit data are available. Load reductions are not calculated for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil & Grease, or total Phosphorus because the parameter benchmark values are higher than the MSGP values.]

Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Industrial Stormwater;
- **Pollutant, Amount and Unit:** Nitrate + Nitrite Nitrogen and 4 Pounds
- **Pollutant, Amount and Unit:** Total Suspended Solids (TSS) and 4386 Pounds
- **Pollutant, Amount and Unit:** Total Aluminum and 21 Pounds
- **Pollutant, Amount and Unit:** Total Iron and 13 Pounds
- **Pollutant, Amount and Unit:** Total Zinc and 3 Pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

Example 3. When Using the Calculator for Other Industries

Fresh Fields is a dairy processing facility located in Claremore, Oklahoma. Production of dairy products takes place in a set of buildings located over 10 acres. The area around the buildings is predominantly gravel and packed soil. There are no existing stormwater BMPs on site, no monitoring data are available, and the permit does not contain numeric effluent limits. The site will be addressed through an enforcement action requiring the implementation of stormwater BMPs to bring the site into compliance.

Step A Select the appropriate calculator to be used

The OtherInd tab in the AllInd_Ver1.2.xls calculator will be used since this site is involved in the production of food products, and there is not a calculator specific to food products.

Step B Enter the area of the site subject to stormwater runoff, in acres.

10 acres

Step C Select the county and state for Claremore, Oklahoma.

For our example, “OK Rogers” is selected from the drop down menu in the model.

Step D Select the appropriate impermeability of surface.

For our example, “Medium (ex. packed soils)” is selected from the drop down menu in the model.

Step E Select the appropriate BMP efficiency, if applicable.

For this example, “None – No reductions” is selected from the drop down menu, because there are no BMPs in place.

Step F Enter case specific in compliance and out of compliance concentrations.

For this example because the “Other_Ind calculator is being used, data from the appropriate MSGP and Benchmark Parameter Values tabs should be looked up and entered into the case-specific data table even though there are no monitoring data available and the permit does not include numeric effluent limits. Data from the “Dairy Products Facilities” table on the “Food Products MSGP” tab are entered in the Case Specific “Out–of-Compliance” Pollutant Concentration column as follows:

Biochemical Oxygen Demand (BOD) = 49.6,
Chemical Oxygen Demand (COD) = 149.3,
Nitrate + Nitrite Nitrogen = 0.99,
Oil & Grease = 6.1,
Total Phosphorus = 1.07 and
Total Suspended Solids (TSS) = 218.

[Note: The MSGP value for Total Kjeldahl Nitrogen (TKN) is not entered because there is no Parameter Benchmark Value for this pollutant with which to calculate a reduction.]

In the “In-Compliance” Pollutant Concentration from Permit column, data from the “Parameter Benchmark Values” tab are entered as follows:

Biochemical Oxygen Demand (BOD) = 30;
Chemical Oxygen Demand (COD) = 120;
Nitrate + Nitrite Nitrogen = 0.68;
Oil & Grease = 15;
Total Phosphorus = 2.0; and
Total Suspended Solids (TSS) = 100.

Step G After all inputs are made, the model will estimate the final load reductions as a result of the enforcement action.

In this example the pollutant reductions in pounds are:

Table 3-8. Other Industries – Example Final Load Reductions

Pollutant	Final Load Reductions (lbs)
Biochemical Oxygen Demand (BOD_5)	**897**
Chemical Oxygen Demand (COD)	**1,341**

Nitrate + Nitrite Nitrogen	**14**
Oil & Grease	**N/A**
Total Phosphorus	**N/A**
Total Suspended Solids (TSS)	**5,399**

Note: Load reductions are not calculated for Oil & Grease or Total Phosphorus because the parameter benchmark values are higher than the MSGP values.

Input for ICIS is as follows:

- **Complying Action:** Implement BMP: Industrial Stormwater;
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 897 Pounds
- **Pollutant, Amount and Unit:** Chemical Oxygen Demand (COD) and 1,341 Pounds
- **Pollutant, Amount and Unit:** Nitrate + Nitrite Nitrogen and 14 Pounds
- **Pollutant, Amount and Unit:** Total Suspended Solids and 5,399 Pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.5 Municipalities

3.5.1 Combined Sewer Overflow (CSO)

3.5.1.1 Background

Combined sewers collect both stormwater and sanitary sewage in the same piping system. During rainfall, the sewer capacity can be exceeded and the sewer may overflow, which is known as a combined sewer overflow or CSO. Combined sewer overflows may contain contaminated stormwater along with human and industrial waste. CSOs are primarily a problem in cities with old infrastructure and are most common in the Northeast and Great Lakes Region.

EPA's CSO Control Policy (published April 19, 1994) requires communities to implement nine minimum CSO controls. In addition, EPA expects communities with a combined sewer system to develop a long-term CSO control plan that will ultimately provide for full compliance with the Clean Water Act. The nine minimum controls are:

- Proper operation and maintenance of the combined sewer system;
- Maximum use of the collection system for storage;
- Review and modification of pretreatment requirements to assure CSO impacts are minimized;
- Maximization of flow to the publicly owned treatment works (POTW) for treatment;
- Prohibition of CSOs during dry weather;
- Control of solids and floatable materials in CSOs;
- Pollution prevention;
- Public notification of CSO occurrences and impacts; and
- Monitoring of CSO impacts and the effectiveness of CSO controls.

Long-term plans must evaluate control strategies and identify control measures and should include monitoring and modeling. EPA provides guidance on developing a long term CSO control plan on the Internet at http://cfpub.epa.gov/npdes/cso/cpolicy.cfm.

The complying actions that apply to CSO cases include:

- CSO Flow Reduction; and
- CSO Primary or Secondary Treatment.

System modifications that apply to each complying action include:

Complying Action	System Modification
CSO Flow Reduction	Reduction or elimination of combined sewer overflows through flow reduction practices.
CSO Primary or Secondary Treatment	Addition or upgrade of primary or secondary treatment for combined sewer overflows resulting in reduced pollutant discharges.

You can calculate pollutant reductions for BOD_5, COD, TSS, and nitrogen and phosphorus using information on the reduction of untreated CSO flow due to the action or information on the amount of direct discharged CSO flow that will undergo primary treatment due to the action. You should also report the volume of untreated discharge that will be reduced or eliminated as a result of the action. When available, use case specific information for flow and wastewater characterization. If flow and/or wastewater characterization data are not known the methodology and tables below can be used.

Table 3-9. Typical Pollutant Concentrations (in mg/L) by Source

Source	TSS	BOD_5	COD [a]	Total Kjeldahl Nitrogen	Total Phosphorus
Urban Stormwater Median Value (or range)	58	8.6	20-600	1.4	0.27
Combined Sewer Overflows	4-4,420 (median = 127)	4-699 (median = 43)	20-1,000 (median = 367)	0.01-16.6 (median = 3.6)	0.15-6.36 (median = 0.7)
Municipal Sewage, untreated	118-487 (median = 217)	88-451 (median = 209)	250-750	11.4-61 (median = 33)	1.3-15.7 (median = 5.8)
Municipal Sewage, treated	30	30	25-80	0.5-32 (median = 3.95)	0.07-6 (median = 1.65)

Source: USEPA, Report to Congress on the Impacts and Control of CSOs and SSOs. (except where noted).
a – From: Control and Treatment of Combined Sewer Overflows, P.E. Moffa, 1990.

Table 3-10. CSO Treatment Process Efficiencies (in %)

Physical Unit Process	Total Suspended Solids	BOD_5	COD	Total Kjeldahl Nitrogen	Total Phosphorus
Sedimentation					
Without chemicals	20-60	30	34	38	20
Chemically assisted	68	68	45	—	—
Swirl Regulator/ Concentrator	40-60	25-60	—	—	—
Screening					
Microstrainers	50-95	10-50	35	30	20
Drum screens	30-55	10-40	25	17	10
Rotary screens	20-35	1-30	15	10	12
Disc screens	10-45	5-20	15	—	—
Static screens	5-25	0-20	13	8	10

Source: Control and Treatment of Combined Sewer Overflows, P.E. Moffa, 1990.

3.5.1.2 Calculation Methodology

Step A Determine the volume of CSO flow that will undergo treatment due to the compliance action

This may occur as overflow reduction (e.g., greater storage in the system that results in more CSO flow through the POTW) or as primary treatment of CSO at the overflow point(s).

If flow is unknown it can be estimated as follows:

1. Estimate stormwater flow per year = yearly rainfall × surface area × runoff coefficient

   Where the surface area is the area of the municipality that feeds the combined sewer; and

   The runoff coefficient is an average value for the area (e.g., 0.3 for rural areas, 0.65-1.0 for urban areas)

2. Estimate the current volume of overflow per year = stormwater flow per year - extra POTW capacity above dry weather flow (this is usually 1 to 2 times the dry weather flow). This can be calculated as the POTW flow capacity above dry weather flow × the number of days per year overflows occur.

   Estimate the volume of overflow that undergoes treatment = volume of overflow per year × 0.85

	This assumes that 85% of the overflow per year will undergo treatment under the enforcement action (either as primary treatment of overflow or reduction in overflow)
Step B	Determine the pollutant concentration reduction as the pollutant concentration in untreated CSO - the pollutant concentration after treatment There are representative values that can be used to estimate CSO concentrations before and after treatment if system specific information is not available, See Table 3-9 above. (This calculation does not apply to microbials.)
Step C	Determine the reduction in pollutant loading Pollutant reduction (lbs/yr) = volume of overflow that undergoes treatment (volume/yr) × pollutant concentration reduction (mass/volume)
Step D	Report the total pollutant reduction (for one year) in pounds in ICIS. Identify “Water (navigable/surface) as the impacted media.

3.5.1.3 Example

As an example, a small urban municipality with a combined sewer system has the following characteristics:

- A drainage area of 1,000 acres;
- An average annual rainfall amount of 20 inches;
- An estimated overall runoff coefficient of 0.75;
- 30 days during the year where the POTW system exceeded its flow capacity; and
- POTW capacity of 1 MGD flow above its dry weather flow.

The municipality will incorporate sewer system and POTW system upgrades to maximize the system’s storage capacity during wet weather events. Therefore, a reduction in CSOs is occurring as a result of additional flow through the POTW.

Step A Stormwater flow per year = 20 inches/year × 1,000 acres × 0.75 (estimated runoff coefficient) × 1 ft/12 inches × 43,560 sq. ft. /acre × 7.481 gal/1 cu. ft. × MG/1,000,000 gal = 407.3 MGY

Overflow per year = 407.3 MGY - [30 days/yr. × 1 MGD] = 377.3 MGY

Volume of overflow that undergoes treatment = 377.3 MGY × 0.85 = 320.7 MGY

Volume of untreated discharge eliminated = 320.7 MG x 1,000,000 gal/MG = 320,700,000 gallons

Step B The system’s CSO flow will go from a median untreated overflow concentration to the effluent concentrations from the POTW. Using Table 3-9 estimates for representative CSO pollutant concentrations and average treated concentrations, the reductions will be:

TSS = 70 mg/l - 30 mg/l = 40 mg/l

BOD_5 = 40 mg/l - 30 mg/l = 10 mg/l

COD = 367 mg/l - 50 mg/l = 317 mg/l

Typical POTW effluents for Total N and Total P are equal to or higher than the typical values for these pollutants in CSO. Therefore, assume in this example that no additional treatment of these pollutants will be effected.

Step C TSS reductions = 320.7 MGY × 40 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 106,900 lbs/year TSS

BOD_5 reductions = 320.7 MGY × 10 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 26,700 lbs/year BOD_5

COD reductions = 320.7 MGY × 317 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 847,500 lbs/year COD

Input for ICIS is as follows:

- **Complying Action:** CSO Flow Reduction
- **Pollutant, Amount and Unit:** Untreated Discharge and 320,700,000 gallons
- **Media: Water (navigable/surface)**
  Counted Under Reporting Measure: Volume (gallons) of Untreated Discharge Eliminated

- **Pollutant, Amount and Unit:** TSS and 106,900 pounds
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 26,700 pounds
- **Pollutant, Amount and Unit:** COD and 847,500 pounds
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.5.2 Sanitary Sewer Overflow (SSO)

3.5.2.1 Background

Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport sewage to a publicly owned treatment works (POTW). However, occasional unintentional discharges of raw sewage from municipal sanitary sewers occur. These types of discharges are called sanitary sewer overflows (SSOs) and EPA estimates that there are at least 40,000 SSOs each year. SSOs have a variety of causes, including but not limited to severe weather, damage and blockages due to grease and roots, improper system operation and maintenance leading to inflow and infiltration (I/I) problems, and vandalism. The untreated sewage from these overflows can contaminate our waters, causing serious water quality problems.

Capacity, Management, Operation, and Maintenance (CMOM) techniques as well as system rehabilitation and diagnostic methods have been shown to reduce SSO occurrences and volumes. Examples of CMOM and I/I reduction techniques include implementing central control of system maintenance (for systems that have fragmented authorities with control over pieces of the system), tracking and recording service complaints, repairing or replacing manhole structures, identifying and disconnecting un-permitted sources of stormwater inflow on private property, and clarifying how to respond to system problems.

Most SSO cases will involve system upgrades and maintenance to eliminate SSOs. The complying action type that applies to these situations is

- SSO CMOM.

The impacted media should be identified as ”**water (navigable/surface)**”. Pollutant reductions occur from SSO cases due to the reduction in the amount of untreated sewage that overflows. The system improvements that result from these cases eliminate overflows. Thus, the sanitary wastewater stays in the system and is treated through the municipalities POTW, receiving the appropriate secondary treatment.

The main problem in estimating pollutant reductions for SSO cases is the lack of information on the volume of SSO that occurs. Based on the information that EPA has to date, the SSO CCDS methodology will use the following assumptions when case specific information are not available:

- Unless specific quantities are known or can be estimated through system modeling, the annual volume of SSO is assumed to be equivalent to 0.5 to 3% of the average daily wastewater flow to the POTW. If the average daily wastewater flow to the municipality is unknown (e.g., a satellite system), you can estimate the daily wastewater flow from the service population using a standard value of 120 gallons per capita per day.
- Assume that the case once it has been fully implemented will result in 100% SSO elimination.

You can calculate pollutant reductions for BOD_5, COD, TSS, and nitrogen and phosphorus using information on the SSO flow and wastewater characterization data. You should also report the volume of untreated discharge that will be released or eliminated as a result of the action. When available, use case specific information for flow and wastewater characterization. If flow and/or wastewater characterization data are not known, the methodology and Table 3-9 can be used.

3.5.2.2 Calculation Methodology

Step A	Determine the annual amount of sanitary sewer overflow that occurs for the municipality (in million gallons MG)

	If the annual volume of SSO can be estimated by the utility, use this volume. If not and the average daily flow discharged to the POTW is known, use from 0.5 to 3% of one day's flow to estimate the volume of SSO. For example, a utility with severe SSO problems and a daily flow discharge of 20 MGD would be estimated to have (0.03 × 20 MGD) = 0.6 MG of SSO annually. The less severe the SSO problems or more arid the region, the lower the percentage you would use for the estimate. If the average daily flow discharged to the POTW is unknown, determine the population served by the system and multiply by 120 gallons per capita per day (gpcd) to determine an average daily flow. For example, a satellite system serving 84,000 people would generate an average daily wastewater flow of (84,000 people × 120 gpcd) = 10,080,000 gallons per day or 10.08 MGD.
Step B	Determine the pollutant concentration reduction as the pollutant concentration in untreated SSO - the pollutant concentration after treatment If the typical untreated and treated concentrations of SSO pollutants are known, use those values. If not, there are representative values that can be used to estimate untreated and treated concentrations, see Table 3-9 above. (This calculation does not apply to microbials.)
Step C	Determine the reduction in pollutant loading Pollutant reduction (Pounds/yr) = Annual volume of SSO (MG/yr) × pollutant concentration reduction (mass/volume) × conversion factors
Step D	Report the total pollutant reduction (for one year) in pounds in ICIS. Identify "Water (navigable/surface)" as the impacted media

3.5.2.3 Example

As an example, a small urban municipality with a POTW flow of 42 MGD will be implementing an SSO plan in response to an enforcement action. It is assumed that with full implementation of the plan, SSOs will be eliminated and all wastewater in the system will be treated through the POTW.

Step A Without case specific information on the SSO volumes, we will assume that 2% of the one day's worth of average daily POTW system flow is equivalent to the annual SSO volume.

Estimate of annual SSO volume = 42 MGD × 0.02 = 0.84 MGY

Volume of untreated discharge eliminated = 0.84 MG x 1,000,000 gallons/MG = 840,000 gallons

Step B The pollutant concentration reductions Using Table 3-9 (for typical untreated and treated concentrations) will be:

TSS = 217 mg/l - 30 mg/l = 187 mg/l

BOD_5 = 209 mg/l - 30 mg/l = 179 mg/l

COD = 250 mg/l - 30 mg/l = 220 mg/l

Total N = 33 mg/l - 3.95 mg/l = 29.05 mg/l

Total P = 5.8 mg/l - 1.65 mg/l = 4.15 mg/l

Step C TSS reductions = 0.84 MGY × 187 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 1,310 lbs/year TSS

BOD_5 reductions = 0.84 MGY × 179 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 1,250 lbs/year BOD_5

COD reductions = 0.84 MGY × 220 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 1,540 lbs/year COD

Total N reductions = 0.84 MGY × 29.05 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 203 lbs/year Total N

Total P reductions = 0.84 MGY × 4.15 mg/l × 3.785 l/gal × 1,000,000 gal/MG × g/1,000 mg × 1 lb/454 g = 29 lbs/year Total P

Step D Input for ICIS is as follows:

- **Complying Action:** SSO CMOM;
- **Pollutant, Amount and Unit:** Untreated Discharge and 840,000 gallons
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Volume (gallons) of Untreated Discharge Eliminated

- **Pollutant, Amount and Unit:** TSS and 1,310 pounds;
- **Pollutant, Amount and Unit:** BOD, 5-day, 20 deg. C and 1,250 pounds;
- **Pollutant, Amount and Unit:** COD and 1,540 pounds;
- **Pollutant, Amount and Unit:** Nitrogen and 203 pounds;
- **Pollutant, Amount and Unit:** Phosphorus and 29 pounds; and
- **Media:** Water (navigable/surface)
  Counted Under Reporting Measure: Estimated Water Pollutants Reduced, Treated, or Eliminated (pounds)

3.5.3 Municipal Separate Storm Sewer Systems (MS4s)

[Place holder section for methodology currently under development.]

3.5.4 Safe Drinking Water Act – PWSS

3.5.4.1 Background and Methodology

The Safe Drinking Water Act (SDWA) directs EPA to set requirements for the level of contaminants in drinking water, and standards by which water supply system operators must comply to meet these levels. Through the PWSS program, EPA implements and enforces drinking water standards to protect public health. EPA's Office of Ground Water and Drinking Water regulates contaminants that present health risks and can potentially occur in public drinking water supplies. EPA set National Primary Drinking Water Regulations (NPDWRs) which are legally enforceable standards that apply to public water systems. The NPDWRs set a Maximum Contaminant Level Goal (MCLG) and a Maximum Contaminant Level (MCL) for specific contaminants. MCLGs are defined as the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on health would occur and are not enforceable. MCLs are the maximum allowable concentration of the contaminant for each pollutant and are an enforceable standard. The NPDWRs contain limits for inorganic chemicals, organic chemicals, radionuclides, and microorganisms.

Contaminants listed under the microorganism section of the NPDWR include Giardia lamblia, heterotrophic plate count, Legionella, total coliforms, turbidity, and viruses. These contaminants cannot be expressed in the typical concentration units of mass per unit volume and their standards are set as a treatment technique, which is an enforceable level of technical performance which public water systems must follow to ensure control of the contaminant. Additional information on microbial pollutants and disinfection byproducts in drinking water can be found at www.epa.gov/OGWDW/mdbp/mdbp.html#regsch.

Because microbial contaminants are not measured in concentration terms, it is not possible to obtain microbial pollutant reductions in terms of pounds of pollutant reduced/eliminated or treated. Therefore, OECA is requesting that the measure of success for SDWA - PWSS cases be represented by the population impacted by the action that will receive cleaner drinking water. The unit of measure for SDWA cases is the number of people served by the system covered under the compliance action. The complying actions to use for SDWA - PWSS cases are:

- Implement BMP: Other
- SDWA Process Change

Enforcement actions that address public notification violations should be entered into ICIS as the complying action "Notification" and this complying action is discussed in the Work Practices section of this document.

3.5.4.2 Example 1

For example, a SDWA case involving a public water utility serving a population of 20,000 people that has been cited for deficiencies in public notification and the enforcement action will require installation or modification of treatment systems to address exceedances in fecal coliform and lead, would result in the following ICIS input:

- **Complying Actions:** Implement BMP: Other;
- **Pollutant:** Lead;
- **Amount and Unit:** 20,000 People; and
- **Media:** Water (drinking)
  Counted Under Reporting Measure: People Protected by Safe Drinking Water Act Enforcement (# of People)

Note: You would also input into ICIS the Work Practices complying action ”Notification”

AND

- **Pollutant:** Coliform, fecal general;
- **Amount and Unit:** “0” People; and
- **Media:** Water (drinking).

3.5.4.3 Example 2 (of non-municipality PWS action)

For example, a SDWA case involving a rural resort that is a public water system serving a transient population of 100 people per day, operating seasonally for 120 days per year, and requiring a change in the existing treatment process to address contaminants (lead and fecal coliform) in the drinking water would result in the following ICIS input:

- **Complying Actions:** SWDA Process Change;
- **Pollutant:** Lead;
- **Amount and Unit:** 100 people per day × 120 days per year = 12,000 People; and
- **Media:** Water (drinking)
  Counted Under Reporting Measure: People Protected by Safe Drinking Water Act Enforcement (# of People)

AND

- **Pollutant:** Coliform, fecal general;
- **Amount and Unit:** “0” People; and
- **Media:** Water (drinking).

3.6 Pesticides

3.6.1 Pesticides Background

The term pesticide includes many kinds of ingredients in products, such as insect repellants, weed killers, disinfectants, and swimming pool chemicals which are designed to prevent, destroy, repel or reduce pests of any sort. Pesticides are found in nearly every home, business, farm, school, hospital and park in the United States. EPA must evaluate pesticides thoroughly before they can be marketed and used in the United States to ensure that they will meet federal safety standards to protect human health and the environment. Pesticides that meet the requirements are granted a license or "registration" which permits their distribution, sale, and use according to specific use directions and requirements identified on the label.

Pesticide program complying actions in the Reduction of On-going Releases category include:

- Pesticide Destroyed – (In Commerce);
- Import Pesticide Returned to Foreign Origin;
- Pesticide Returned to Compliance by Manufacturer/Producer (Domestic);
- Proper Pesticide Use;
- Cease Pesticide Sale, Distribution;
- Pesticide Advertising Claim Removed;
- Pesticide Secondary Containment Change (on-going); and
- Pesticide Container Change (on-going).

3.6.2 Examples

Example 1. Pesticide Destroyed – In Commerce

A registrant produces an adulterated pesticide that cannot be used because it contains both an herbicide and fungicide. The Agency issues a Stop Sale Order requiring the registrant to cease all sale, distribution, and use of the product. The registrant takes pesticides off the shelves where the product has already been shipped or distributed by the manufacturer (i.e., is no longer under the control of the manufacturer). The registrant cannot reformulate pesticide due to the level of contamination and must destroy the material through appropriate means (e.g., incineration). Under the action, 100 lbs of pesticide product will need to be destroyed.

Input for ICIS:

- **Complying Action:** Pesticide Destroyed – In Commerce
- **Pollutant:** Pesticide, generals;
- **Amount and Unit:** 100 pounds (actual amount destroyed)[5]; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

[5] Note: Pesticide outcomes should be reported in accordance with the FIFRA CBI Outcomes Reporting Protocol. Generally, actual "in-commerce" amounts can be reported directly into ICIS. However, when an actual "in-commerce" amount is not available, reportable quantities are calculated using an annualized basis which uses the annual production data for the violative product as reported in the Section Seven Tracking System (SSTS); these annualized quantities are protected by FIFRA CBI restrictions and may only be reported using the aggregation methodology which requires at least 3 or more results to be reported in aggregate. An exception to this procedure may be applicable if the company explicitly grants permission for EPA to publish the annualized production data for their company.

Example 2. Imported Pesticide Returned to Foreign Origin

A pesticide manufactured in China is shipped to the U.S. and is stopped and held at the port of entry by Customs. EPA inspects the shipment and finds it to be non-compliant with FIFRA because it is adulterated or unregistered. EPA issues an enforcement action requiring the shipment to be rerouted either to the point of origin or another foreign destination and the product does not proceed beyond the port within the United States. The amount of shipped pesticide product is 2,000 pounds.

Input for ICIS:

- **Complying Action:** Import Pesticide Returned to Foreign Origin
- **Pollutant:** Pesticide, generals;
- **Amount and Unit:** 2,000 pounds (actual amount of pesticides refused entry at port)[5]; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 3. Imported Pesticide Returned to Foreign Origin

A pesticide manufactured in Mexico is shipped to the U.S. The broker submits a Notice of Arrival (NOA) requesting EPA approval for release by US Customs. EPA reviews the NOA and determines the shipment is noncompliant with FIFRA and, using the NOA, refuses to authorize release by US Customs into U.S. commerce. Importer returns the product to the foreign manufacturer or other foreign location and the pesticide product does not proceed beyond the port within the United States. The amount of shipped pesticide product is 2,000 pounds.

Input for ICIS:

- **Complying Action:** Import Pesticide Returned to Foreign Origin
- **Pollutant:** Pesticide, general;
- **Amount and Unit:** 2,000 pounds (actual amount of pesticides refused entry at port)[5]; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 4. Pesticide Returned to Compliance by Manufacturer/Producer (Domestic)

A pesticide manufactured in Texas is distributed and sold in the U.S. EPA inspects the product during a Producer Establishment Inspection (PEI) and determines it to be noncompliant with FIFRA because it is misbranded. EPA issues an enforcement action and the product already in commerce is returned to the producer to be relabeled. The amount of misbranded pesticide product returned to compliance is 2,000 pounds.

Input for ICIS:

- **Complying Action:** Pesticide Returned to Compliance by Manufacturer/Producer (Domestic)
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 2,000 lbs (actual amount of pesticides returned to producer)[5]
  Media: Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 5. Proper Pesticide Use

A commercial pesticide applicator improperly applies a Restricted Use Pesticide (RUP) outside a residential home. EPA takes enforcement action where the applicator continues to use the pesticide but returns to a compliant use pattern. The amount to be reported is calculated by determining the normal 1-year use of the pesticide(s) the applicator would have been applying improperly which will now be used properly. For this case that amount is estimated as 2,000 lbs/yr.

Input for ICIS:

- **Complying Action:** Proper Pesticide Use
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 2,000 lbs/yr (annualized amount of pesticide(s) used/applied)[5]
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 6. Cease Pesticide Sale, Distribution

A company produces a product that contains an active ingredient with impurities of toxicological significance. The Confidential Statement of Formula (CSF) for the product does not identify the presence of these impurities. EPA has reason to believe the CSF for the product did not accurately reflect the composition of the product as required by FIFRA Section 3. EPA issues a Stop Sale, Use or Removal Order (SSURO) ordering the company to immediately cease the distribution, sale, or use of the product. One hundred thousand pounds of the material is currently under the ownership or control of the company and will be impacted by the action.

Input for ICIS

- **Complying Actions**: Cease Pesticide Sale, Distribution
- **Pollutant:** Pesticide, general
- **Unit:** 100,000 pounds (actual amount of product stopped from further distribution/sale)[5]
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 7. Pesticide Advertising Claim Removed

A pesticide registrant placed an ad in a lawn care trade journal advertising a lawn care insecticide, claiming mosquito and other pest elimination from customer yards. At the bottom of the ad, it states "Safe." Use of the term "safe" was not a claim approved by EPA as part of the pesticide's registration. EPA issues an enforcement action requiring the respondent to remove the pesticidal claim from the lawn care journal ad. To comply, the registrant removes the claim. The reportable amount of pesticide is calculated by annualizing the sales/distributions of the pesticide product associated with the illegal advertisement. This amount will be CBI protected and the CBI reporting protocol must be followed.

Input for ICIS:

- **Complying Actions:** Pesticide Advertising Claim Removed
- **Pollutant:** Pesticide, general
- **Unit:** 0 lbs (report annualized product sales/distribution using Section 7 reports and following the FIFRA CBI reporting protocol)[5]
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 8. Secondary Containment Change (On-Going)

A pesticide producer is producing, selling and distributing agricultural pesticides from stationary pesticide containers. EPA inspects the facility and finds that the secondary containment and/or pesticide dispensing areas do not comply with FIFRA because they do not have the capacity, structural integrity, or design required by the Pesticide Management and Disposal Rule. EPA issues an enforcement action requiring the containment structures to be built, changed, or repaired.

Secondary Containment: The facility's largest tank held 15,000 gallons of agricultural pesticides. The density of the agricultural pesticides is estimated at 8 lbs/gallon. Per year, the facility annually processes about 200,000 gallons of pesticides through their stationary bulk tanks.

To calculate the reportable quantity for reporting purposes under the on-going releases category, calculations should be done by determining the tank inventory only at the time of the incident or inspection and subject to immediate correction.

(Note that there would also be a preventive result that would be calculated by determining the weight of the products involved for an annualized period of compliant activity and reported using the FIFRA CBI reporting protocol.)

Input for ICIS:

- **Complying Action:** Containment Structure Change (On-Going)
- **Pollutant:** Pesticide, general

- **Amount and Unit:** 120,000 lbs (8 lbs/gallon × 15,000 gallons) of environmental benefits under Reduction of On-Going Releases for the pesticide in the tank at the time the problem was identified.

  Note: Case developer should also calculate a prevention of Future Releases result of 1,600,000 lbs (8 lbs/gallon × 200,000 gallons- **CBI**)[5].
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

Example 9. Pesticide Container Change (On-Going)

A producer is selling and distributing pesticide in non-refillable and refillable containers. EPA inspects the producer and finds there is an on-going release from the containers because they do not meet the structural, design, or dispensing requirements outlined by the Pesticide Management and Disposal Rule. EPA issues an enforcement action requiring the producer to address the on-going release pesticides with compliant containers.

The facility had 10, 5-gallon non-refillable containers packaged, labeled, and ready for shipment at the time of the inspection that did not meet the requirements. Annually, the facility produced, sold and distributed about 50,000 gallons of pesticides in the non-complaint containers.

To calculate the reportable quantity for reporting purposes under the on-going releases category, calculations should be done by determining the product inventory on-hand at the time of the incident or inspection and subject to immediate correction. For this case, the density of the pesticide is estimated as 8 lbs/gallon.

(Note that there would also be a preventive result that would be calculated by determining the quantity of the product produced for an annualized period of compliant activity and reported using the FIFRA CBI reporting protocol.)

Input for ICIS:

- **Complying Action:** Pesticide Container Change (On-Going)
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 4,000 lbs (8 lbs/gallon × 500 gallons) of environmental benefits under Reduction of On-Going Releases for the pesticides held for sale at the time the problem was identified.

  Note: Case developer should also calculate a prevention of Future Releases result of 400,000 lbs (8 lbs X 50,000 Gallons- **CBI**)[5]
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

3.7 <u>Mobile Sources</u>

3.7.1 Background

Mobile sources is a term used to describe a wide variety of vehicles, engines, and equipment that generate air pollutants and that move, or can be moved, from place to place. On-road or highway sources include vehicles used on roads for transportation of passengers or freight. Non-road sources include vehicles, engines, and equipment used for construction, agriculture, transportation, recreation, and many other purposes. Within these two broad categories, on-road and non-road sources are further distinguished by size, weight, use, and/or horsepower.

The mobile source complying actions in the On-going Releases Category include:

- Offset Project (mobile sources);
- Retire Pollution Credits (mobile sources); and
- Replace or Remediate Engines/Vehicles (in commerce).

3.7.2 Calculation Methodology

For offset projects, there should be a direct correlation between the pounds of pollution reduced via an offset project (lbs/year) and the amount that is reported into ICIS.

When retiring pollution credits, there should be a direct correlation between the pounds of pollution credit retired (lbs/year) and the amount that is reported into ICIS.

The example calculation methodologies for Replace or Remediate Engines/Vehicles (in commerce) complying action are shown below. In general, potential reductions can be calculated for hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM). The step by step methodology for engines, vehicles, or equipment that are exported, destroyed, recalled, or subject to a stop-sale for non-compliant parts (already in commerce) is as follows:

Replace/Remediate Engine or Vehicle (In Commerce)	
Step A	Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.
Step B	Identify the baseline emissions for that engine/vehicle/equipment category.
Step C	For onroad vehicles, identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or KW-hr usage/year) by the engine/vehicle/equipment type. For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity (hours/year) by the engine/equipment type.

Step D	Calculate one year's worth of baseline emission benefits as follows: Baseline emissions (g pollutant/hp-hr) × engine/vehicle/equipment annual power usage rate (hp-hr/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year OR Baseline emissions (g pollutant/hp-hr) × engine/equipment power (hp) x engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) x # of units × 1 lb/454 g = lbs of pollutant reduction/year

In the case of engine or equipment replacement, the reductions should represent the difference between baseline emissions and the improved emissions after the replacement. The methodology for this situation is as follows:

Step E	Identify the emission standards that will apply for that engine/vehicle/equipment category.
Step F	Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows: Difference in emissions = baseline emission rate – compliance standard emission rate (Note: units must be the same)
Step G	Calculate one year's worth of emission benefits as follows: Difference in emissions (g pollutant/hp-hr) × engine/vehicle/equipment annual power usage rate (hp-hr/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year OR Difference in emissions (g pollutant/hp-hr) × engine/equipment power (hp) × engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

Note that HC represents hydrocarbon emissions for vehicles/engines powered by the following fuels:

1. Gasoline- and LPG-fueled ATVs: THC emissions.
2. Natural gas-fueled ATVs: NMHC emissions.
3. Alcohol-fueled engines: THCE emissions.

3.7.3 Examples

The following subsections provide information on emission factors and example calculations for the following types of mobile sources:

- Highway Motorcycles (Subsection 3.7.3.1);
- Recreational Vehicles (Subsection 3.7.3.2);
- Small Non-road Spark Ignition (Gasoline) Engines (Subsection 3.7.3.3); and
- Large Non-road Spark Ignition (Gasoline) Engines (Subsection 3.7.3.4).

3.7.3.1 Highway Motorcycles

According to 40 CFR § 86.402-78, highway motorcycles are motor vehicles with a headlight, tail light, and stoplight having: two wheels, or three wheels and a curb mass less than or equal to 680 kg (1,499 lbs.). This category includes three classes, Class I, II, and III.

The classes of engines are defined by their displacement volume (defined as the total volume of air/fuel mixture an engine can draw in during one complete engine cycle) and are normally stated in cubic centimeters (cc) as follows:

- Class I: 0 to 169 cc (note that before 2006, <50 cc motorcycles were not regulated);
- Class II: 170 to 279 cc; and
- Class III: > 279 cc.

Table 3-11 and Table 3-12 present baseline and Tier 1 and Tier 2 emission factors by engine type and size. The emission factors include a deterioration factor that is additive to the Zero-mile emission factor.[6] The Tier 1 standards became effective in 2006 and the Tier 2 standards become effective in 2010. Table 3-13 presents current emission standards by motorcycle category based on the Highway Motorcycle Final Rule. Table 3-14 presents typical annual miles of operation per year by motorcycle engine size type.

Table 3-11. Zero-Mile Level (ZML) Emission Factors and Deterioration Factors (DF) for On-Highway Motorcycles <50cc

Control Category	THC		CO		NO_x	
	ZML, g/mi	DF (additive), g/mi/10k mi	ZML, g/mi	DF (additive), g/mi/10k mi	ZML, g/mi	DF (additive), g/mi/10k mi
Baseline (Pre-control) - two-strokes	9.66	0	16.1	0	0.1	0
Baseline (Pre-control) - four-strokes	1.27	1.31	15.5	2.53	0.32	0
Tier 1	1.27	1.31	15.5	2.53	0.32	0

Source: Final Regulatory Support Document: Control of Emissions from Highway Motorcycles. U.S. EPA, December 2003, EPA 420-R-03-015. pg 6-8.
THC – Total Hydrocarbons.

[6] Note that 40 C.F.R. § 86.432-78 describes a multiplicative deterioration factor, so actual test data should not be directly compared with these emission factors.

Table 3-12. Zero-Mile Level Emission Factors and Deterioration Factors Rates (DF) for On-Highway Motorcycles >50cc

Control Category	THC		CO		NO_x	
	ZML, g/mi	DF (additive), g/mi/10k mi	ZML, g/mi	DF (additive), g/mi/10k mi	ZML, g/mi	DF (additive), g/mi/10k mi
Baseline (Tier 0)	1.42	0.7	17.4	2.46	0.7	0
Tier 1 (effective in 2006)	1.01	0.5	17.4	2.46	0.52	0
Tier 2 (effective in 2010)	0.57	0.28	17.4	2.46	0.3	0

Source: Final Regulatory Support Document: Control of Emissions from Highway Motorcycles. U.S. EPA, December 2003, EPA 420-R-03-015. pg 6-9.
THC – Total hydrocarbons.

Table 3-13. Current Federal Exhaust Emissions Standards for Motorcycles

Class	Engine Size (cc)	HC (g/km)	CO (g/km)
I	50-169	1	12
II	170-279	1	12
Class	**Engine Size (cc)**	**HC + NO_x (g/km)**	**CO (g/km)**
III (2006-2009)	>279	1.4	12
III (2010-later)	>279	0.8	12

Source: Control of Emissions from Highway Motorcycles; Final Rule. 69 FR 2397, January 15, 2004.

Table 3-14. Typical Annual Miles of Operation per Year by Motorcycle Engine Size Type

Average Annual Miles of Operation	650 miles/year	2,907 miles/year
Engine Size	<50 cc motorcycles	≥50 cc motorcycles

Source: Final Regulatory Support Document: Control of Emissions from Highway Motorcycles. U.S. EPA, December 2003, EPA 420-R-03-015. pgs 6-5 and 6-6.

Example Calculation

An enforcement case includes importation of 250 MY2008 small (125 cc 4-stroke) highway motorcycles which are not covered by a certificate of conformity. Since the motocycles were released into commerce from the manufacturer, denial of the vehicles will constitute an on-going releases category action. The reductions in emissions due to the required export of these motorcycles would be calculated using the methodology shown below.

Step A Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Small 4-stroke motorcycles (Class I), 125cc, 250 units denied import.

Step B Identify the baseline emissions for that engine/vehicle/equipment category.

Baseline emissions (g pollutant/mile) = ZML + DF

From Table 3-12, Motorcycles ≥50cc baseline (precontrol) emissions are:

THC = (1.42 + 0.7) g/mile = 2.12 g/mile

CO = (17.4 + 2.46) g/mile = 19.86 g/mile

NO_x = (0.7 + 0) g/mile = 0.7 g/mile

Step C Identify the average annual usage rate (e.g., miles/year) by the engine/vehicle/equipment type.

Estimated average annual usage rate for motorcycles ≥50cc is 2,907 miles/year

Step D Calculate one year's worth of emission benefits as follows:

Baseline emissions (g pollutant/mile) × engine/vehicle/equipment annual usage rate (miles/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

Lbs THC prevented/year = 2.12 g/mile × 2,907 miles/year × 250 units × 1 lb/454 g = 3,394

Lbs CO prevented/year = 19.86 g/mile × 2,907 miles/year × 250 units × 1 lb/454 g = 31,791

Lbs NO_x prevented/year = 0.7 g/mile × 2,907 miles/year × 250 units × 1 lb/454 g = 1,121

Input for ICIS:

- **Complying Action**: Replace or Remediate Engines/Vehicles (in commerce)
- **Pollutant:** Hydrocarbons
- **Amount and Unit:** 3,394 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Carbon Monoxide
- **Amount and Unit:** 31,791 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Nitrogen Oxides

- **Amount and Unit:** 1,121 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

3.7.3.2 Recreational Vehicles

Recreational Vehicles include off-road motorcycles, all-terrain vehicles (ATVs), and snowmobiles (marine recreational vehicles are discussed as a separate category). Table 3-15 presents precontrolled and Phase 1 standards by category. Under the Phase 1 regulations, new engines have to meet emission standards for HC + NO_x and CO for off road motorcycles and ATVs and HC and CO for snowmobiles. Table 3-16 presents median vehicle lifespan data.

Table 3-15. Emission Factors for Offroad Motorcycles, ATVs, and Snowmobiles

Offroad Motorcycles and ATVs	HC, g/mile	CO, g/mile	NO_x, g/mile	PM, g/mile
Precontrol 2-stroke offroad motorcycles (R12S)	55.7	54.1	0.15	2.1
Precontrol 4-stroke offroad motorcycles (R14S)	2.4	48.5	0.41	0.06
Phase 1 Stds. offroad motorcycles Model year 2006 and later	3.2 (for HC + NO_x)	40.2	—	—
Precontrol 2-stroke all terrain vehicles (R12S)	53.9	54.1	0.15	2.1
Precontrol 4-stroke all terrain vehicles (R14S)	2.4	48.5	0.41	0.06
Phase 1 Stds. all terrain vehicles Model year 2006 and later	2.4 (for HC + NO_x)	56	—	—
Snowmobiles	**HC, g/hp-hr**	**CO, g/hp-hr**	**NO_x, g/hp-hr**	**PM, g/hp-hr**
Precontrol 2-stroke snowmobiles (R12S)	111	296	0.86	2.7
Modified 2-stroke snowmobiles (R12S1)	53.7	146.9	0.86	2.7
Direct Injection 2-stroke snowmobiles (R12S2)	21.8	90	2.8	0.57
Phase 1 Stds. snowmobiles Model year 2006 – 2009	75	205	—	—
Phase 2 Stds. snowmobiles Model years 2010 and 2011	56	205	—	—

Sources: Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. U.S. EPA, December 2005, EPA 420-R-05-019. pg 9.
Phase 1 standards for offroad motorcycles from Table 1, 40 CFR §1051.105; Phase 1 standards for ATVs from Table 1, 40 CFR §1051.107; Phase 1 and 2 standards for snowmobiles from Table 1, 40 CFR §1051.103.
Note: Standards for off-road motorcycle and ATV recreational engines allow the engine manufacturers to meet the controlled 4-stroke engine standard with a 2-stroke engine.

Table 3-16. Median Life for Snowmobiles, All-Terrain Vehicles, and Offroad Motorcycles

Application	Median Life (Hours at Full Load or Miles)	Median Life (Years) [a]	Load Factor	Hours per Year	Mileage per Year
Snowmobiles	174 hours	9	0.34	57	—
All-Terrain Vehicles	20,410 miles	13	1	—	1,608
Offroad Motorcycles	21,600 miles	9	1	—	1,600

Source: Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling. U.S. EPA, April 2004, EPA 420-P-04-005. pgs 7 and 13.
a – Median Life (Years) NOT at full load

Example Calculation

For an enforcement case that includes the recall and replacement of 300 ATVs (2-stroke engines) without emission controls, to ATVs with controls, the pollutant emissions reduced would be calculated as follows:

Step A Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Recreational vehicle category, ATVs, 300 units.

Step B Identify the baseline emissions for that engine/vehicle/equipment category.

From Table 3-15, ATV 2-stroke engine precontrolled baseline emissions are:

HC = 53.9 g/mile
CO = 54.1 g/mile
NO_x = 0.15 g/mile
PM = 2.1 g/mile

HC + NO_x = 54.05 g/mile

Step C Identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or kW-hr usage/year) by the engine/vehicle/equipment type.

Estimated average annual usage rate for an ATV from Table 3-16 is 1,608 miles/year

Step E Identify the emission standards that will apply with the controlled engines for that engine/vehicle/equipment category.

From Table 3-15, ATV Phase 1, ATV emissions standards for model years 2006 - 2009 are:

HC + NO_x = 2.4 g/mile
CO = 56 g/mile
PM = no standard set

Step F Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

Difference in emissions = baseline emission rate – compliance standard emission rate. [Note: Units must be the same.]

HC + NO_x = 54.05 – 2.4 (g/mile) = 51.65 g/mile

CO = 54.1 – 56 (g/mile) = negative so no reductions will occur

Step G Calculate one year's worth of emission benefits as follows:

Difference in emissions (g pollutant/mile) × engine/vehicle/equipment annual usage rate (miles/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

Lbs HC + NO_x prevented/year = 51.65 g/mile × 1,608 miles/year × 300 units × 1 lb/454 g = 54,881

Since the CO Phase 1 emission standard is higher than the pre-control emission rate, no CO pollutant reductions are assumed for this case.

Input for ICIS:

- **Complying Action:** Replace or Remediate Engines/Vehicles (in commerce)
- **Pollutant:** Hydrocarbons
- **Amount and Unit:** 54,881 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Nitrogen Oxides
- **Amount and Unit:** 0 lbs
- **Media:** Air

3.7.3.3 Small Non-road Spark Ignition (Gasoline) Engines

This category includes all engines <25 hp (<19kW) except those used for recreational applications (such as motorcycles or snowmobiles, for marine propulsion, or for toy boats or airplanes). The engines in this category are used primarily in lawn and garden equipment. Classes I and II refer to non-handheld small spark-ignition engines; classes III, IV, and V refer to handheld small spark-ignition engines.

The classes of engines are defined by their displacement volume (defined as the total volume of air/fuel mixture an engine can draw in during one complete engine cycle) and are normally stated in cubic centimeters (cc) as follows:

- Class I: Non-handheld and <225 cc;
- Class II: Non-handheld and ≥225 cc;
- Class III: Handheld and <20 cc;
- Class IV: Handheld and ≥20 cc and <50 cc; and
- Class V: Handheld and ≥50 cc.

Table 3-17 presents baseline emission factors by category. Table 3-18, Table 3-19, and Table 3-20 present emission standards by category. Appendix E, Table E-1 presents load factors and activity rates (hours/year) by engine/equipment category for small and large non-road engines and equipment.

Table 3-17. Baseline Emission Factors for Small Non-road Gasoline Engines

Engine Type	HC g/hp-hr	CO g/hp-hr	NO_x g/hp-hr	PM g/hp-hr
G2H3 (gas 2-stroke handheld Class III, baseline)	261	718.87	0.97	7.7
G2H4 (gas 2-stroke handheld Class IV, baseline)	261	718.87	0.94	7.7
G2H5 (gas 2-stroke handheld Class V, baseline)	159.58	519.02	0.97	7.7
G2N1 (gas 2-stroke nonhandheld Class I, baseline)	207.92	485.81	0.29	7.7
G4N1S (gas, side-valved, 4-stroke nonhandheld Class I, baseline)	38.99	430.84	2	0.06
G4N1O (gas, overhead-valved, 4-stroke nonhandheld Class I, baseline)	13.39	408.84	1.8	0.06
G2N2 (gas 2-stroke nonhandheld Class II, baseline)	207.92	485.81	0.29	7.7
G4N2S (gas, side-valved, 4-stroke nonhandheld Class II, baseline)	9.66	430.84	2.06	0.06
G4N2O (gas, overhead-valved, 4-stroke nonhandheld Class II, baseline)	5.2	408.84	3.5	0.06

Source: Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. U.S. EPA, December 2005, EPA 420-R-05-019. pgs 5-7.

Table 3-18. Phase 2 Emissions Standards for Handheld Engines (Final Rule Finalized April 25, 2000)

Engine Class	Emission Requirement	Emission Standards (g/kW-hr) by Model Year					
		2002	2003	2004	2005	2006	2007 and Later
Class III	$HC+NO_x$	238	175	113	50	50	50
	CO	805	805	805	805	805	805
Class IV	$HC+NO_x$	196	148	99	50	50	50
	CO	805	805	805	805	805	805
Class V	$HC+NO_x$	—	—	143	119	96	72
	CO	—	—	603	603	603	603

Source: Amendments to the Phase 2 Requirements for Spark-Ignition Nonroad Engines at or Below 19 Kilowatts; Direct Final Rule and Proposed Rule. 69 FR 1823, January 12, 2004.

Table 3-19. Phase 2 Emission Standards for Non-handheld Engine Classes I, I-A, and I-B

Engine Class	Emission Standards (g/kW-hr)			Effective Date
	$HC+NO_x$	$NMHC+NO_x$	CO	
Class I	16.1	14.8	610	August 1, 2007 [a]
Class I-A	50	—	610	2001 Model Year
Class I-B	40	37	610	2001 Model Year

Source: Amendments to the Phase 2 Requirements for Spark-Ignition Nonroad Engines at or Below 19 Kilowatts; Direct Final Rule and Proposed Rule. 69 FR 1823, January 12, 2004.
a – In addition, any Class I engine family initially produced on or after August 1, 2003 must meet the Phase 2 Class I standards before they may be introduced into commerce.
Note: $NMHC+NO_x$ standards are applicable only to natural gas fueled engines at the option of the manufacturer, in lieu of $HC+NO_x$ standards.

Table 3-20. Phase 2 Emission Standards for Non-handheld Engine Class II

Engine Class	Emission Requirement	Emission Standards (g/kW-hr) by Model Year				
		2001	2002	2003	2004	2005 and Later
Class II	$HC+NO_x$	18.0	16.6	15.0	13.6	12.1
	$NMHC+NO_x$	16.7	15.3	14.0	12.7	11.3
	CO	610	610	610	610	610

Source: Amendments to the Phase 2 Requirements for Spark-Ignition Nonroad Engines at or Below 19 Kilowatts; Direct Final Rule and Proposed Rule. 69 FR 1823, January 12, 2004.
Note: $NMHC+NO_x$ standards are applicable only to natural gas fueled engines at the option of the manufacturer, in lieu of $HC+NO_x$ standards.

Example Calculation

For an enforcement case that involves denial of import of 200 small (19cc) handheld 3.0 hp chainsaws (Class III) intended for residential use, the pollutant emissions reduced would be calculated using the Replace/Remediate Engine or Vehicle (in commerce) methodology shown above.

Step A Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Small handheld chainsaws (Class III), 3.0 hp, 200 units

Step B Identify the baseline emissions for that engine/vehicle/equipment category.

From Table 3-18, gas 2-stroke handheld Class III baseline emissions are:

HC = 261 g/hp-hr
CO = 718.87 g/hp-hr
NO_x = 0.97 g/hp-hr
PM = 7.7 g/hp-hr

Step C For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity (hours/year) by the engine/equipment type.

Estimated load factor and activity for a residential chain saw from Appendix E, Table E-1 is a load factor of 0.70 and an activity of 13 hours/year.

Step D Calculate one year's worth of emission benefits as follows:

Baseline emissions (g pollutant/hp-hr) × engine/equipment power (hp) x engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) x # of units × 1 lb/454 g = lbs of pollutant reduction/year

Lbs HC prevented/year = 261 g/hp-hr × 3 hp × 0.70 × 13 hours/year × 200 units × 1 lb/454 g = 3,139

Lbs CO prevented/year = 718.87 g/hp-hr × 3 hp × 0.70 × 13 hours/year × 200 units × 1 lb/454 g = 8,645

Lbs NO_x prevented/year = 0.97 g/hp-hr × 3 hp × 0.70 × 13 hours/year × 200 units × 1 lb/454 g = 12

Lbs PM prevented/year = 7.7 g/hp-hr × 3 hp × 0.70 × 13 hours/year × 200 units × 1 lb/454 g = 93

Input for ICIS:

- **Complying Action:** Replace or Remediate Engines/Vehicles (in commerce)
- **Pollutant:** Hydrocarbons
- **Amount and Unit:** 3,139 lbs
- **Media:** Air

  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Carbon Monoxide
- **Amount and Unit:** 8,645 lbs
- **Media:** Air

  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Nitrogen Oxides
- **Amount and Unit:** 12 lbs
- **Media:** Air

  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Particulate Matter
- **Amount and Unit:** 93 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

3.7.3.4 Large Non-road Spark Ignition (Gasoline) Engines

Non-road spark-ignition (SI) engines above 25 hp (19 kW) are generally found in industrial equipment and are used in a variety of applications, including forklifts, airport ground-service equipment, terminal tractors, generators, compressors, welders, aerial lifts, and ice grooming machines. These engines may operate on gasoline, liquid petroleum gas (LPG) or compressed natural gas (CNG). Table 3-21 presents baseline (uncontrolled) emission factors for large non-road SI engines and Table 3-22 presents transient adjustment factors. For large non-road SI engines, steady state emission factors for HC and CO should be multiplied by the transient adjustment factor to account for increased emissions that occur during transient conditions. Table 3-23 presents the 2002 Emission standards for large spark-ignition engines under Tier 1 and Tier 2. Appendix A, Table E-13 presents load factors and activity rates (hours/year) by engine/equipment category for small and large non-road engines and equipment.

Table 3-21. Baseline Emission Factors for Large Non-road SI Engines

Engine Type	HC	CO	NO_x	PM
G4GT25 (gas, 4-stroke, baseline) [a]	3.85 (g/hp-hr)	107.23 (g/hp-hr)	8.43 (g/hp-hr)	0.06 (g/hp-hr)
	5.16 (g/kW-hr)	143.8 (g/kW-hr)	11.3 (g/kW-hr)	0.08 (g/kW-hr)

Source: Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. U.S. EPA, December 2005, EPA 420-R-05-019. pg 8.
a – Conversion: hp × 0.7457 = kW.

Table 3-22. Transient Adjustment Factors for Large Non-road SI Engines

Engine Type	HC, g/hp-hr	CO, g/hp-hr	NO_x, g/hp-hr	PM, g/hp-hr
Pre-control TAFs	1.3	1.45	1	1

Source: Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. U.S. EPA, December 2005, EPA 420-R-05-019. pg 15.

Table 3-23. Tier 1 and 2 Emission Standards for Large Non-road SI Engines

Standard	HC + NO_x (g/kW-hr)	CO (g/kW-hr)
Tier 1 (starting in 2004)	4.0	50
Tier 2 (starting in 2007)	2.7	4.4

Source: Control of Emissions from Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-based); Final Rule, 67 FR 68241, November 8, 2002.

Example Calculation

An enforcement case requires remediation of 200 56 hp gasoline fueled forklifts in commerce. The forklift engines are currently uncontrolled and will be modified to meet the Tier 2 standards for large non-road SI engines. The reductions prevented through this action can be calculated using the methodology below.

Step A Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Large non-road SI engine forklifts, 56 hp (42 kW), 200 units

Step B Identify the baseline emissions for that engine/vehicle/equipment category.

From Table 3-21 and Table 3-22, baseline (uncontrolled) emissions are equal to the uncontrolled emission factor times the transient adjustment factor:

HC = 5.16 g/kW-hr × 1.3 = 6.7 g/kW-hr
CO = 143.8 g/kW-hr × 1.45 = 208.5 g/kW-hr
NO_x = 11.3 g/kW-hr × 1.0 = 11.3 g/kW-hr
PM = 0.08 g/kW-hr × 1.0 = 0.08 g/kW-hr

Step C For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity (hours/year) by the engine/equipment type.

Estimated load factor and activity for a large 2-stroke or 4-stroke non-road SI fork lift from Appendix A, Table E-1 is a load factor of 0.30 and an activity of 1,800 hours/year.

Step E Identify the Tier 2 emission standards that will apply once the remediation action is completed for the engine/vehicle/equipment category.

From Table 3-23, Tier 2 emissions standards are:

HC + NO_x = 2.7 g/kW-hr
CO = 4.4 g/kW-hr
PM = none

Step F Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

Difference in emissions = baseline emission rate – compliance standard emission rate [Note: Units must be the same.]

The Tier 2 standards apply to the combination of HC and NO_x. To determine a combination precontrol emission factor:

$HC + NO_x$ (uncontrolled) = 6.7 + 11.3 g/kW-hr = 18.0 g/kW-hr
$HC + NO_x$ = 18.0 – 2.7 (g/kW-hr) = 15.3 g/kW-hr
CO = 208.5 – 4.4 (g/kW-hr) = 204.1 g/kW-hr

No Tier 2 standards are set for PM so no reductions are calculated for that pollutant.

Step G Calculate one year's worth of emission benefits as follows:

Difference in emissions (g pollutant/hp-hr) × engine/equipment power (hp) x engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) x # of units × 1 lb/454 g = lbs of pollutant reduction/year

Lbs $HC + NO_x$ prevented/year = 15.3 g/kW-hr × 42 kW × 0.30 **×** 1,800 hour/year × 200 units × 1 lb/454g = 152,865

Lbs CO prevented/year = 204.1 g/kW-hr × 42 kW × 0.30 × 1,800 hours/year × 200 units × 1 lb/454 g = 2,039,202

Input for ICIS:

- **Complying Action:** Replace or Remediate Engines/Vehicles (in commerce)
- **Pollutant:** Hydrocarbons
- **Amount and Unit:** 152,865 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

AND

- **Pollutant:** Nitrogen Oxides
- **Amount and Unit:** 0 lbs
- **Media:** Air

AND

- **Pollutant:** Carbon Monoxide
- **Amount and Unit:** 2,039,202 lbs
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

NOTE: Appendix F presents a listing of OECA's Environmental Benefit Calculators, including those developed for various types of mobile sources.

3.8 Stationary Sources

Under the CAA the following types of enforcement cases are typical:

- Enforcement actions against facilities that have triggered a Prevention of Significant Deterioration (PSD)/New Source Review (NSR) violation.
- Enforcement actions resulting from violations with a MACT/NESHAP standard.
- Enforcement actions impacting Leak Detection and Repair (LDAR) requirements.

The sections below present methodologies for determining pollutant reductions and environmental benefit for typical cases involving an air media. Each section includes information on the background, calculation methodology, and example calculations and input for ICIS using specific scenarios. The typical complying actions in the On-going Releases Category that apply to these types of cases are:

- Retire Pollution Credits (stationary sources);
- Source Reduction;
- Emissions Change; and
- Leak Repair (LDAR).

When retiring pollution credits, there should be a direct correlation between the pounds of pollution credit retired (lbs/year) and the amount that is reported into ICIS.

In addition, it should be noted that for CAA cases involving exceedances with existing air pollution standards, actual emission amounts should be used in the calculations and not potential to emit amounts.

3.8.1 NO_x Reductions at a Petroleum Refinery under PSD/NSR

3.8.1.1 Background

Emissions of NO_x at petroleum refineries are associated with refinery combustion units. Refinery boilers and process heaters are usually targeted for NO_x reductions under compliance actions. Fluidized catalytic cracking unit (FCCU) regenerators are also sources of NO_x emissions at petroleum refineries (NO_x is generated when coke is burned off of the catalyst); however, these units are typically not controlled for NO_x reductions and therefore will not be discussed further under this guidance. There are two primary types of fuel burned in the boilers and process heaters: fuel oil and gas. The gas can be either refinery fuel gas that is produced at the facility or natural gas. There are different options that facilities may use to reduce NO_x emissions depending on the unit and fuel type.

The primary reduction techniques for boilers and process heaters can be classified into one of three fundamentally different methods C combustion controls, post-combustion controls, and fuel switching. Combustion controls reduce NO_x by suppressing NO_x formation during the combustion process while post-combustion controls reduce NO_x emissions after their formation.

Combustion controls are the most widely used method of controlling NO_x formation in all types of boilers and process heaters and include:

- Low excess air;
- Burners out of service;
- Biased-burner firing;
- Flue gas recirculation;
- Overfire air; and
- Low- NO_x burners.

Post-combustion control methods include selective non-catalytic reduction (SNCR) and selective catalytic reduction (SCR). These controls can be used separately, or combined to achieve greater NO_x reduction. For enforcement actions where combustion control technologies will be implemented, the complying action is Emissions Change. Fuel switching replaces one type of fuel with another and can also be combined with other controls to achieved greater NO_x reduction. For actions that will implement fuel switching you should identify the complying action Source Reduction. For each of these complying action types the typical units reported are “tons” or “pounds” and the media impacted is “air”.

Combustion Techniques (FGR and Low NO_x Burners)

Currently, the two most prevalent combustion control techniques used to reduce NO_x emissions are flue gas recirculation (FGR) and low NO_x burners. In an FGR system, a portion of the flue gas is recycled from the stack to the burner wind box. Upon entering the windbox, the recirculated gas is mixed with combustion air prior to being fed to the burner. The recycled flue gas consists of combustion products which act as inerts during combustion of the fuel/air mixture. The FGR system reduces NO_x emissions by two mechanisms. Primarily, the recirculated gas acts as a diluent to reduce combustion temperatures, thus suppressing the thermal NO_x mechanism. To a lesser extent, FGR also reduces NO_x formation by lowering the oxygen concentration in the primary flame zone.

Low NO_x burners reduce NO_x by accomplishing the combustion process in stages. Staging partially delays the combustion process, resulting in a cooler flame which suppresses thermal NO_x formation. The two most common types of low NO_x burners being applied are staged air burners and staged fuel burners. NO_x emission reductions of 40 to 85 percent (relative to uncontrolled emission levels) have been observed with low NO_x burners. When low NO_x burners and FGR are used in combination, these techniques are capable of reducing NO_x emissions by 60 to 90 percent.

Post-Combustion Technologies

Two post-combustion technologies that may be applied to natural gas-fired boilers to reduce NO_x emissions are selective non-catalytic reduction (SNCR) and selective catalytic reduction (SCR). The SNCR system injects ammonia or urea into combustion flue gases (in a specific temperature zone) to reduce NO_x emission. In many situations, a boiler or process heater may have an SNCR system installed to trim NO_x emissions to meet permitted levels. In these cases, the SNCR system may not be operated to achieve maximum NO_x reduction. The SCR system involves injecting NH_3 into the flue gas in the presence of a catalyst to reduce NO_x emissions.

Fuel Switching

Fuel switching may be used to reduce NO_x emissions. For certain boiler and process heater units, it may be possible for the facility to switch from fuel oil combustion to natural gas combustion. This switch in fuels can result in reduced NO_x emissions.

3.8.1.2 Calculation Methodology

There are essentially two methods to calculate NO_x reductions from process heaters and boilers:

1. Calculate emissions for the unit using emission factors representing the pre-compliance and post-compliance conditions (e.g., uncontrolled and controlled scenario; or, emissions from fuel oil burning versus emission from refinery fuel gas switching). Subtract the post-compliance estimate from the pre-compliance estimate to determine the reductions.

2. Calculate emissions for the pre-compliance condition (e.g., uncontrolled) using emission factors. Multiply a NO_x control efficiency to the pre-compliance emission estimate that represents the control strategy that is or will be used by the facility to come into compliance (e.g., the control efficiency for a low-NO_x burner). The estimated reduction is equal to the amount of NO_x emissions controlled.

Published emission factors and control efficiencies are available for process heaters and boilers by fuel type and size or rated heat input of the unit. It is important to note that there are no published emission factors or control efficiencies specific to the use of >refinery fuel gas'. Factors are available for the combustion of natural gas. In situations where refinery gas is being used as a fuel, the emissions reductions should be calculated using the emission factors or control efficiencies that are published for natural gas combustion in boilers and process heaters. The exception to this case would be if the facility provides emission factors specific to the refinery fuel gas being used at that facility.

The following steps should be followed to calculate NO_x emission reductions for boilers and process heaters at petroleum refineries. ***[Note: The steps should be followed to calculate emission reductions for each unit that is affected by the compliance measures and total reductions should be summed for all affected units to estimate a total reduction quantity for the compliance action***.] Table 3-24 (following the examples) presents a worksheet that shows how to compile the information in order to calculate emission reductions (the field names in Table 6-1 are coded to the items listed in the methodology below):

Calculation Methodology for NO_x Reductions from Boilers and Process Heaters	
Step A	Determine the operating conditions of the unit under non-compliance conditions.
Step B	Determine the reduction strategy for the affected unit.

Step C	If the affected unit is a boiler, locate the emission factor in Table 1.3-1 or Table 1.4-1 of AP-42 (EPA, 1995) that best matches the pre-compliance condition (e.g., uncontrolled). If the affected unit is a process heater, locate the emission factor from Tables 5-11 to 5-15 of the *Alternative Control Techniques Document - NO_x Emissions from Process Heaters* (EPA, 1993) that best matches the pre-compliance condition. Table 6-1 shows examples for a boiler unit (B1) and process heaters (PH1, PH2).
Step D	If the affected unit is a boiler, locate the emission factor in Table 1.3-1 or Table 1.4-1 of AP-42 that best matches the post-compliance condition (e.g., unit controlled with low NO_x burners). If the affected unit is a process heater, locate the emission factor from Tables 5-11 to 5-15 of the *Alternative Control Techniques Document - NO_x Emissions from Process Heaters* that best matches the post-compliance (i.e., controlled) condition. Table 3-24 shows examples for a boiler unit (B1) and process heaters (PH1, PH2). [***Note: if an emission factor that represents the reduction strategy cannot be located in the referenced tables, then skip to step "E" below.]***
Step E	If emission factors representing emission reduction strategies are not available, it is also possible to calculate emission reductions based on estimated control efficiencies. In these cases, refer to Table 12.3-1 of Volume II, Chapter 12 of the EIIP document series located at http://www.epa.gov/ttn/chief/eiip/techreport/volume02/ii12/pdf. Locate the control efficiency that best matches the reduction strategy used for compliance and use the value in Table 3-24, Column E.
Step F	If the unit is a process heater, enter the annual heat input for the affected unit for which emission reductions are being estimated. [Conversion factors to go from a volume basis to an energy basis are provided in Table 3-24.]
Step G	If the unit is a boiler, enter the annual quantity of fuel burned. [If the fuel burned is fuel oil use units of 1×10^3 gallons; if the fuel burned is natural gas use units of 1×10^6 scf. Conversion factors to go from a volume basis to an energy basis are provided in Table 3-24.]
Step H	Multiply the emission factor (from Column C) for the pre-compliance scenario by either the heat input value (from Column F for process heaters) or the fuel burned (from Column G for boilers) and enter the emission estimate in Column H.

Step I	Multiply the emission factor for the post-compliance scenario (Column D) by either the heat input value (Column F for process heaters) or the fuel burned (Column G for boilers) and enter the emission estimate in Column I**.** If an emission factor was not available for the control device adopted by the facility to come into compliance, then skip to step K below. See example calculation below.
Step J	Subtract Column I from Column H and enter the quantity of NO_x emissions reduced for the unit.
Step K	Multiply the pre-compliance estimate in Column H by the control efficiency in Column E and enter the quantity of NO_x emissions reduced for the unit.
Step L	Report the total pollutant reduction in pounds in ICIS. Identify "Air" as the impacted media.

3.8.1.3 Examples

The following examples demonstrate how emission reductions can be calculated for a petroleum refining facility. The input data and calculated reductions for Examples 1 and 2 below are shown on Table 3-24. EPA/OC has also developed a PSD/NSR Calculator tool for use in developing pollutant reductions for boilers and process heaters.

Example 1

ABC Oil Company has a facility that added a new gas-fired boiler and 2 gas-fired process heaters (both are natural draft [ND] heaters) in order to increase its production. The boiler and process heaters were installed with no controls. In operating the new units, the facility increased its NO_x emissions by more than 40 tons per year, and thus triggered PSD/NSR, falling out of compliance with Prevention of Significant Deterioration (PSD) requirements for their NO_x emissions cap. Following an administrative order, the facility agrees to add control devices to the new boiler and process heater units in order to reduce NO_x emissions. The facility agrees to use a low-NO_x burner (LNB) and flue-gas recirculation (FGR) on the boiler unit and to retrofit the two new process heaters with ultra low-NO_x burners (ULNB). The annual quantity of fuel burned in the boiler is 687×10^6 scf. The annual quantity of heat input into the process heaters is 1.0×10^6 MMBtu each.

EPA's PSD/NSR Calculator can be used to calculate emissions for the boiler (B1) and the process heaters (PH1 and PH2) based on uncontrolled conditions (pre-compliance) and also with controls installed (post-compliance). The calculation of reductions follows the steps outlined above.

For Boiler 1:

Pre-compliance NO_x emissions	=	annual quantity of fuel burned × pre-compliance emission factor
	=	687×10^6 scf/yr × 100 lb/10^6 scf
	=	68,700 lb/yr
	=	34 ton/yr
Post compliance NO_x emissions	=	Annual quantity of fuel burned × post-compliance emission factor
	=	687×10^6 scf/yr × 32 lb/10^6 scf
	=	21,984 lb/yr
	=	11 ton/yr
Annual NO_x reduction	=	Pre-compliance emissions - post-compliance emissions
	=	34 ton/yr - 11 ton/yr
	=	23 ton/yr

For Process Heaters 1 and 2:

Pre-compliance NO_x emissions	=	Annual heat input × pre-compliance emission factor
	=	1.0×10^6 MMBtu/yr × 0.098 lb/MMBtu
	=	98,000 lb/yr
	=	49 ton/yr
Post-compliance NO_x emissions	=	Annual heat input × post-compliance emission factor
	=	1.0×10^6 MMBtu/yr × 0.025 lb/ MMBtu
	=	25,000 lb/yr
	=	12.5 ton/yr
Annual NO_x reduction	=	Pre-compliance emissions - post-compliance emissions
	=	49 ton/yr - 12.5 ton/yr
	=	36.5 ton/yr

The total reductions for the facility based on its compliance actions are equal to the sum of the reductions for all three units on which controls were installed. The total reductions for NO_x are equal to 192,000 pounds per year.

Total NO_x Reduction	=	B1 reduction + PH 1 reduction + PH 2 reduction
	=	23 ton/yr + 36.5 ton/yr + 36.5 ton/yr
	=	96 ton/yr or 192,000 pounds/yr

Input for ICIS:

- **Complying Action**: Emissions Change;
- **Pollutant**: Nitrogen oxides;
- **Amount and Unit**: 192,000 pounds; and
- **Media**: Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2

XYZ Refining Company has decided that to come into compliance with its PSD requirements it will switch from using No. 6 fuel oil in its utility boiler to using No. 2 fuel oil, and in addition, will install low-NO_x burners with flue gas recirculation. The utility boiler is rated at 250 MMbtu/hr heat input and has a normal firing configuration prior to compliance action. The annual quantity of fuel burned in the utility boiler is 11,680 H 10^3 gallons. The PSD/NSR Calculator can be used to calculate emissions for the utility boiler (UB1) based on uncontrolled conditions (pre-compliance) and after the fuel switch and control device additions are made (post-compliance). The NO_x reductions achieved represent the difference between the pre-compliance and post-compliance estimates, which in this case is estimated to be 216 tons.

Pre-compliance NO_x emissions	=	Annual fuel burned × pre-compliance emission factor
	=	$11,680 \times 10^3$ gal/yr × 47 lb/ 10^3 gal
	=	548,960 lb/yr
	=	274 ton/yr
Post-compliance NO_x emissions	=	Annual fuel burned × post-compliance emission factor
	=	$11,680 \times 10^3$ gal/yr × 10 lb/10^3 gal
	=	116,800 lb/yr
	=	58 ton/yr
Total annual NO_x reduction	=	Pre-compliance emissions - post-compliance emissions
	=	274 ton/yr - 58 ton/yr
	=	216 ton/yr or 432,000 pounds/yr

Input for ICIS:

- **Complying Action:** Source Reduction and Emissions Change;
- **Pollutant:** Nitrogen oxides;
- **Amount and Unit:** 432,000 pounds; and
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

Table 3-24. Worksheet to Calculate NO_x Emission Reductions from Process Heaters and Boilers

Unit ID	Pre-Compliance Condition (A)a	Reduction Strategy (B)a	Pre-Compliance Emission Factor (C)	Post-Compliance Emission Factor (D)	NO_x Control Efficiency (E)	Annual Heat Input (F)a	Annual Fuel Burned (G)a	Pre-Compliance Emission Estimate (H)	Post-Compliance Emission Estimate (I)	NO_x Emissions Reduced (factor based) (J)	NO_x Emissions Reduced (CE based) (K)
B 1	no control	LNB +FGR	100 lb/106 scf	32 lb/106 scf	NA		687 × 106 scf	34 tons NO_x	11 tons NO_x	23 tons NO_x	NA
PH 1	no control	ULNB	.098 lb/MMBtu	.025 lb/MMBtu	NA	1.0 ×106 MMBtu		49 tons NO_x	12.5 tons NO_x	36.5 tons NO_x	NA
PH 2	no control	ULNB	.098 lb/MMBtu	.025 lb/MMBtu	NA	1.0 ×106 MMBtu		49 tons NO_x	12.5 tons NO_x	36.5 tons NO_x	NA
UB1	no control	Fuel switch + LNB + FGR	47 lb/103 gal	10 lb/103 gal	NA		11680 × 103 gal	274 tons NO_x	58 tons NO_x	216 tons NO_x	NA

a – Information known from the case file.
2000 pounds = 1 ton

Conversion factors to convert energy values (Million BTU or MMBtu) to volume values for fuels used in process heaters and boilers:

For gas, use the natural gas heating value of 1,020 MMBtu/10^6 scf.
For fuel oil, use a heating value of 150 MMBtu/10^3 gal for Nos. 4, 5, 6, and residual fuel oil, and 140 MMBtu/10^3 gal for No. 2 and distillate fuel oil.

B1 = boiler # 1 from example calculation 1
PH1 = process heater # 1 from example calculation 1
PH2 = process heater # 2 from example calculation 1
UB1 = utility boiler #1 from example calculation 2
LNB = low NO_x burner
FGR = flue-gas recirculation
ULNB = ultra low-NO_x burner

3.8.2 SO_2 and HAP Reductions at a Kraft Pulp and Paper Mill Under MACT

3.8.2.1 Background

In the kraft pulping process, wood is digested under elevated temperature and pressure using a cooking liquor of sodium hydroxide and sodium sulfide. The digester contents are separated by the pulp washing system into a pulp slurry and spent cooking liquor. The pulp slurry is sent to subsequent processing and conditioning equipment (e.g., screening, oxygen delignification, bleaching) and the spent cooking liquor is concentrated in the evaporator system and then fired in the chemical recovery boiler. The inorganic cooking chemicals, recovered as smelt from the boiler furnace floor, are sent to the recausticizing area to be used in preparing fresh cooking liquor. The kraft pulping process also produces several byproducts (tall oil, turpentine) that are usually recovered onsite.

Air toxics (hazardous air pollutants or HAPs) and total reduced sulfur (TRS) compounds are formed in the wood digestion process and pulp treatment processes (e.g., oxygen delignification, chemical bleaching) and are emitted from discrete process vents and open equipment throughout the process. The emission points at a typical kraft pulp and paper mill include vents from the following systems: digester, evaporator, turpentine recovery, pulp washing, screening, knotter, decker, oxygen delignification, and chemical bleaching. Most mills tend to reuse or recycle process condensates in an effort to reduce fresh water consumption. Process equipment that uses recycled condensates typically has higher emissions than the same piece of equipment using fresh water due to the volatilization of pollutants in the process condensates.

Sulfur dioxide (SO_2) emissions at kraft pulp and paper mills are generated by the combustion of sulfur-containing fuels (black liquor and fossil fuels) and by the combustion of pulping vent gases that contain TRS compounds. Lime kilns, which convert calcium carbonate to quick lime for use in liquor preparation, are generally not considered significant sources of SO_2 emission at kraft mills since the exhaust gases are usually passed through a wet scrubber to remove particulate matter, which in turn also reduces SO_2 emissions.

The recovery boiler is the heart of the kraft chemical pulping process. During normal operation, spent cooking liquor (black liquor) from the evaporator system is burned in the chemical recovery boiler (fuel oil or natural gas may be burned during periods of start-up and shutdown). The organic content of the black liquor is oxidized to generate process steam and the inorganic cooking chemicals are recovered as smelt from the furnace bed. Some of the sulfur contained in the black liquor is reduced in the furnace bed and exits the boiler with the smelt. The remaining sulfur is oxidized in the upper furnace. The SO_2 emissions from the recovery boiler are determined by the relative amounts of sodium and sulfur volatilized during black liquor combustion.

The generation of black liquor is directly related to pulp production, therefore, any increases in pulp production necessitates an increase in black liquor firing rate with an associated increase in SO_2 emissions. In some cases, the recovery boiler has sufficient excess capacity to handle pulp production increases. However, if the pulp production capacity is greater than the available recovery capacity, then the boiler must be modified to handle the increase in black liquor throughput.

Although the chemical recovery boiler is the primary source of process steam in the mill, fossil fuels and wood waste are fired in power boilers at pulp and paper mills to generate additional process steam and electricity. Sulfur dioxide emissions generated by burning a given fuel are proportional to the heat input rate of the boiler. An increase in heat input rate, either due to modification of an existing boiler or addition of a new boiler, translates to an increase in SO_2 emissions.

Control Techniques

Air Toxic Emissions

Air toxic emissions from regulated pulping process vents are almost exclusively controlled using mill combustion sources (e.g., power boilers, lime kilns) or using dedicated thermal oxidizers. Reductions in HAP emissions can also be achieved by replacing higher-emitting process equipment with lower-emitting ones. For example, HAP emissions from the pulp washing system could be reduced by replacing the rotary vacuum drum washers with diffusion washers.

Sulfur Dioxide Emissions

The strategy for reducing SO_2 emissions is dependent on the source of sulfur (i.e., fuel or pulping process vent gases). For sources of emissions associated with fuel combustion, emission reductions can be achieved through physical process modifications and fuel switching. However, for chemical recovery boilers, fuel switching is only an option during periods of start-up and shutdown. For sources of SO_2 emissions associated with pulping process vent gas combustion, emission reductions can be achieved by treating the inlet gas to remove TRS compounds prior to combustion or by treating the outlet gas to remove SO_2 directly. This type of gas treatment is typically accomplished using a gas scrubber with caustic scrubbing media (sodium hydroxide or fresh (white) cooking liquor).

Process Modifications

Process modifications are the most prevalent control techniques used to reduce SO_2 emissions from chemical recovery boilers. Sulfur dioxide emissions are influenced by the temperature in the lower furnace area and can be nearly zero for boilers that have been modified to operate with a hotter lower furnace. Sulfur dioxide emissions can also be reduced by using sulfur-free chemicals, such as caustic soda (NaOH) and soda ash (Na_2CO_3), instead of saltcake (Na_2SO_4) to makeup sodium lost in the chemical recovery process.

Fuel Switching

Fuel switching can reduce SO_2 emissions from power (and recovery boilers during start up/shutdown), if a fuel with a lower sulfur content can be used. For example, a boiler burning coal or distillate oil, natural gas would be a candidate for fuel switching. However, fuel switching would not be feasible for a boiler firing natural gas since a fuel with a lower sulfur content is not available.

Gas Treatment

At some mills, the pulping process vent gases are routed through a scrubber (typically using white cooking liquor or caustic solution as the scrubbing media) to absorb sulfur compounds prior to combustion. This type of pretreatment is usually limited to dedicated thermal oxidizers. Due to the large volume of gas associated with recovery and power boilers, treatment of inlet and outlet gases to remove TRS (or SO_2 after combustion) is usually cost prohibitive.

Based on these control technologies, the typical types of direct complying actions applicable to SO_2 and HAP reduction, elimination, and treatment include emissions change and source reduction.

3.8.2.2 Calculation Methodology

The preferred method for calculating emission reductions associated with an add-on control technology or with process modifications is to use approved test data for the period before and after the emission reduction was achieved. For some process modifications, such as modifications to the heat recovery sections of recovery boilers, test data may be the only method for calculating emission reductions since reliable emission factors are not generally available. However, if approved test data are not available, as in most cases, then emission factors and control technology/treatment device efficiencies must be used to estimate emission reductions.

As discussed in Section 3.14.1, emissions from noncombustion and combustion sources at kraft pulp mills are either directly or indirectly a function of the pulp production rate. Consequently, site-specific process data (e.g., pulp production rate, fuel firing rate, operating schedule) are necessary to estimate reductions using emission factors.

Emission factors for characterizing HAP and TRS emissions are typically in units of mass of pollutant per mass of pulp production and are available from EPA documents (AP-42, Pulp and Paper NESHAP emission factor document). Emission factors are also available from industry reports and publications. Sulfur dioxide emission factors for fuel combustion are typically given in mass of pollutant per unit of fuel usage. AP-42 contains emission factors for various boiler configurations and fuels firing combinations. Process data (e.g., pulp production rate, operating schedule) should be obtained from mill documents or mill personnel. The efficiencies of control technologies or devices can be found in the EPA's Emission Inventory Improvement Program (EIIP), Volume II, Chapter 12, *How to Incorporate the Effects of Air Pollution Control Device Efficiencies and Malfunctions into Emission Inventory Estimates* located at http://www.epa.gov/ttn/chief/eiip/techreport/volume02/ii12.pdf.

To estimate the reduction in SO_2 emissions achieved by fuel switching, the following calculation steps should be used:

Step A	Gather process parameters for power boiler no. 1.
Step B	Find appropriate SO_2 emission factors for no. 6 fuel oil and natural gas for power boiler no. 1.
Step C	Determine the maximum amount of no. 6 fuel oil burned per year in the boiler.

Step D	Determine the equivalent amount of natural gas burned per year in the boiler.
Step E	Calculate the SO_2 emissions from firing no. 6 fuel oil for the boiler.
Step F	Calculate the SO_2 emissions from firing natural gas for the boiler.
Step G	Subtract the SO_2 emissions from natural gas firing from the SO_2 emissions from no. 6 fuel oil firing to estimate emission reductions.
Step H	Report the total pollutant reduction in pounds in ICIS. Identify “Air” as the impacted media.

To estimate the reduction in HAP emissions achieved by an add-on control device, the following calculation steps should be used:

Step A	Gather process parameters for the pulp washing system.
Step B	Find an appropriate HAP emission factor for the pulp washing system.
Step C	Determine the uncontrolled HAP emissions from the pulp washing system.
Step D	Determine the control efficiency of the add-on control device.
Step E	Calculate the HAP emission reduction by multiplying the control efficiency of the add-on device by the uncontrolled emissions from the pulp washing system.
Step F	Report the total pollutant reduction in pounds in ICIS. Identify “Air” as the impacted media.

3.8.2.3 Examples

The following examples demonstrate how HAP and SO_2 emission reductions can be calculated from emission sources at a kraft pulp and paper mill. In these examples, the data (emission factors, process parameter, and control device efficiencies) are arranged such that the specific units (MMBtu/hr, lb/ton, lb removed/100 pounds at inlet) in the numerator and denominator of the data can be canceled out. This approach is used to help ensure that conversion errors are not introduced into the emission reduction calculations.

Example 1. Sulfur Dioxide Emission Reductions Using Fuel Switching

Under a Prevention of Significant Deterioration (PSD) violation, ABC Paper Company was found to have significantly increased pulp production. The increase in pulp production resulted in an increase in SO_2 emissions from the recovery furnace due to increased firing of black liquor. Since the cost of an add-on control device for reducing SO_2 emissions was determined to be cost-prohibitive, the mill is planning to offset the SO_2 emissions increase from the recovery boiler by reducing SO_2 emissions from the mill's power boiler.

To achieve the required SO_2 emission reduction, the mill plans to switch from burning no. 6 oil to natural gas in the power boiler. The mill currently has one no. 6 fuel oil-fired power boiler with maximum heat input rate of 250 million British thermal units per hour (MMBtu/hr). The boiler uses low-NO_x burners and has a maximum operating schedule of 8,760 hours per year.

Step A In calculating emissions from the power boiler, the following process parameters are needed:

- Maximum heat input rate (MMBtu/hr);
- Fuels fired;
- Type of burners used; and
- Boiler operating hours.

From the information provided in Example 1, the following information is obtained:

- Maximum heat input rate of power boiler no. 1 = 250 MMBtu/hr;
- No. 6 fuel oil is fired;
- The boiler uses low- NO_x burners; and
- The boiler operates a maximum of 8,760 hours per year.

Step B Once the boiler process parameters have been identified, appropriate SO_2 emissions factors for no. 6 fuel oil and natural gas firing can be found in Sections 1.3 and 1.4, respectively, of EPA's AP-42. For the boiler and fuel type, the following emission factors were selected from Tables 1.3-1 and 1.4-1:

No. 6 fuel oil firing = 157(S) lb/1,000 gallons

Where S = the percent sulfur in no. 6 fuel oil; and

Natural gas firing = 0.6 lb/10^6 scf of natural gas

For the fuel oil emission factor, the percent sulfur content of the fuel oil is needed before the emission factor can be used. Appendix A of AP-42 (Miscellaneous Data and Conversion Factors) contains average fuel characteristics that can be used in lieu of more specific information (e.g., vendor specifications for percent sulfur). For this calculation, the percent sulfur in fuel oil was selected as 0.5 percent. Therefore, the SO_2 emission factor for fuel oil is calculated as follows:

157(0.5) = 78.5 lb/1,000 gallon fuel oil

Step C The maximum amount of no. 6 fuel oil burned in the boiler is determined using the maximum heat input rate, the heat content of no. 6 fuel oil, and the operating schedule. Since the heat content of no. 6 fuel oil was not provided by the mill, an average value of 140,000 Btu/gallon (for distillate oil) was selected from Appendix A of AP-42.

To determine the maximum amount of no. 6 fuel oil burned in the boiler, the following unit conversion is used:

$$\frac{\text{MMBtu}}{\text{hr}} \times \frac{1{,}000{,}000\ \text{Btu}}{\text{MMBtu}} \times \frac{\text{hrs}}{\text{yr}} \times \frac{\text{gallon no.6 oil}}{140{,}000\ \text{Btu}}$$

For power boiler no. 1, the above unit conversion is calculated as follows:

$$\frac{250\ \text{MMBtu}}{\text{hr}} \times \frac{10^6\ \text{Btu}}{\text{MMBtu}} \times \frac{8760\ \text{hr}}{\text{yr}} \times \frac{1\ \text{gal}}{140{,}000\ \text{Btu}} = \frac{1.56 \times 10^7\ \text{gal}}{\text{yr}}$$

Step D Once the maximum amount of no. 6 fuel oil burned for the boiler is determined, an amount of natural gas that is equivalent to the quantity of no. 6 fuel oil is needed. To determine the equivalent amount of natural gas burned per year in the boiler, a unit conversion similar to that used in Step 3 is followed:

$$\frac{\text{MMBtu}}{\text{hr}} \times \frac{1{,}000{,}000\ \text{Btu}}{\text{MMBtu}} \times \frac{\text{hr}}{\text{yr}} \times \frac{\text{scf natural gal}}{1{,}050\ \text{Btu}}$$

For power boiler no. 1, the above unit conversion is calculated as follows:

$$\frac{250\ \text{MMBtu}}{\text{hr}} \times \frac{10^6\ \text{Btu}}{\text{MMBtu}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{1\ \text{scf}}{1{,}050\ \text{Btu}} = \frac{2.09 \times 10^9\ \text{scf}}{\text{yr}}$$

Step E The SO_2 emissions from firing no. 6 fuel oil in power boiler no. 1 are calculated using the appropriate emission factor determined in Step 2 and the maximum amount of fuel oil burned, determined in Step 3, as follows:

$$\frac{78.5\ \text{lb}\ SO_2}{1{,}000\ \text{gal fuel oil}} \times \frac{1.56 \times 10^7\ \text{gal}}{\text{yr}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = 613.98\ \text{tons}\ SO_2/\text{yr}$$

Step F Similarly to the procedures in Step E, the SO_2 emissions from natural gas firing in power boiler no. 1 are calculated as follows:

$$\frac{0.6\ \text{lb}}{10^6\ \text{scf}} \times \frac{2.09 \times 10^9\ \text{scf}}{\text{yr}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = 0.63\ \text{tons}\ SO_2/\text{yr}$$

Step G The emission reduction achieved by switching from no. 6 fuel oil to natural gas for the power boiler is determined by subtracting the SO_2 emissions determined in Step 6 from the SO_2 emissions determined in Step 5.

Power boiler no. 1 emission reduction = 613.98 - 0.63 = 613.35 tons SO_2/yr or 1,226,700 pounds SO_2/yr.

Step H Input for ICIS

- **Complying Action:** Source Reduction;
- **Pollutant:** Sulfur dioxide;
- **Amount and Unit:** 1,226,700 pounds; and
- **Media:** Air

Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2. Air Toxic Emission Reduction Using an Add-on Control Device

As a result of an enforcement action, a kraft mill subject to the pulp and paper NESHAP must control their emissions from their brown stock washing system (all other subject vents at the mill are currently controlled). Because the distance between the pulp washing system and the existing power boilers is too great, the mill decides to control the pulp washing system emissions using a dedicated thermal oxidizer meeting the design parameters specified in the NESHAP.

The pulp production rate of the mill is 1,200 air-dried tons of pulp per day (ADTPD). The pulp washing system is a diffusion washer (i.e., low-air flow design) that uses fresh water as wash water.

Step A In calculating uncontrolled HAP emissions from a pulp washing system, the following process parameters are needed:

- Type of pulp washing system (e.g., rotary vacuum drum);
- HAP concentration of washed water used; and
- Pulp production rate.

From the information provided in Example 2, the following information is obtained:

- Type of pulp washing system = diffusion washer (low-air flow design);
- HAP concentration of washed water = negligible; and
- Pulp production rate = 1,200 ADTPD.

Step B The Chemical Pulping Emission Factor Development Document (Revised Draft) prepared by the EPA for the pulp and paper NESHAP (40 CFR part 63 subpart S) contains HAP emission factors for kraft pulp mills. In Table 1-1 of the emission factor document, HAP emissions are presented for an example (1,000 tons oven-dried pulp per day, ODTPD). For low air flow washers, the HAP emissions for the example mill in the emission factor document are given as 20 megagrams per year (Mg/yr). Dividing the HAP emissions by the example mill production yields (1,000 tons air-dried pulp per day) and an assumed operating schedule of 365 days per year, a HAP emission factor of 5.48E-05 Mg/ODT is obtained.

Step C Once an appropriate HAP emission factor for the pulp washing system has been obtained, uncontrolled emissions can be estimated by multiplying the mill pulp production rate by the HAP emission factor. However, in this example, the pulp production rate is given in terms of **air**-dried tons and the emission factor is in terms of **oven**-dried tons. To properly use the HAP emission factor, the pulp production rate must be converted to oven-dried tons using the following relationship:

1 air-dried ton of pulp = 0.9 oven-dried ton of pulp

This relationship is developed based on the industry standard that an air-dried ton of pulp contains 10 percent moisture. Using the above conversion, the ADTPD pulp production rate in this example is converted to ODTPD using the following calculation:

$$\frac{1{,}200 \text{ air-dried tons}}{\text{day}} \times \frac{0.9 \text{ oven-dried ton}}{1 \text{ air-dried ton}} = 1{,}080 \text{ ODTPD}$$

The uncontrolled HAP emissions from the pulp washing system can now be estimated by multiplying the mill pulp production rate by the HAP emission factor as follows:

$$\frac{5.48 \times 10^{-5} \text{ MgHAP}}{\text{ODTP}} \times \frac{1{,}080 \text{ ODTP}}{\text{day}} \times \frac{365 \text{ days}}{\text{yr}} \times \frac{21.60 \text{ Mg HAP}}{\text{yr}}$$

Step D The pulp and paper NESHAP provides several control options for reducing HAP emissions from pulping process vents. The control options, of which the design thermal oxidizer is an alternative, are intended to achieve at least 98 percent destruction of HAP emissions. Therefore, it is appropriate to assume that the control efficiency of the thermal oxidizer in this example is 98 percent.

Step E Once an appropriate efficiency for the add-on control device is obtained, the HAP emission reduction for the pulp washing system is calculated by multiplying the control device efficiency by the uncontrolled HAP emissions as follows:

$$\frac{21.6 \text{ Mg HAP at thermal oxidizer inlet}}{\text{yr}} \times \frac{98 \text{ Mg Reduced}}{100 \text{ Mg at thermal oxidizer inlet}} = \frac{21.17 \text{ Mg HAP reduced}}{\text{yr}}$$

This metric value can be converted to English units using the following conversion:

$$\frac{21.17 \text{ Mg HAP Reduced}}{\text{yr}} \times \frac{1{,}000 \text{ kg}}{\text{Mg}} \times \frac{1 \text{ lb}}{0.454 \text{ kg}} \times \frac{46{,}630 \text{ pounds HAP reduced}}{\text{yr}}$$

Step F Input for ICIS

- **Complying Action:** Emissions Change;
- **Pollutant:** Total hazardous air pollutants;
- **Amount and Unit:** 46,630 pounds; and
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

3.8.3 Leak Detection and Repair

3.8.3.1 Background

Under the Clean Air Act, fugitive emissions from a variety of equipment, including pumps, valves, flanges, connectors, and compressors, are to be controlled through the implementation of a Leak Detection and Repair program (LDAR). Through this program, equipment must be routinely monitored for leaks and if a leak is found, it must be repaired. If equipment leaks go undetected, fugitive emissions of volatile organic compounds (VOCs) and other hazardous chemicals will be emitted continually into the atmosphere. These emissions have a number of adverse effects such as contributing to smog and human health problems. The complying action that applies to LDAR cases is Leak Repair LDAR.

If LDAR program violations are identified, emissions from a particular piece of equipment can be estimated using the EPA correlation equation approach. This method involves obtaining screening values (from a portable organic vapor analyzer) before and after the leak was repaired. Using these values, a calculation can be performed to determine the resulting reduction in emissions. This approach applies to cases where the screening values are measurable (i.e., the portable organic vapor analyzer measurement is inside the range of the device).

3.8.3.2 Calculation Methodology

To estimate LDAR pollutant reductions according to the EPA correlation equation method, you need:

- The equipment screening value (ppmv) before the repair;
- The equipment screening value (ppmv) after the repair;
- The hours of operation (hr/yr);
- The pollutant concentration (weight percent) within the equipment; and
- The Total Organic Carbon (TOC) concentration (weight percent) within the equipment.

The EPA correlation equation approach involves the use of a unit and site-specific correlation equation. These correlation equations have been developed for organic chemical manufacturing (SOCMI) process units and for the petroleum industry and can be found in the document entitled, *Protocol for Equipment Leak Emission Estimates* (EPA, Nov. 95). Table 3-25 and Table 3-26 contain a few of these equations.

Table 3-25. SOCMI Leak Rate/Screening Value Correlations

Equipment Type	Correlation
Gas valves	leak rate (kg/hr) = 1.87 E-06 × $(SV)^{0.873}$
Light liquid valves	leak rate (kg/hr) = 6.41 E-06 × $(SV)^{0.797}$
Light liquid pumps	leak rate (kg/hr) = 1.90 E-05 × $(SV)^{0.824}$
Connectors	leak rate (kg/hr) = 3.05 E-06 × $(SV)^{0.885}$

Source: Protocol for Equipment Leak Emission Estimates (EPA, Nov. 1995).
SV = screening value in ppmv

Table 3-26. Petroleum Industry Leak Rate/Screening Value Correlations

Equipment Type	Correlation
Valves (all)	leak rate (kg/hr) = 2.29 E-06 × $(SV)^{0.746}$
Pump seals (all)	leak rate (kg/hr) = 5.03 E-05 × $(SV)^{0.610}$
Open-ended lines (all)	leak rate (kg/hr) = 2.20 E-06 × $(SV)^{0.704}$
Connectors (all)	leak rate (kg/hr) = 1.53 E-06 × $(SV)^{0.735}$
Flanges (all)	leak rate (kg/hr) = 4.61 E-06 × $(SV)^{0.703}$
Others [a]	leak rate (kg/hr) = 1.36 E-05 × $(SV)^{0.589}$

Source: Protocol for Equipment Leak Emission Estimates (EPA, Nov. 1995)
SV = screening value in ppmv
a – Others shall be applied to any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

If the available screening value is below ”zero” (the screening value that represents the minimum detection limit of the monitoring device) or a ”pegged” screening value (the screening value that represents the upper detection limit of the monitoring device), the correlations in the above two tables cannot be used. Instead, the values displayed in Table 3-27 and Table 3-28 should be used rather than a correlation.

Table 3-27. SOCMI Default Zero Leak Rates and Pegged Leak Rates

Equipment Type	Default Zero Emission Rate (kg/hr)	Pegged Emission Rate (10,000 ppmv) (kg//hr)	Pegged Emission Rate (100,00 ppmv) (kg/hr)
Gas Valves	6.6E-07	0.024	0.11
Light liquid valves	4.9E-07	0.036	0.15
Light liquid pumps	7.5E-06	0.14	0.62
Connectors	6.1E-07	0.044	0.22

Source: *Protocol for Equipment Leak Emission Estimates* (EPA, Nov. 1995).

Table 3-28. Petroleum Industry Default Zero Leak Rates and Pegged Leak Rates

Equipment Type	Default Zero Emission Rate (kg/hr)	Pegged Emission Rate (10,000 ppmv) (kg/hr)	Pegged Emission Rate (100,000 ppmv) (kg/hr)
Connector (all)	7.5E-06	0.028	0.030
Flange (all)	3.1E-07	0.085	0.084
Open-ended line (all)	2.0E-06	0.030	0.079
Pump (all)	2.4E-05	0.074	0.160
Valve (all)	7.8E-06	0.064	0.140
Other	4.0E-06	0.073	0.110

Source: *Protocol for Equipment Leak Emission Estimates* (EPA, Nov. 1995).

Calculation Methodology for Leak Detection and Repair	
Step A	For each leaking equipment type, choose the appropriate equation from Table 3-25 or Table 3-26. If the available screening value is a "zero" or "pegged" value, choose the appropriate value from Table 3-27 or Table 3-28. If a "zero" or "pegged" screening value exists before repair, skip Step B. If a "zero" or "pegged" screening value exists after repair, skip Step D.
Step B	Enter the equipment screening value (ppmv) before the repair into the equation chosen in Step A in order to calculate the leak rate (kg/hr) before repair.
Step C	Calculate the pollutant emissions (kg/yr) before repair of the leak using the following equation: Pollutant emissions before repair (kg/yr) = [Leak rate (kg/hr) calculated in Step B or picked in Step A × pollutant concentration (weight percent) within the equipment × hours of operation (hr/yr)] / TOC concentration (weight percent) within the equipment
Step D	Now, enter the screening value (ppmv) after the repair into the equation chosen in Step A in order to calculate the leak rate after repair
Step E	Calculate the pollutant emissions (kg/yr) after repair of the leak using the following equation: Pollutant emissions after repair (kg/yr) = [Leak rate (kg/hr) calculated in Step D or picked in Step A × pollutant concentration (weight percent) within the equipment × hours of operation (hr/yr)] / TOC concentration (weight percent) within the equipment
Step F	The emission reduction achieved by the repair is determined by subtracting the emissions after repair from the emissions before the repair and converting to a total load reduction for one year.
Step G	Report the total pollutant reduction in pounds in ICIS. Identify "Air" as the impacted media.

3.8.3.3 Examples

Example 1. SOCMI with Non-Zero, Non-Pegged Screening Values

Under a LDAR violation, injunctive relief for a chemical manufacturing facility entailed repair of a leak at a pump that pumps light liquid. Monitoring of the leak signaled that the VOC concentration was 5,000 ppmv. Upon repair of the leak, an inspector went back to the equipment location with his monitoring device. This time the device registered a VOC concentration of 50 ppmv. Records show that the pump is run for approximately 8760 hr/yr and that the light liquid that is pumped contains 20% wt. VOC and 40% wt. TOC.

Step A The following equation is chosen from the SOCMI table (Table 3-27) and corresponds to the light liquid pump: leak rate (kg/hr) = 1.90 E-05 × $(SV)^{0.824}$

Where: SV = screening value in ppmv

Step B Leak rate (kg/hr) before repair = 1.90E-05 × $(5000)^{0.824}$ = 0.0212 kg/hr

Step C VOC emission (kg/yr) = 0.0212 (kg/hr) × 20 (wt. %) × 8760 (hr/yr) / 40 (wt. %)

VOC emission (kg/yr) before repair = 92.8 kg/yr

Step D Leak rate (kg/hr) after repair = 1.90E-05 × $(50)^{0.824}$ = 0.000477 (kg/hr)

Step E VOC emission (kg/yr) = 0.000477 (kg/hr) × 20 (wt. %) × 8760 (hr/yr) / 40 (wt. %)

VOC emission (kg/yr) after repair = 2.09 kg/yr

Step F VOC emission reduction = (92.8 (kg/yr) - 2.09 (kg/yr)) × 1 lb/454 kg × 1000g/kg × 1 year = 200 lbs of VOC

Step G Input for ICIS

- **Complying Actions:** Leak Repair (LDAR);
- **Pollutant:** VOC;
- **Unit:** 200 pounds; and
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

Example 2. Petroleum Industry with Zero and Pegged Screening Values

A LDAR inspection of a petroleum refining facility resulted in the discovery of leaks at 4 connectors. During the inspection, the monitoring device signaled that the VOC concentrations were greater than 10,000 ppmv, the upper detection limit of the monitoring device. An administrative order requires repair of the connectors to a monitoring concentration of less than 1,000 ppmv, the lower detection limit of the monitoring device. Facility records show that the facility operates continuously (approximately 8760 hr/yr) and that the light liquid that is pumped through the connectors contains 20% wt. VOC and 40% wt. TOC.

Step A Since the screening values before the repair are "pegged" and after the repair will be "zero," respectively, the values are chosen off of Table 3-28.

Leak rate before repair = 0.028 kg/hr.
Leak rate after repair = 7.5E-06 kg/hr

Step B Skipped

Step C VOC emission (kg/yr) = 0.028 (kg/hr) × 20 (wt. %) × 8760 (hr/yr) / 40 (wt. %)

VOC emission (kg/yr) before repair = 122.6 kg/yr per connector

Step D Skipped

Step E VOC emission (kg/yr) = 7.5E-06 (kg/hr) × 20 (wt. %) × 8760 (hr/yr) / 40 (wt. %)

VOC emission (kg/yr) after repair = 0.03 kg/yr per connector

Step F VOC emission reductions = (122.6 (kg/yr) - 0.03 (kg/yr)) × 4 connectors × 1 lb/454g × 1000g/kg × 1 year = 1,080 lbs VOC

Step G Input for ICIS

- **Complying Actions:** Leak Repair (LDAR);
- **Pollutant:** VOC;
- **Unit:** 1,080 pounds; and
- **Media:** Air
  Counted Under Reporting Measure: Estimated Air Pollutants Reduced, Treated, or Eliminated (pounds)

3.9 Toxics (Asbestos, Lead-based Paint, and PCBs)

Many of the enforcement actions related to asbestos, lead-based paint, and PCB contamination will be covered by the removal and restoration category described in Section 2.2. However, there may be additional complying actions that impact this group of toxics and result in reductions to the on-going release of these materials. These complying actions include: abatement of releases using a non-removal remediation approach, implementation of an asbestos management plan, and/or disposal changes for handling PCBs.

For these types of complying actions, report the number of school/housing/building units that are impacted by the action. Lead-based paint or asbestos that is remediated on-site (through containment practices) may include reporting in units of housing or schools.

Example 1. Implement Asbestos Management Plan

A school failed to implement an asbestos management plan where the school is required by the plan to encapsulate, enclose and repair damaged friable asbestos containing material. The plan does not require removal of the material. As part of the settlement, the school implements the asbestos management plan.

Input for ICIS:

- **Complying Action:** Implement Asbestos Management Plan;
- **Pollutant:** Asbestos;
- **Amount and Unit:** 1 school; and
- **Media:** School
  Counted Under Reporting Measure: Toxic Material Abated (# Housing Units, Schools, Buildings)

Example 2. Abatement (non-removal remediation)

A school has damaged friable surfacing asbestos containing material present in the school in violation of TSCA. As a part of the settlement, the school encapsulates, encloses and repairs the damaged material, but does not remove the material which is acceptable.

Input for ICIS:

- **Complying Action:** Abatement (non-removal remediation);
- **Pollutant:** Asbestos;
- **Amount and Unit:** 1 School; and
- **Media:** School
  Counted Under Reporting Measure: Toxic Material Abated (# Housing Units, Schools, Buildings)

Example 3. Abatement (non-removal remediation)

An apartment complex is found to be in violation of the lead-based paint disclosure rule. In the settlement, a lead-based paint inspection/risk assessment is completed and lead-based paint hazards are found. Rather than permanently abating the lead-based paint, the facility conducts interim control measures to stabilize the chipping paint to temporarily make the facility lead-safe.

Input for ICIS:

- **Complying Action:** Abatement (non-removal remediation);
- **Pollutant:** Lead paint;
- **Amount and Unit:** 100 housing units; and
- **Media:** Housing units
  Counted Under Reporting Measure: Toxic Material Abated (# Housing Units, Schools, Buildings)

Example 4. Handling PCBs – Disposal Change

A used oil vendor handling PCB transformer fluid was cited for improper disposal. The enforcement action will require the vendor to change to proper disposal, eliminating improper releases of PCB transformer fluid. The enforcement action will impact disposal of 2,000 gallons/yr of PCB transformer fluid. Assuming a fluid density of 7.92 lbs/gallon, the transformer fluid impacted by the action is equal to 15,840 lbs.

Input for ICIS:

- **Complying Action:** Handling PCBs – Disposal Change;
- **Pollutant:** PCB transformer fluid;
- **Amount and Unit:** 15,840 pounds; and
- **Media:** Land

Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

3.10 Underground Injection Control

3.10.1 Background and Methodology

The SDWA (under SDWA Sections 1422/1423) established the Underground Injection Control (UIC) program to provide safeguards on underground injection operations in order to protect current and future underground sources of drinking water (USDW).

Underground injection is the technology of placing fluids underground into porous formations of rocks, through wells or other similar conveyance systems. The fluids injected may be water, wastewater, or water mixed with chemicals. Facilities across the U.S. discharge a variety of hazardous and non-hazardous fluids into more than 400,000 injection wells. Agribusiness and the chemical and petroleum industries all make use of underground injection for waste disposal.

EPA has grouped underground injection into five classes for regulatory control purposes. Each class includes wells with similar functions, and construction and operating features so that the technical requirements can be applied consistently to the class. These classes of wells include:

- **Class I** - injection or emplacement of hazardous and non-hazardous fluids (industrial and municipal wastes) into isolated formations beneath the lowermost USDW. Because they may inject hazardous waste, Class I wells are the most strictly regulated by both the CWA - UIC program and SDWA - UIC.
- **Class II** - injection of brines and other fluids associated with oil and gas production. Some Class II wells inject fluids for enhanced recovery of oil and natural gas while others inject liquid hydrocarbons that constitute our Nation’s strategic fuel reserves in times of crisis.
- **Class III** - injection of superheated steam, water, or other fluids into formations to extract minerals.
- **Class IV** - injection of hazardous or radioactive wastes into or above a USDW. These wells are banned under the UIC program because they directly threaten public health.
- **Class V** - includes many other underground injection wells not covered under Classes I- IV. Some Class V wells may not be waste disposal wells, for example, injection of surface water to replenish depleted aquifers or to prevent salt water intrusion.

Injection wells have the potential to inject contaminants that may cause our underground sources of drinking water to become contaminated. The UIC program prevents this contamination by setting minimum requirements. These requirements are designed to keep injected fluids within the well and the intended injection zone, or to require that injected fluids not cause a public water system to violate drinking water standards or otherwise adversely affect public health. These minimum requirements affect the siting of an injection well, and the construction, operation, maintenance, monitoring, testing, and ultimately closure of the well. All injection wells require authorization under general rules of specific permits.

The complying action that applies to UIC cases where the well(s) are causing contamination between aquifer layers is:

- UIC Plug and Abandon (w/ leaks).

For these cases report into ICIS the number of wells impacted by the action and the media impacted is USDW. The pollutant to report in ICIS is “wastewater”.

3.10.2 Example

For example, a UIC case requiring the plugging and abandonment of 10 injection wells found to be causing contamination at a mining facility with accompanying monitoring to track aquifer contamination would be reported in ICIS as follows:

- **Complying Actions:** UIC Plug and Abandon (w/ leaks);
- **Pollutant:** Wastewater;
- **Amount and Unit:** 10 wells; and
- **Media:** Water (underground source of drinking water)
  Counted Under Reporting Measure: Estimated Contaminated Water/Aquifer to be Cleaned Up (cubic yds.)

In addition, you would report “Monitoring” under the Work Practices Category.

3.11 Underground Storage Tanks

3.11.1 Background and methodology

Subtitle I of RCRA provides EPA with regulatory authority for Underground Storage Tanks (USTs) and is an important component of the act because it allows EPA to regulate petroleum and chemical products and hazardous wastes. An underground storage tank is defined as a tank, including its underground piping that is 10 percent or more beneath the surface of the ground. To be regulated by Subtitle I, the tank must store petroleum or a hazardous substance. Certain tanks are excluded from this definition. For a complete list of exempt USTs, please see 40 CFR, Part 280. (http://www.epa.gov/docs/epacfr40/chapt-I.info/subch-I/40P0280.pdf)

For all non-exempt USTs, performance standards for tank design, construction, and installation have been developed. Additionally, requirements concerning leak detection, record keeping, reporting, corrective action, and closure have also been promulgated.

The regulation of USTs is vital because leaks from an UST can cause fires and explosions, as well as contamination of the ground water. In order to protect both people and the environment, several key regulations have been developed for the safe operation of USTs. As of December, 1993, all new and existing USTs had to be equipped with a leak detection system, and by December,1998, new and existing USTs had to be equipped with spill, overfill, and corrosion protection. To ensure spill protection, USTs are required to be equipped with catch basins to contain spills. For overfill protection, USTs are required to be equipped with automatic shut off devices, overfill alarms, or ball float valves. Finally, for corrosion protection, the tank and piping had to be made completely of non-corrodible material, or of steel having a corrosion-resistant coating and having cathodic protection, or of steel clad with a thick layer of non-corrodible material.

To deal with non-compliance or illegal UST operation, EPA or the state regulatory agency may take enforcement actions to ensure that the substandard UST is temporarily closed until it can be permanently closed, replaced, or upgraded. These pollution prevention actions may include monetary penalties and administrative or judicial enforcement actions. However, if an UST pollutant release is detected, the result is a corrective action scenario and pollutant reductions can be calculated.

Enforcement actions related to RCRA UST cases may include the following types of complying actions:

- Tank Repair;
- Tank Removal; and
- Tank Storage Change.

3.11.2 Examples

Example 1. UST Tank Removal

An enforcement action has been lodged against Ajax Service Station for release of gasoline from their underground storage tanks into the surrounding soil. The station will be required to decommission and remove the existing three tanks (which were non-compliant with the UST regulations) and remediate the site. The leaking tanks have a total capacity of 15,000 gallons. Converting the volume to pounds using the density for gasoline from Table 2-2 results in 15,000 gal x 6.092 lbs/gal = 91,380 lbs.

Input for ICIS:

- **Complying Action:** Tank Removal;
- **Pollutant:** Gasoline;
- **Amount Unit:** 91,380 pounds; and
- **Media:** Land
  Counted Under Reporting Measure: Estimated Toxics and Pesticides Reduced, Treated, or Eliminated (pounds)

4. PREVENTION OF FUTURE RELEASES CATEGORY

4.1 Overview and Complying Actions Included in the Category

This section applies to enforcement benefits derived from a complying action that prevents a potential release of pollutant(s) into the environment. Where the On-going Releases Category of actions applies to instances in which a facility has an on-going release into the environment either by design (through a permitted discharge point) or by accident or neglect (e.g., through a leak or fugitive emission), the prevention of future releases category of actions applies to instances in which there is no current release of pollutants but a release could occur in the future without the enforcement action. The remedy obtained through the enforcement action is intended to prevent a future release. Many cases may include complying actions that fall under both the on-going releases category and the prevention of future releases category. You can report environmental benefits associated with each category, provided that you do not double-count the same benefit. In those cases, part of the remedy obtained through the enforcement action would apply to the treatment or reduction of on-going releases, and part of the remedy would apply to the prevention of a future release.

Table 4-1 presents the complying actions included in the prevention of future releases category along with their definition.

Table 4-1. Prevention of Future Releases Category of Complying Actions and Definitions

Program Category	Complying Action	Definition
Hazardous Waste Management	Proper Waste Transport	Actions taken to safeguard the movement of hazardous waste from one site to another by highway, rail, water, or air. This includes transporting hazardous waste from a generator's site to a facility that can recycle, treat, store, or dispose of the waste.
Hazardous Waste Management	Proper Waste Storage	Actions to prevent future release of pollutants as a result of improper holding practices prior to transport, treatment or disposal.
Hazardous Waste Management	Proper Waste Containment	Actions to prevent future release of pollutants housed in containment areas or structures, such as tanks, containment buildings, drip pads, waste piles, or surface impoundments.
Hazardous Waste Management	Proper Waste Disposal	Actions to address improper waste disposal practices to prevent the future release of harmful pollutants to the environment.
Hazardous Waste Management	Proper Waste Export	Actions regarding the requirements that allow wastes to be shipped to other countries in accordance with applicable domestic laws and regulations.
Hazardous Waste Management	Cathodic Protection System Maintenance/Repair	Actions to correct and/or repair damaged or non-functioning tank and/or piping cathodic protection systems.
Industrial Processes	Oil Storage Change	Actions impacting oil storage tanks (stationary or mobile) to prevent a future spill or leak.

Table 4-1. Prevention of Future Releases Category of Complying Actions and Definitions

Program Category	Complying Action	Definition
Mobile Sources	Compliance/Warranty Schedule Change	Actions include accelerating compliance and extended warranty/defect reporting activities. Because many of the standards for mobile sources are phased in over a period of years, accelerating compliance means agreeing to comply with these standards early and thus preventing emissions that would otherwise have occurred.
Mobile Sources	Replace or Remediate Engines/Vehicles (Future Production)	Actions including the export or destruction of non-compliant or uncertified vehicles or engines at the manufacturer (prior to release into commerce); replacing non-compliant vehicles, engines, parts or equipment or restoring non-compliant vehicles or engines to their certified condition at the manufacturer; and stopping sale of non-compliant parts from non-road equipment (such as weed whackers, chainsaws, off-road motorcycles, all-terrain vehicles, mobile generators, construction equipment, trains, and ships) prior to its release into commerce.
Oil Spill Prevention, Control, and Countermeasure Plan	Plan Implementation	Development and implementation of a spill prevention plan under CWA-311(j)
Pesticides	Pesticide Production Ceased	Actions where pesticides are being produced in an unregistered establishment. The establishment may come into compliance with FIFRA by ceasing all pesticide production.
Pesticides	Pesticide Label Revised (Future Production)	Actions where a label is revised and placed on a newly produced product in response to noncompliant products found in commerce.
Pesticides	Pesticide Advertising Claim Removed (Future Production)	Actions where a person or company makes advertising claims that are substantially different from any claims made in connection with its registration under FIFRA Section 3. This applies to products not yet produced,. The individual or company agrees to cease oral pesticidal claims and remove written pesticidal claims.
Pesticides	Pesticide Manufacturing Change	Actions where a change in the manufacturing process is made to reformulate a noncompliant product.
Pesticides	Pesticide Container Change	Preventative actions that correct or fix containers that fail to meet the Pesticide Management and Disposal Rule standards.
Pesticides	Pesticide Secondary Containment Change	Actions requiring installation for intercepting and containing spills and leaks of pesticides in areas where stationary containers are stored and where refillable containers are refilled or cleaned. Includes preventative actions related to traditional secondary containment for pesticides as well as pesticide dispensing areas such as containment pads.
Stationary Sources	Leak Detection (LDAR)	Process piping and equipment monitoring activities that prevent fugitive emission leaks from process equipment.
Stationary Sources	Risk Management Plan Implemented	Development and implementation of a Risk Management Plan under Section 112(r) of the CAA.

Table 4-1. Prevention of Future Releases Category of Complying Actions and Definitions

Program Category	Complying Action	Definition
Stationary Sources	Industry Standards Adopted	Adoption of industry standards under Section 112(r) of the CAA.
Toxics (Asbestos/Lead/PCBs)	Toxic Material Abatement (without existing release)	Actions requiring the containment, stabilization, or removal and disposal of asbestos materials or lead-based paint from buildings and schools as part of preventative renovation projects where release of asbestos (in a friable form) or lead-based paint chips has not yet occurred.
Toxics (Asbestos/Lead/PCBs)	Preventative Management Plan Implemented	Actions and practices taken to properly manage toxic containing materials (asbestos, lead-based paint, and PCBs) to prevent the likelihood of future release.
UIC	Plug and Abandon (without leaks)	Underground injection well plug and abandon actions where the well(s) have not yet caused contamination between aquifer layers.
UST	Secondary Containment	Implementation of a secondary containment system around an underground storage tank.
UST	Implement Corrosion Protection System (no release)	Implementation of corrosion prevention technology(ies) on an underground storage tank where no active UST leak exists (e.g., cathodic protection)
UST	Implement Tank Overfill/Spill Protection	Implementation of overfill/spill prevention technology(ies) on an underground storage tank (e.g., addition of level controls/alarms)
UST	Implement Release Detection System (UST)	Implementation of a leak detection technology(ies) to an underground storage tank (e.g., addition of leak detection alarm), or installation of leak detection equipment and actions to ensure required Release Detection mechanisms are installed and operational.
UST	Tank Closure	Closure of an UST to prevent future release of tank contents.
Wetlands	Wetlands Preservation	Protection of a wetland area through implementation of physical mechanisms including those that contribute significantly to the ecological sustainability of the watershed.

4.2 Hazardous Waste Management

4.2.1 Background and Calculation Methodology

Hazardous wastes are generally regulated by the Resource Conservation and Recovery Act (RCRA) and cleaned up under the RCRA Corrective Action Program or CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act; also known as Superfund). RCRA consists of three major programs: Subtitle C (the hazardous waste management program), Subtitle D (the solid waste program), and Subtitle I (the UST program). Under Subtitle C, EPA has developed a comprehensive program to ensure that all hazardous waste is safely managed from the time it is generated to its final disposition at a Treatment, Storage, or Disposal (TSD) facility. The objective of the “cradle-to-grave” management system is to ensure that hazardous waste is handled in a manner that protects human health and the environment. To this end, there are Subtitle C regulations for the generation, transportation, and treatment, storage, or disposal of hazardous wastes.

Prevention of Future Releases Category complying actions that would impact the management of hazardous waste to prevent releases include:

- Proper Waste Transport;
- Proper Waste Storage;
- Proper Waste Containment;
- Proper Waste Disposal;
- Proper Waste Export; and
- Cathodic Protection System Maintenance/Repair.

For preventative complying actions, report the volume of hazardous waste impacted by the action; use cubic yards for contaminated medium, gallons for UST capacities, and pounds for hazardous wastes or other chemical substances not contained within the volume of hazardous waste.

The pollutant to report in ICIS for these types of cases is "hazardous waste." If case information includes further identification of specific hazardous pollutants that are in the waste, you can report those pollutants in ICIS as well. However, you must show 0 for the specific pollutant amounts so that you do not double count the volume of waste.

4.2.2 Examples

Example 1. Proper Waste Transport

A&B Trucking was found in violation of West Virginia Hazardous Waste Management Regulations for improper packing of a transported hazardous waste. The total amount of hazardous waste material transported was 1,000 pounds.

- **Complying Action:** Proper Waste Transport;
- **Pollutant:** Hazardous waste;
- **Amount and Unit:** 1,000 pounds; and
- **Media:** Land
  Counted Under Reporting Measure: Hazardous Waste Prevented from Release (pounds)

Example 2. Proper Waste Storage

ABC Corporation is a metal finishing shop that generates acids, caustics and F006 sludges from the treatment of electroplating rinsewater. A Subtitle C RCRA Order was issued to the facility for the storage of ten 55-gallon drums of spent hydrochloric acid in non-leaking containers that were in poor condition and improperly labeled. The Order required the facility to transfer the hazardous waste into labeled storage containers in good condition. The density of spent hydrochloric acid is 9.16 pounds/gallon. The total amount impacted by the action = 55 gallons/drum x 10 drums x 9.16 pounds/gallon = 5,038 pounds

- **Complying Action:** Proper Waste Storage;

- **Pollutant:** Hydrochloric Acid;
- **Amount and Unit:** 5,038 pounds; and
- **Media:** Land
  Counted Under Reporting Measure: Hazardous Waste Prevented from Release (pounds)

Example 3. Proper Waste Storage

ABC Chemical Company is a generator that stores ignitable waste (D001) in a 10,000 gallon underground tank and associated piping system. A RCRA Subtitle C Order was issued to the facility for failure to conduct daily tank inspections. In response to the Order, the facility developed and implemented a tank inspection program. Assume a liquid density of 8.34 pounds/gallon for a total amount of hazardous waste impacted by the action = 10,000 gallons x 8.34 pounds/gallon = 83,400 pounds.

Tank volume = 10,000 gallons - for purposes of determining the environmental benefit for developing and implementing an inspection program for hazardous waste tanks, the volume of the waste stored in the tank at the time of inspection can be used as the conservative estimate, if known, otherwise use the maximum capacity of the tank system which, in the event of a tank failure, would be the maximum volume of hazardous waste released at the facility. Organic vapor releases should be calculated pursuant to the LDAR methodologies identified for the CAA program and quantified as an environmental benefit under On-going Releases Category (On-going Release)

- **Complying Action:** Proper Waste Storage;
- **Pollutant:** Hazardous Waste, D001;
- **Amount and Unit:** 83,400 pounds; and
- **Media:** Land
  Counted Under Reporting Measure: Hazardous Waste Prevented from Release (pounds)

Example 4. Proper Waste Containment

Under a RCRA 7003 order, ABC municipal landfill is being closed. The landfill closure will include capping of the site which will effectively contain the landfill waste and prevent migration of future rainfall through the landfill waste which would have created additional contaminated leachate. The volume of contaminated landfill waste is 10,400,000 cu.yds. Estimates of the amount of annual leachate volume generated from the landfill cell using the HELP Model showed that under the uncapped conditions the landfill generates 17,845,000 gallons/year leachate and after capping will generate 10,029,000 gallons/year leachate. Therefore, the leachate prevented through the containment portion of the order is 7,816,000 gallons/year. Convert the gallons of leachate prevented to pounds as follows: 7,816,000 gallons x 8.34 pounds/gallon = 65,185,440 pounds

- **Complying Action:** Proper Waste Containment;
- **Pollutant:** Contaminated landfill waste;

- **Amount and Unit:** 10,400,000 cu.yds.; and
- **Media:** Soil
  Counted Under Reporting Measure: Estimated Contaminated Soil/Debris to be Cleaned Up (cubic yds)

Also report:

- **Complying Action:** Proper Waste Containment;
- **Pollutant:** Leachate;
- **Amount and Unit:** 65,185,440 pounds; and
- **Media:** Soil
  Counted Under Reporting Measure: Hazardous Waste Prevented from Release (pounds)

Example 5. Proper Waste Disposal

ABC Metal Works Company is a metal machining shop which uses lubricating oil in their process. During an on-site inspection, the used oil from the shop was not being sent to a properly certified used oil handler. An administrative order was issued requiring the facility to properly dispose of the used oil using a certified used oil handler. The quantity of used oil generated at the facility is approximately 10 gallons per month. Assume a density for the used oil of 7.59 pounds/gallon.

Used oil generated per year is:

10 gallons/mo. × 12 mos./year x 7.59 pounds/gallon = 911 pounds/year

- **Complying Action:** Proper Waste Disposal;
- **Pollutant:** Used oil;
- **Amount and Unit:** 911 pounds/year; and
- **Media:** Land
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

Example 6. Proper Waste Export

ABC Carriers is a generator of spent organic solvents (including Waste Codes D008 (lead), D009 (mercury), D040 (trichloroethylene) and F001). The company arranged for the export of the hazardous waste to Canada without attaching a valid acknowledgement of consent confirming that Canada had been informed of and consented to the shipments thereby violating 40 CFR Subsection 262.54(H). The quantity of hazardous waste in the shipments without the proper consent was 550 gallons. In addition, the company's annual report of their export shipments failed to account for 26 shipments in violation of 40 CFR Subsection 262.5(a). The quantity of hazardous waste associated with these shipments was another 14,300 gallons. EPA issued an enforcement action to address these violations. The total quantity addressed is 14,850 gallons. Assume the density of the spent solvents is 8.34 lbs/gal.

The total mass of spent solvents is 14,850 gallons x 8.34 lbs/gal. = 123,849 lbs.

- **Complying Action:** Proper Waste Export;
- **Pollutant:** Hazardous Waste;
- **Amount and Unit:** 123,849 lbs.; and
- **Media:** Soil
  Counted Under Reporting Measure: Hazardous Waste Prevented from Release (pounds)

AND

- **Pollutant:** D008;
- **Amount and Unit:** "0" pounds; and
- **Media:** Soil.

AND

- **Pollutant:** D009;
- **Amount and Unit:** "0" pounds; and
- **Media:** Soil.

AND

- **Pollutant:** D040;
- **Amount and Unit:** "0" pounds; and
- **Media:** Soil.

AND

- **Pollutant:** F001;
- **Amount and Unit:** "0" pounds; and
- **Media:** Soil.

Example 7. UST Cathodic Protection System Maintenance/Repair

The Golden Age Company has ceased operation and is required, as part of its post-closure requirements, to conduct cathodic leak detection monitoring on a periodic basis to determine that no UST leaks are occurring. A routine maintenance review of the cathodic system indicates signs of improper performance and/or deterioration. An enforcement action is issued requiring the facility to perform proper maintenance and repair of the equipment. The amount of product in the tanks is estimated at 20,000 gallons.

- **Complying Action:** Cathodic Protection System Maintenance/Repair;
- **Pollutant:** Petroleum Product;
- **Amount and Unit:** 20,000 Gallons; and
- **Media:** Land
  Counted Under Reporting Measure: Underground Storage Tank Capacity Prevented from Release (Gallons)

4.3 Industrial Processes - Oil Storage Change

4.3.1 Background and Calculation Methodology

For SPCC enforcement actions involving changes to oil storage tanks that are not actively leaking, report the volume, in gallons of oil in the tank(s) impacted by the action. If the volume of oil in the storage tanks is known, you should report the known amount for a more conservative estimate. If the volume is unknown, then you should use the tank capacity.

4.3.2 Examples

Example 1. Industrial Processes – Oil Storage Change

A routine inspection at City Slickers Oil Company led to the discovery of oil product containing units that are damaged. There is no evidence that oil has leaked from the storage units. An enforcement action is issued requiring the owner of the facility to conduct tank integrity testing and repair the storage units if needed. The amount of oil product addressed by the action is estimated at 5,000 gallons.

Input for ICIS:

- **Complying Action:** Oil Storage Change;
- **Pollutant:** Petroleum Product;
- **Amount and Unit:** 5,000 Gallons
- **Media:** Land
  Counted Under Reporting Measure: No National Metric

Example 2. Industrial Processes - Oil Storage Change

An inspection of ABC Company identified improper spill prevention in a used oil storage facility. The facility had inadequate secondary containment which, if the tanks were compromised, would have resulted in a discharge of 10,000 gallons to the nearby stream. In response to the action, the facility changed its spill prevention requirements to comply with the SPCC regulations.

Input for ICIS:

- **Complying Action:** Oil Storage Change;
- **Pollutant:** Used Oil
- **Amount and Unit:** 10,000 gallons
- **Media:** Water
  Counted Under Reporting Measure: No National Metric

4.4 Mobile Sources

4.4.1 Background and Calculation Methodology

Mobile sources include a wide variety of vehicles, engines, and equipment that move, or can be moved, from place to place and generate air pollutants. On-road or highway sources include vehicles used on roads for transportation of passengers or freight. Non-road sources include vehicles, engines, and equipment used for construction, agriculture, transportation, recreation, and many other purposes. Within these two broad categories, on-road and non-road sources are further distinguished by size, weight, use, and/or horsepower.

The Prevention of Future Releases Category complying actions that apply to mobile source cases include:

- Compliance/Warranty Schedule Change; and
- Replace or Remediate Engines/Vehicles (Future Production).

For these types of preventative actions, the calculation methodology will determine potential reductions for hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM). EPA has developed a *Mobile Sources Pollutant Reduction Methodologies* document which presents the calculation methodologies and emission standards needed for mobile source cases. Example calculation methodologies for each complying action type are shown below. In addition, EPA has also developed Excel-based calculators to support case calculations for the recreational vehicle, small non-road gasoline engine, non-road diesel engine, highway motorcycle, light duty truck, and highway diesel vehicles and engine categories.

Compliance/Warranty Schedule Change. Accelerating compliance at the manufacturer by a year or more should result in reporting of one year's worth of prevention benefit for those emissions that would have occurred if the vehicle/equipment had continued to operate at their baseline emission rates without compliance. The benefit is the difference between the emissions at baseline minus the emissions while complying with the new standards.

The step by step methodology is as follows:

1. Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

2. Identify the baseline emissions for that engine/vehicle/equipment category.

3. Identify the emission standards that will apply with the accelerated compliance for that engine/vehicle/equipment category.

4. For on-road vehicles, identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or KW-hr usage/year) by the engine/vehicle/equipment type.

For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity factor (hours/year) by the engine/equipment type.

5. Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

   Difference in emissions = baseline emission rate – compliance standard emission rate [Note: units must be the same]

6. Calculate one year's worth of prevention benefits as follows:

   Difference in emissions (g pollutant/hp-hr) × engine/vehicle/equipment annual power usage rate (hp-hr/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

   OR

   Difference in emissions (g pollutant/hp-hr) × engine/equipment power (hp) × engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

   Note that HC represents hydrocarbon emissions for vehicles/engines powered by the following fuels:

   a. Gasoline- and LPG-fueled ATVs: THC emissions.
   b. Natural gas-fueled ATVs: NMHC emissions.
   c. Alcohol-fueled engines: THCE emissions.

Replace or Remediate Engines/Vehicles (Future Production). Under a mobile source replace or remediate action, engines, vehicles, or equipment that has NOT left the manufacturer may be destroyed, replaced, remediated or become subject to a stop-sale for non-compliant parts. In these cases, pollutant emissions are prevented from occurring since the engine/vehicle/equipment will be stopped and/or corrected at the manufactureer operation. These actions should result in reporting one year's worth of prevention benefit for those emissions that would have occurred if the engine/vehicle/equipment had continued to operate at their baseline emission rates.

The step by step methodology for engines, vehicles, or equipment that is exported, destroyed, recalled, or subject to a stop-sale for non-compliant parts is as follows:

1. Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

2. Identify the baseline emissions for that engine/vehicle/equipment category.

3. For on-road vehicles, identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or KW-hr usage/year) by the engine/vehicle/equipment type.

   For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity (hours/year) by the engine/equipment type.

4. Calculate one year's worth of prevention benefits as follows:

   Baseline emissions (g pollutant/hp-hr) × engine/vehicle/equipment annual power usage rate (hp-hr/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

   OR

   Baseline emissions (g pollutant/hp-hr) × engine/equipment power (hp) × engine/equipment load factor (fraction) × engine/equipment activity (hrs/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

   In the case of engine or equipment replacement, the reductions should represent the difference between baseline emissions and the improved emissions after replacement (similar to the Compliance/Warranty Schedule methodology above).

4.4.2 Examples

The following subsections provide information on emission factors and example calculations for the following types of mobile sources:

- Highway Diesel Vehicles and Engines (Subsection 4.4.2.1);
- Light Duty Trucks (Subsection 4.4.2.2); and
- Non-road Compression Ignition (Diesel) Engines (Subsection 4.4.2.3).

4.4.2.1 Highway Diesel Vehicles and Engines (Heavy Duty)

Diesel engines are typically used to power trucks, buses, and non-road equipment because of their good fuel economy and durability. Diesel engines use compression instead of spark plugs to ignite the fuel and the high temperatures typical of diesel compression ignition causes oxygen and nitrogen from the intake air to combine as NO_x. NO_x reacts with hydrocarbons and sunlight to form ground-level ozone; NO_x also combines with other atmospheric constituents to form fine particulate matter. Thus, diesel engines contribute a substantial portion of the NO_x and PM, and, to a lesser extent, the HC emissions from mobile sources.

Highway Diesel Vehicles and Engines are classified by vehicle class and gross vehicle weight rating (GVWR – vehicle weight plus rated cargo capacity) as follows:

Table 4-2. Service Classes of Heavy-Duty Vehicles

Service Class	Vehicle Class	GVWR (lb)
Light HD	2B – 5	8,500 – 19,500
Medium HD	6 – 7	19,501 – 33,000
Heavy HD	8	33,001 +
Urban bus[7]	—	—

Source: Final Regulatory Impact Analysis: Control of Emissions of Air Pollution from Highway Heavy-Duty Engines. U.S. EPA, September 16, 1997, pg 85.

Table 4-3 presents the Model Year 1988 - 2003 EPA emission standards for heavy duty diesel truck engines, the October 1997 new emission standards for model year 2004 and later engines (where emission standards other than NMHC and NO_x continued at their 1998 levels), and the current emission standards for model year 2007 and later (where emission standards for CO continue at their 1998 levels).

Table 4-3. Model Year 1988 – Current EPA Emission Standards for Heavy Duty Diesel Engines

Year	NMHC (g/bhp-hr)	HC (g/bhp-hr)	CO (g/bhp-hr)	NO_x (g/bhp-hr)	PM (g/bhp-hr)
1988		1.3	15.5	10.7	0.6
1990		1.3	15.5	6.0	0.6
1991		1.3	15.5	5.0	0.25
1994		1.3	15.5	5.0	0.1
1998		1.3	15.5	4.0	0.1
2004 and later	0.5		15.5	2.0[a]	0.1
2007 and later	0.14		15.5	0.20	0.01

Source: www.dieselnet.com/standards/us/hd.php.
a – 2004 model year and later standard also included NMHC + NO_x at 2.5 g/bhp-hr
For the model year 2007 and later standards, NO_x and NMHC standards will be phased in between 2007 and 2010.

In order to be able to calculate reductions between the various standards, we can convert the NMHC emission standards into total HC standards using the conversion: 0.984 NMHC/total HC. Therefore the 2004 and later HC standard is equal to 0.50813 g/bhp-hr and the 2007 and later HC standard is equal to 0.14227 g/bhp-hr.

Table 4-4 presents information on revised useful engine lives by service class and an estimated average miles/year usage rate. Table 4-5 presents information to convert from diesel engine bhp-hr to miles.

Table 4-4. Revised Useful Engine Lives from the 1997 Rule

Vehicle Category	Miles	Years	Estimated Miles/Year
Light HD	110,000	10	11,000

[7] Defined at 40 C.F.R. § 86.091-2.

Medium HD	185,000	10	18,500
Heavy HD / Urban bus	435,000	10	43,500

Source: www.dieselnet.com/standard/us/hd.php.

Table 4-5. Conversion Factors for Heavy-Duty Diesel Vehicles, for Conversion to g/mile

Vehicle Category	Conversion Factor (bhp-hr/mi)
Light HD	1.23
Medium HD	2.25
Heavy HD	2.97
Urban bus	4.68

Source: Regulatory Impact Analysis: Control of Emissions of Air Pollution from Highway Heavy-Duty Engines. U.S. EPA, July 2000, pg 111.

Example Calculation

A heavy duty diesel engine (vehicle category Medium HD) settlement includes accelerated compliance with the 2007 NMHC, NO_x and PM standard for 100 engines. The methodology below calculates one year's benefit of emission reductions due to this action.

Step 1 Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Heavy duty diesel engines (Medium HD) category, 100 units

Step 2 Identify the baseline emissions for that engine/vehicle/equipment category.

From Table 4-3, assume baseline emissions are the previous 2004 emission standards:

NMHC = 0.5 g/bhp-hr; and using the conversion to total HC of 0.984 NMHC/total HC;

HC = 0.50813 g/bhp-hr

NO_x = 2.0 g/bhp-hr

PM (assume compliance at 1998 standard) = 0.1 g/bhp-hr

Step 3 Identify the emission standards that will apply with accelerated compliance for the engine/vehicle/equipment category.

From Table 4-3, 2007 emissions standards are:

NMHC = 0.14 g/bhp-hr; and using the conversion to total HC of 0.984 NMHC/total HC;

HC = 0.14227 g/bhp-hr

NO_x = 0.2 g/bhp-hr

PM = 0.01 g/bhp-hr

Step 4 Identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or KW-hr usage/year) by the engine/vehicle/equipment type.

From Table 4-4 estimate that the vehicle engines would be used for an estimated 18,500 miles/year.

Step 5 Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

Difference in emissions = baseline emission rate – compliance standard emission rate [Note: Units must be the same.]

HC = 0.50813 g/bhp-hr - 0.14227 g/bhp-hr = 0.36586 g/bhp-hr
NO_x = 2.0 g/bhp-hr – 0.2 g/bhp-hr = 1.8 g/bhp-hr
PM = 0.1 g/bhp-hr – 0.01 g/bhp-hr = 0.09 g/bhp-hr

Conversion to g/mile using information from Table 4-5:

HC = 0.36586 g/bhp-hr × 2.25 bhp-hr/mile = 0.82318 g/mile
NO_x = 1.8 g/bhp-hr × 2.25 bhp-hr/mile = 4.05 g/mile
PM = 0.09 g/bhp-hr × 2.25 bhp-hr/mile = 0.2025 g/mile

Step 6 Calculate one year's worth of emission benefits as follows:

Difference in emissions (g pollutant/mile) × engine/vehicle/equipment annual usage rate (miles/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

Lbs HC prevented/year = 0.82318 g/mile × 18,500 miles/year × 100 units × 1 lb/454 g = 3,354

Lbs NO_x prevented/year = 4.05 g/mile × 18,500 miles/year × 100 units × 1 lb/454 g = 16,503

Lbs PM prevented/year = 0.2025 g/mile × 18,500 miles/year × 100 units × 1 lb/454 g = 825

Input for ICIS:

- **Complying Action:** Compliance/Warranty Schedule Change
- **Pollutant:** Hydrocarbons
- **Amount and Unit:** 3,354 lbs
- **Media:** Air

AND

- **Pollutant:** Nitrogen Oxides

- **Amount and Unit:** 16,503 lbs
- **Media:** Air

AND

- **Pollutant:** Particulate Matter
- **Amount and Unit:** 825 lbs
- **Media:** Air

4.4.2.2 Light Duty Trucks

Table 4-6 presents nontampered exhaust emission rates for low altitude light duty gasoline powered vehicles for pre-1968 model year trucks and low altitude light duty diesel powered vehicles for pre-1975 model year trucks. The emission rates are for a 50,000 mile emission level and 100,000 mile emission level where these values incorporate the zero mile emission level and a deterioration rate. These values can be used as pre-control (or baseline) emission rates.

Table 4-6. Nontampered Exhaust Emission Rates for Light-Duty Trucks (Emissions in g/mile)

Category	HC		CO		NO_x	
	50,000 mile	100,000 mile	50,000 mile	100,000 mile	50,000 mile	100,000 mile
Low Altitude Gasoline Powered Vehicles Pre-1968 Model Year	8.15	9.05	89.52	100.77	3.44	3.44
Low Altitude Diesel Powered Vehicles Pre-1975 Model Year	1.71	2.11	3.36	4.01	1.66	1.86

Source: http://epa.gov/otaq/ap42.htm#highway.

Two sets of standards have been defined for light-duty vehicles in the Clean Air Act Amendments (CAAA) of 1990:

Tier 1 standards, which were published as a final rule on June 5, 1991 and phased-in progressively between 1994 and 1997.

Tier 2 standards, which were adopted in December 1999, with a phase-in implementation schedule from 2004 to 2009.

Tier I standards applied to all new light-duty vehicles (LDV), such as passenger cars, light-duty trucks, sport utility vehicles, minivans and pick-up trucks and are presented in Table 4-7. The LDV category included all vehicles of less than 8,500 pounds gross vehicle weight rating (GVWR – vehicle weight plus rated cargo capacity). LDVs were further divided into the following categories:

- Passenger cars;
- Light light-duty trucks (LLDT), below 6,000 lbs GVWR; and

- Heavy light-duty trucks (HLDT), above 6,000 lbs but less than 8,500 lbs GVWR.

Table 4-7. EPA Tier 1 Emission Standards for Light-Duty Trucks (Emissions in g/mile)

	50,000 miles/5years						100,000 miles/10 years [b]					
Category [a]	THC	NMHC	CO	NO_x [c] Diesel	NO_x Gasoline	PM	THC	NMHC	CO	NO_x [c] Diesel	NO_x Gasoline	PM
LLDT ≤3,750 lbs	—	0.25	3.4	1.0	0.4	0.08	0.8	0.31	4.2	1.25	0.6	0.1
LLDT >3,750 lbs	—	0.32	4.4	—	0.7	0.08	0.8	0.40	5.5	0.97	0.97	0.1
HLDT ≤5,750 lbs	0.32	—	4.4	—	0.7	—	0.8	0.46	6.4	0.98	0.98	0.1
HLDT >5,750 lbs	0.39	—	5.0	—	1.1	—	0.8	0.56	7.3	1.53	1.53	0.12

Source: www.dieselnet.com/standards/us/ld.php.
a – Weights are loaded vehicle weight (LVW) (curb weight + 300 lbs) for LLDTs and adjusted loaded vehicle weight (ALVW) (numerical average of the curb weight and the GVWR) for HLDTs.
b – Useful life 120,000 miles/11 years for all HLDT standards and for THC standards for LDT
c – More relaxed NO_x limits for diesels applicable to vehicles through 2003 model year
THC – Total hydrocarbons.
NMHC – Non-methane hydrocarbons.

The Tier 2 regulation introduced more stringent numerical emission limits relative to the previous Tier 1 requirements, and a number of additional changes that made the standards more stringent for larger vehicles. Under the Tier 2 regulation, the same emission standards apply to all vehicle weight categories, i.e., cars, minivans, light-duty trucks, and SUVs have the same emission limit.

The same emission limits also apply to all vehicles regardless of the fuel they use. Since light-duty emission standards are expressed in grams of pollutants per mile, vehicles with large engines (such as light trucks or SUVs) have to use more advanced emission control technologies than vehicles with smaller engines in order to meet the standards.

The EPA Tier 2 program uses a three-step compliance strategy: 1) pre-production evaluation is used to certify vehicles prior to sale; 2) a production evaluation is used on the assembly line for early evaluation of production vehicles; and 3) in-use evaluation is used to verify properly maintained vehicles after several years of use.

The Tier 2 emissions standards are structured into 8 permanent and 3 temporary certification levels of different stringency, called “certification bins”, and an average fleet standard for NO_x emissions. Vehicle manufacturers have a choice to certify particular vehicles to any of the available bins. When fully implemented in 2009, the average NO_x emissions of the entire light-duty vehicle fleet sold by each manufacturer has to meet the average NO_x standard of 0.07 g/mi. The temporary certification bins (bin 9, 10, and 11) are available in the phase-in period and expire after the 2008 model year. Bin 5 has a NO_x limit of 0.07 g/mile, which is equal to the fleet average NO_x standard. Therefore, NO_x emissions from vehicles certified to bins higher than Bin 5 must be offset by selling a sufficient number of vehicles certified to Bins lower than Bin 5. For the purposes of environmental benefit calculations, Bin 5 will be the default standard for current model year light duty trucks.

The emission standards for all pollutants for each of the permanent certification bins when tested on the Federal Test Procedure (FTP) are shown in Table 4-8.

Table 4-8. EPA Tier 2 Emission Standards for Light-Duty Trucks (Emissions in g/mile)

Bin	Intermediate Life (50,000 miles/5years)					Full Useful Life [a]				
	NMOG	CO	NO_x	HCHO	PM	NMOG	CO	NO_x	HCHO	PM
8 [b]	0.1 (0.125)	3.4	0.14	0.015	—	0.125 (0.156)	4.2	0.2	0.018	0.02
7	0.075	3.4	0.11	0.015	—	0.09	4.2	0.15	0.018	0.02
6	0.075	3.4	0.08	0.015	—	0.09	4.2	0.1	0.018	0.01
5	0.075	3.4	0.05	0.015	—	0.09	4.2	0.07	0.018	0.01
4	—	—	—	—	—	0.07	2.1	0.04	0.011	0.01
3	—	—	—	—	—	0.055	2.1	0.03	0.011	0.01
2	—	—	—	—	—	0.01	2.1	0.02	0.004	0.01
1	—	—	—	—	—	0.0	0.0	0.0	0.0	0.0

Source: www.dieselnet.com/standards/us/ld_t2.php.
a – Full useful life for LLDTs has been extended to 120,000 miles or ten years, whichever occurs first. For HLDTs it is 120,000 miles or 11 years, whichever occurs first.
b – The higher temporary NMOG, CO, and HCHO values apply only to HLDTs and expire after 2008.
NMOG – Non-methane organic gases.
HCHO – Formaldehyde.

Since Tier 1 standards were fully implemented by 1997, enforcement actions are assumed to require implementation of a Tier 2 standard.

Example Calculation

An enforcement case has identified the need for a light light-duty truck (LLDT) manufacturer to remediate their fleet of 100 vehicles to comply with Bin 5 Tier 2 standards. The trucks have a loaded vehicle weight of 4,500 lbs and are assumed to currently comply with only the Tier 1 standards. The pollutant emissions prevented would be calculated using the accelerating compliance methodology shown above.

Step 1 Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Light light-duty trucks with a loaded vehicle weight of 4,500 lbs (category LLDT/LDT2), 100 units

Step 2 Identify the estimated current emissions using the Tier 1 standards for that engine/vehicle/equipment category.

From Table 4-8, LLDT full useful life emissions standards are:

THC = 0.8 g/mile
NMHC = 0.4 g/mile
CO = 5.5 g/mile
NO_x = 0.97 g/mile
PM = 0.1 g/mile

Step 3 Identify the Tier 2 emission standards that will apply for that engine/vehicle/equipment category.

From Table 4-8, Tier 2, Bin 5 LDT2 full useful life emissions standards are:

NMOG = 0.09 g/mile
CO = 4.2 g/mile
NO_x = 0.07 g/mile
HCHO = 0.018 g/mile
PM = 0.01 g/mile

Step 4 Identify the average annual usage rate (e.g., typical miles/year, horsepower-hr or KW-hr usage/year) by the engine/vehicle/equipment type.

For this example we will use 12,000 miles/year as the estimate of typical miles driven in a year for a light light-duty truck based on the useful life for LLDTs of 120,000 miles or 10 years (12,000 miles/year)[8].

Step 5 Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

Difference in emissions = Tier 1 emission rate – Tier 2 compliance standard emission rate

(Note: Units must be the same.)

The overlap of standards between Tier 1 and Tier 2 applies to CO, NO_x, and PM:

CO = 5.5 – 4.2 (g/mile) = 1.3 g/mile
NO_x = 0.97 – 0.07 (g/mile) = 0.9 g/mile
PM = 0.1 – 0.01 (g/mile) = 0.09 g/mile

In addition, the Tier 1 THC standard can be converted to a NMOG standard using a conversion from U.S.EPA 2005 as follows:

THC Tier 1 standard = 0.8 g/mile × 1.019 NMOG/THC for liquid petroleum gas (LPG) engines = 0.8152 g/mile for NMOG

NMOG = 0.8152 – 0.09 (g/mile) = 0.7252 g/mile

Step 6 Calculate one year's worth of emission benefits as follows:

Difference in emissions (g pollutant/mile) x engine/vehicle/equipment annual usage rate (miles/yr) × # of units × 1 lb/454 g = lbs of pollutant reduction/year

[8] Useful life for LLDTs under Tier 2 is extended from Tier 1, where it is 100,000 miles or 10 years (10,000 miles/year),

Lbs CO prevented/year = 1.3 g/mile × 12,000 miles/year × 100 units × 1 lb/454 g = 3,436

Lbs NO_x prevented/year = 0.9 g/mile × 12,000 miles/year × 100 units × 1 lb/454 g = 2,379

Lbs PM prevented/year = 0.09 g/mile × 12,000 miles/year × 100 units × 1 lb/454 g = 238

Lbs NMOG prevented/year = 0.7252 g/mile × 12,000 miles/year × 100 units × 1 lb/454 g = 1,917

Input for ICIS:

- **Complying Action:** Replace/Remediate Engine or Vehicle (Future Production)
- **Pollutant:** Carbon Monoxide
- **Amount and Unit:** 3,346 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

AND

- **Pollutant:** Nitrogen Oxides
- **Amount and Unit:** 2,379 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

AND

- **Pollutant:** Particulate Matter
- **Amount and Unit:** 238 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

AND

- **Pollutant:** Nonmethane Organic Gases (NMOG)
- **Amount and Unit:** 1,917 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

4.4.2.3 Non-road Compression Ignition (Diesel) Engines

Non-road diesel engines are used in most kinds of construction, agricultural, and industrial equipment. Table 4-9 and Table 4-10 below present precontrolled emission factors for non-road diesel engines greater than 37 kW (50 hp) and less than 37 kW (50 hp), respectively. Table 4-11 and Table 4-12 present the Tier 1, 2, 3, and current Tier 4 standards that apply to diesel engines. Table 4-13 provides information on the load factor and average annual usage (hours/year) for diesel engines. To convert kilowatts (kW) to horsepower (hp) you can use the following conversion factor: kW × 1.341 = hp.

Table 4-9. Pre-control Non-road Engines at or above 37 kW, g/kW-hr (g/bhp-hr)

Engine Category	HC	CO	NO_x	PM
>35 to 75 kW (> 50 to 100 hp)	1.32 (0.99)	4.65 (3.49)	11.07 (8.30)	0.96 (0.72)
>75 kW (>100 hp)	0.91 (0.68)	3.60 (2.70)	11.17 (8.38)	0.54 (0.40)

Source: Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines. U.S. EPA, August 1998, EPA 420-R-98-016. pg 89.

Table 4-10. Emission Factors for Pre-control Non-road Engines less than 37 kW, g/kW-hr (g/bhp-hr)

Engine Category	HC	CO	NO_x	PM
0 to 12 kW (0 to 16 hp)	2.0 (1.5)	6.7 (5.0)	13.3 (10.0)	1.33 (1.0)
>12 to 37 kW (>16 to 50 hp)	2.4 (1.8)	6.7 (5.0)	9.2 (6.9)	1.07 (0.8)

Source: Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines. U.S. EPA, August 1998, EPA 420-R-98-016. pg 90.

Table 4-11. Tier 1, 2 and 3 Emission Standards (in g/kW-hr)

Rated Power kW (hp)	Tier Std.	Model Year1	NO_x	HC	NMHC + NO_x	CO	PM
< 8 kW (< 11 hp)	1	2000	—	—	10.5	8.0	1.0
	2	2005	—	—	7.5	8.0	0.80
8 ≤ kW < 19 (11 ≤ hp < 25)	1	2000	—	—	9.5	6.6	0.80
	2	2005	—	—	7.5	6.6	0.80
19 ≤ kW < 37 (25 ≤ hp < 50)	1	1999	—	—	9.5	5.5	0.80
	2	2004	—	—	7.5	5.5	0.60
37 ≤ kW <75 (50 ≤ hp <100)	1	1998	9.2	—	—	—	—
	2	2004	—	—	7.5	5.0	0.40
	3	2008	—	—	4.7	5.0	0.40
75 ≤ kW < 130 (100 ≤ hp < 175)	1	1997	9.2	—	—	—	—
	2	2003	—	—	6.6	5.0	0.30
	3	2007	—	—	4.0	5.0	0.30

Table 4-11. Tier 1, 2 and 3 Emission Standards (in g/kW-hr)

Rated Power kW (hp)	Tier Std.	Model Year1	NO_x	HC	NMHC + NO_x	CO	PM
130 ≤ kW < 225 (175 ≤ hp < 300)	1	1996	9.2	1.3	—	11.4	0.54
	2	2003	—	e	6.6	3.5	0.20
	3	2006	—	—	4.0	3.5	0.20
225 ≤ kW < 450 (300 ≤ hp < 600)	1	1996	9.2	1.3	—	11.4	0.54
	2	2001	—	—	6.4	3.5	0.20
	3	2006	—	—	4.0	3.5	0.20
450 ≤ kW ≤ 560 (600 ≤ hp ≤ 750)	1	1996	9.2	1.3	—	11.4	0.54
	2	2002	—	—	6.4	3.5	0.20
	3	2006	—	—	4.0	3.5	0.20
> 560 kW (> 750 hp)	1	2000	9.2	1.3	—	11.4	0.54
	2	2006	—	—	6.4	3.5	0.20

1 – The model years listed indicate the model years for which the specified tier of standards take effect.
Source: 40 CFR Section 89.112

Table 4-12. Tier 4 Emission Standards (g/hp-hr)

Engine Power	Model Year(s)	Transitional or Final	Emission Standard (g/hp-hr)			
			PM	NO_x	NMHC	CO
<19 kW (<25 hp)	2008	Final	0.30	5.6		6.0/4.9 b
19≤kW≤56 (25≤hp≤75)	2008-2012	Transitional	0.22	5.6/3.5 a		4.1/3.7 b
	2013	Final	0.02	3.5		4.1/3.7 b
56≤kW≤130 (75≤hp≤175)	2012-2014	Transitional and Final	0.01	0.30	0.14	3.7
130≤kW≤560 (175≤hp≤750)	2011-2014	Transitional and Final	0.01	0.30	0.14	2.6
>560 kW (>750 hp) Except Generator Sets	2011-2014	Transitional	0.075	2.6	0.30	2.6
	2014	Final	0.03	2.6	0.14	2.6

Source: Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines. U.S. EPA, May 2004, EPA 420-R-04-007.
a – Note: For 25-75 hp engines, the transitional NMHC+NO_x standard is 5.6 g/hp-hr for engines below 50 hp and 3.5 g/hp-hr for engines at or above 50 hp.
b – Note: For engines under 75 hp, the CO standard is 6.0 g/hp-hr for engines below 11 hp, 4.9 g/hp-hr for engines 11 to under 25 hp, 4.1 g/hp-hr for engines 25 to below 50 hp, and 3.7 g/hp-hr for engines at or above 50 hp.
NMHC – Nonmethane hydrocarbons. Conversion of NMHC to total HC is = 0.984 NMHC/total HC.

Since the Tier 4 emission standards for non-road diesel engines ≤75 hp are a combination of non-methane hydrocarbons (NMHC) and NO_x, a relationship is needed between NMHC and total HC. A conversion for diesel engines is 0.984 NMHC/total HC provided in U.S. EPA, Conversion Factors for Hydrocarbon Emission Components, EPA420-R-05-015, December 2005 (U.S.EPA 2005).

Table 4-13. Load Factors and Average Annual Usage (Hours/Year) for Diesel Engines

Power Range in hp (kW)	Average Life Span (years) a	Average Annual Usage/Activity (hr/year)	Total Hours of Useful Life	Average Load Factor	Engine Life at Full Load (years)
0-50 (0-37)	6.2	695	4,309	0.57	3.5
50 – 100 (37-75)	9	815	7,335	0.55	5.0
100 – 175 (75-130)	10.2	622	6,344	0.63	6.4
175 – 600 (130-450)	10.7	576	6,163	0.65	7.0
600 – 750 (450-560)	8.4	1073	9,013	0.67	5.6
>750 (>560)	9	1056	9,504	0.63	5.7

Source: Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines. U.S. EPA, August 1998, EPA 420-R-98-016. pgs 105, 106, and 108.
a – Average Life Span (years) NOT at full load.

Example Calculation

An enforcement case includes early compliance with Tier 4 transitional standards for diesel tractors, 56 hp engine size, and a total of 100 units impacted by the action. The pollutant emissions prevented would be calculated using the accelerating compliance methodology shown above.

Step 1 Determine the mobile source category and the number of units (engine/vehicle/equipment) estimated to be impacted by the enforcement action.

Non-road diesel engines, 56 hp tractor, 100 units.

Step 2 Identify the baseline emissions for that engine/vehicle/equipment category.

From Table 4-9, >50 – 100 hp engines pre-control emissions are:

HC = 0.99 g/hp-hr
CO = 3.49 g/hp-hr
NO_x = 8.3 g/hp-hr
PM = 0.72 g/hp-hr

Step 3 Identify the Tier 4 emission standards that will apply with early compliance with the transitional standards for that engine/vehicle/equipment category.

From Table 4-12, Tier 4 emissions standards for $25 \leq hp \leq 75$ transitional standards are:

NMHC + NO_x = 3.5 g/hp-hr
Note: Transitional standards are for NMHC + NO_x
CO = 3.7 g/hp-hr
PM = 0.22 g/hp-hr

Step 4 For non-road (small and large) spark ignition or diesel engines/equipment, identify the load factor (fraction) and the activity (hours/year) by the engine/equipment type.

From Table 4-13, the load factor is 0.55 and the average annual usage (or activity) of operation for nonroad diesel engines in the 50 -100 hp range is 815 hours/year

Step 5 Calculate the difference in emissions (for each pollutant) from baseline to the standard as follows:

Difference in emissions = baseline emission rate – compliance standard emission rate [Note: Units must be the same.]

The Tier 4 standards apply to the combination of NMHC and NO_x. To determine a combination precontrol emission factor:

NMHC + NO_x (precontrol) = (0.99 g/bhp-hr HC) (0.984 NMHC/HC from U.S.EPA 2005) + 8.3 g/bhp-hr NO_x = 9.27416 g/bhp-hr

NMHC + NO_x = 9.27416 – 3.5 (g/hp-hr) = 5.77416 g/hp-hr

CO = 3.49 – 3.7 (g/hp-hr) = a negative result so assume no reductions in emissions

PM = 0.72 – 0.22 (g/hp-hr) = 0.5 g/hp-hr

Step 6 Calculate one year's worth of emission benefits as follows:

Difference in emissions (g pollutant/hp-hr) × engine hp × load factor x engine/vehicle/equipment annual usage/activity (hours/yr) × # of units × 1 lb/454 g
= lbs of pollutant reduction/year

Lbs NMHC + NO_x prevented/year = 5.77416 g/hp-hr × 56 hp × 0.55 × 815 hours/year × 100 units × 1 lb/454 g = 31,926 lbs.

Lbs CO prevented/year = 0

Lbs PM prevented/year = 0.5 g/hp-hr × 56 hp × 0.55 × 815 hours/year × 100 units × 1 lb/454 g = 2,765 lbs.

Input for ICIS:

- **Complying Action:** Compliance/Warranty Schedule Change
- **Pollutant:** Nonmethane Hydrocarbons
- **Amount and Unit:** 31,926 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

AND

- **Pollutant:** Nitrogen Oxides
- **Amount and Unit:** 0 lbs
- **Media:** Air

AND

- **Pollutant:** Particulate Matter
- **Amount and Unit:** 2,765 lbs
- **Media:** Air
  Counted Under Reporting Measure: Emission Prevented from CAA Mobile Sources (pounds)

4.5 Oil Spill Prevention, Control, and Countermeasures (SPCC) Program

4.5.1 Facility Response Plan (FRP)

Under the Clean Water Act, as amended by the Oil Pollution Act (OPA), facilities that could reasonably be expected to cause "substantial harm" to the environment by discharging oil into or on navigable waters are required to prepare and submit Facility Response Plans (FRPs). The factors that may be considered in identifying a facility as posing substantial harm include:

- Type of transfer operations
- Oil storage capacity
- Lack of secondary containment
- Proximity to fish, wildlife, and sensitive environments or drinking-water intakes
- Spill history

An FRP demonstrates a facility's preparedness to respond to a worst case oil discharge. The law also requires that facility owners notify authorities of oil or hazardous substance discharges.

The Prevention of Future Releases Category complying action that applies to FRP violation cases is "Plan Implementation." ICIS reporting for FRP includes the oil or oil product subject to the action as the pollutant, and the volume in gallons of oil/oil product tank capacity at the site.

Example 1. CWA Facility Response Plan Implemented

ABC Corporation has a holding capacity of 1,000,500 gallons of No. 2 Fuel Oil and is required to have and implement a Facility Response Plan (FRP). EPA conducted a Government Initiated Unannounced Exercise (GIUE) of the facility and the facility failed the response drill. EPA also determined that it had a deficient FRP Plan. EPA issued a judicial referral and the company agreed to a $350,000 penalty. Also, as a direct result of the enforcement actions, the company is updating its FRP and is conducting drills at its facility each year for two years.

Input for ICIS:

- **Complying Action**: Plan Implementation;
- **Pollutant:** fuel oil, no. 2**;**
- **Amount and Unit**: 1,000,500 gallons; and
- **Media**: Water (navigable/surface)
  Counted Under Reporting Measure: **Volume of Oil Spills Prevented (gallons)**

4.5.2 Oil Spill Prevention, Control, and Countermeasures (SPCC) Program

Section 311 of the CWA addresses pollution from oil and hazardous substance releases and provides EPA with the authority to establish programs for preventing, preparing for, and responding to oil spills that reach navigable waters of the U.S. or the adjoining shoreline. Under CWA Section 311, EPA published the Oil Pollution Prevention regulation (40 C.F.R. Part 112) which requires development and implementation of Spill Prevention, Control, and Countermeasures (SPCC) plans. In recent years, EPA has incorporated amendments into the SPCC rule to address issues raised by the regulated community, increase clarity, tailor or streamline requirements, and facilitate compliance by owners and operators of a facility. In addition, the 1990 Oil Pollution Act (OPA) requires certain facility owners or operators to prepare facility response plans addressing a worst-case discharge of oil. That statute also requires that facility owners notify authorities of oil or hazardous substance discharges.

The SPCC program regulates non-transportation-related onshore and offshore facilities that could reasonably be expected to discharge oil or oil products into navigable waters of the United States or adjoining shorelines. The types of facilities that might need to comply with SPCC requirements include (but are not limited to): petroleum marketing facilities, manufacturing plants, military installations, motor pools, asphalt plants, service stations and garages, utility companies, large construction sites, and bus, truck, and auto maintenance facilities. Under the SPCC rule, facilities meeting the applicability requirements must prepare and implement an SPCC plan. Applicable facilities are those with oil storage containers in excess of 55 gallons, with aggregate above ground container capacity greater than 1,320 gallons, with a total underground storage capacity greater than 42,000 gallons, or at a location which can expect spilled oil to reach navigable waters. SPCC plans ensure that these facilities put in place containment and countermeasures that will prevent oil discharges and also include requirements to implement, and revise the plan as well as train employees to carry it out.

The Prevention of Future Releases Category complying action that applies to SPCC and 311(b) violation cases is “Plan Implementation.” ICIS reporting for SPCC/FRP includes the oil or oil product subject to the action as the pollutant, and the volume in gallons of oil/oil product tank capacity at the site.

Examples

Example 1. CWA SPCC Plan Implemented

Under a CWA 311(j) settlement agreement with EPA, XYZ oil storage facility has agreed to prepare an Oil Spill Prevention Plan (which it previously had not prepared). The agreement requires the facility to develop and implement the plan and will also require notification and training of facility personnel once the SPCC plan has been developed. The facility includes 2 oil storage tanks with a total holding capacity of 30,000 gallons.

Input for ICIS:

- **Complying Action**: Plan Implementation;
- **Pollutant:** Oil;
- **Amount and Unit**: 30,000 gallons; and
- **Media**: Water (navigable/surface)
  Counted Under Reporting Measure: **Volume of Oil Spills Prevented (gallons)**

[Note: Work Practices Category complying actions also apply to this case including Notification and Training.]

Example 2. CWA Section 311(b) Plan Implemented

EPA inspected one of ABC Corporation facilities and discovered that it failed to prepare and implement Spill Prevention, Control, and Countermeasure (SPCC) plans as required at nine of its No. 2 Fuel Oil facilities. Under the enforcement action, ABC Corporation will prepare and implement the required plans per a negotiated schedule. Each facility is estimated to store 100,000 gallons of No. 2 Fuel Oil.

Input for ICIS:

- **Complying Action**: Plan Implementation;
- **Pollutant:** fuel oil, no. 2;
- **Amount and Unit**: 900,000 gallons; and
- **Media**: Water (navigable/surface).
  Counted Under Reporting Measure: Volume of Oil Spills Prevented (gallons)

4.6 Pesticides

4.6.1 Background and Calculation Methodology

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides federal control of pesticide distribution, sale, and use. Important FIFRA requirements include the registration of pesticides prior to their sale, distribution, or use (unless the pesticide meets specific exemptions as described in the regulations). Registration includes acceptance by the EPA of the pesticide's label, which gives detailed instructions for its proper use. In addition, EPA must classify each pesticide as either ”general use”, ”restricted use”, or both. ”General use“ pesticides may be applied by anyone, but ”restricted use” pesticides may only be applied by certified applicators or persons working under the direct supervision of a certified applicator. Applicators are state-certified if the state operates an EPA approved certification program.

The EPA may issue a civil administrative complaint to any person or company who violates FIFRA. The complaint may impose a civil penalty, and may also require correction of the violation. EPA may also issue a Stop Sale, Use or Removal Order (SSURO) prohibiting the person who owns, controls, or has custody of a volatile pesticide or device from selling, using, or removing that product except in accordance with the provisions of the SSURO. The prevention of future releases category includes the following pesticide complying actions:

- Pesticide Production Ceased
- Pesticide Label Revised (Future Production)
- Pesticide Advertising Claim Removed (Future Production)
- Pesticide Manufacturing Change
- Pesticide Container Change
- Pesticide Secondary Containment Change

These complying actions are applicable where the pesticide product is still at the manufacturing site and has not been placed into "the channels of trade". See section 3.6 for an example of reporting when the pesticide product has already entered "the channels of trade".

4.6.2 Examples

Example 1. Pesticide Production Ceased

A company produces a misbranded or unregistered pesticide at an unregistered facility. EPA takes an enforcement action against the company for violating the FIFRA section 7 establishment registration requirement and for distribution and sale of misbranded and unregistered pesticides. EPA determines that, although the company produced 20,000 lbs of the misbranded and unregistered pesticide annually, there is no inventory of noncompliant product. To return to compliance, the company decides to cease production of the violative product at the unregistered facility. Rather than obtain a valid producer establishment registration for the facility, by ceasing to produce the pesticide at their facility, the company returns to compliance. Since the registrant will no longer produce the pesticide, 20,000 pounds (average annual production) of the noncompliant pesticide will be removed from the environment in the future.

Input for ICIS:

- **Complying Action**: Pesticide Production Ceased
- **Pollutant:** Pesticide Product
- **Amount and Unit**: 0 (20,000 lbs is the annual amount produced for the single product produced and, as such, is CBI restricted and must be reported using the CBI aggregation methodology; the entry in ICIS should be "0" and the 20,000 lbs amount should be reported manually in the year-end Workbook according to the FIFRA CBI outcomes reporting protocol)
- **Media**: Land, Air and Water
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

Example 2. Pesticide Advertising Claim Removed (Future Production)

A company has a product registered but has not yet begun to distribute and sell it. Nevertheless, the company has begun its marketing campaign and makes unauthorized public health claims that the product is effective against disease-carrying insects and ticks. EPA takes enforcement action citing the company for making advertising claims that are substantially different from any claims made in connection with its registration under FIFRA Section 3. The company agrees to remove the illegal pesticidal claims from its advertising materials. Calculating the reportable quantity for ICIS involves determining the annual production amount of the pesticide associated with the illegal advertisement and following the FIFRA CBI reporting protocol. If no history of production has yet occurred, the annualized quantity should reflect the projected production from the Section 7 annual reports.

Input for ICIS:

- **Complying Action:** Pesticide Claim Removed (Future Production)
- **Pollutant:** Pesticide, general
- **Amount/Unit:** 0 lbs (Actual production data for previous year or projected for forthcoming production year should be used for amount of future product produced. That amount is CBI restricted and the FIFRA CBI reporting protocol should be followed.)
- **Media:** NA
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

Example 3. Pesticide Manufacturing Change

A pesticide manufactured in Kansas is distributed and sold in the U.S. EPA inspects the product during a marketplace/retail inspection and determines it to be noncompliant with FIFRA because its composition differs from the EPA approved registration. EPA issues an enforcement action requiring the product to be brought back into compliance. EPA determines there is no existing inventory of the product and that the composition problem was due to a problem in the manufacturing process. As a result of the enforcement action, the producer implements changes to its production process which rectifies the process problem. As a result, subsequent manufacturing produces a compliant product. To report the benefit of this complying action, the amount of future pesticide product manufactured is calculated by computing an annual average for the amount produced, using Section 7 production data.

Input for ICIS:

- **Complying Action:** Pesticide Manufacturing Change
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 0 lbs (annualized production data should be used for this calculation; such data is FIFRA CBI protected and the FIFRA CBI Reporting Protocol should be followed, reporting “0 lbs” in ICIS and reporting the full 1,000 lbs in the year-end Workbook)
- **Media:** Land
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

Example 4. Pesticide Container Change

A producer is selling and distributing pesticides in non-refillable and refillable containers. EPA inspects the producer and finds that the non-refillable containers and/or refillable containers do not comply with FIFRA because they do not meet the structural, design, or dispensing requirements outlined by the Pesticide Management and Disposal Rule. EPA issues an enforcement action requiring the producer to distribute pesticides with compliant containers.

The facility had ten 5 gallon non-refillable containers packaged, labeled, and ready for shipment at the time of the inspection that did not meet the requirements. Annually, the facility produced, sold and distributed about 50,000 gallons of pesticides in the non-complaint containers. The estimated density of the pesticide product is 8 lbs/gallon.

Input for ICIS:

- **Complying Action:** Pesticide Container Change
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 400,000 lbs (8 lbs/gallon × 50,000 Gallons) CBI restrictions may apply.
- **Media:** Land
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

Example 5. Secondary Containment Change

A pesticide producer is producing, selling and distributing agricultural pesticides from stationary pesticide containers. EPA inspects the facility and finds that the secondary containment and/or pesticide dispensing areas do not comply with FIFRA because they do not have the capacity, structural integrity, or design required by the Pesticide Management and Disposal Rule. EPA issues an enforcement action requiring the containment structures to be built, changed, or repaired.

For Secondary Containment: The facility's largest tank held 15,000 gallons of agricultural pesticides. Per year, the facility processes about 200,000 gallons of pesticides through their stationary bulk tanks. The estimated density of the pesticide product is 8 lbs/gallon.

Input for ICIS:

- **Complying Action:** Pesticide Secondary Containment Change
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 1,600,000 lbs (8 lbs/gallon × 200,000 gallons) CBI restrictions may apply.
- **Media:** Land
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

For Pesticide Dispensing Pads: The facility transfers agricultural pesticides on the dispensing pad to and from tanks with capacities up to and greater than 750 gallons. Per year, the facility processes / transfers about 200,000 gallons of pesticides over the dispensing pad. The estimated density of the pesticide product is 8 lbs/gallon.

Input for ICIS:

- **Complying Action:** Pesticide Secondary Containment Change
- **Pollutant:** Pesticide, general
- **Amount and Unit:** 1,600,000 lbs (8 lbs/gallon × 200,000 gallons) CBI restrictions may apply.
- **Media:** Land
  Counted Under Reporting Measure: Toxic Chemicals and Pesticides Prevented from Misuse/Environmental Release (pounds)

4.7 Risk Management Program (RMP)/General Duty Clause (GDC)

4.7.1 Background and Calculation Methodology

Section 112(r) of the CAA addresses the prevention of accidental releases and the minimization of the consequences arising from the release of any extremely hazardous substances. Section 112(r)(1) establishes that owners and operators of stationary sources producing, processing, handling or storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur. Section 112(r)(7) authorizes the Administrator to promulgate release prevention, detection, and correction requirements which may include monitoring, record-keeping, reporting, training, vapor recovery, secondary containment, and other design, equipment, work practice, and operational requirements. These activities in the aggregate constitute a Risk Management Program (RMP).

The RMP regulates stationary sources having greater than a threshold quantity of one or more regulated chemicals in a process. Threshold quantities vary by chemical and fall in the range of 500 to 20,000 pounds. The types of facilities that might need to comply with RMP requirements include (but are not limited to) water and wastewater treatment plants, agricultural retail establishments, refrigerated warehouses and food processing facilities, chemical warehouses, chemical and petroleum refineries, and natural gas processing plants. Stationary sources that do not have more than a threshold quantity of any extremely hazardous chemicals in a process are still subject to the General Duty Clause.

Under the RMP rule, facilities meeting the applicability requirements must prepare and implement an RMP plan. Subject facilities are those with extremely hazardous chemicals held onsite above threshold quantities. RMP plans ensure that these facilities put in place appropriate controls and practices to address mechanical integrity, operation procedures, hazard identification, and operator training.

The Prevention of Future Releases Category complying actions that apply to RMP cases are "Risk Management Plan Implemented" and "Industry Standards Adopted." ICIS reporting includes the total quantity of chemicals subject to the action as the pollutant.

4.7.2 Examples

Example 1. GDC Administrative Penalty

Happytime Yogurt experienced an accidental release from its anhydrous ammonia (an extremely hazardous chemical) refrigeration system. Since the total quantity of ammonia held onsite is below the threshold quantity (only 7,865 lbs.), RMP does not apply; however, GDC does. Follow up investigations revealed that Happytime failed to adequately inspect and replace several pressure release valves in its ammonia refrigeration system. These valves were directly implicated in the release. EPA proposed an administrative penalty for violations of the general duty clause and required Happytime to fully implement a more complete prevention program.

Input for ICIS:

- **Complying Action**: Risk Management Plan Implemented;
- **Pollutant:** Extremely Hazardous Chemicals;
- **Amount and Unit**: 7.865 lbs; and
- **Media**: Air
  Counted Under Reporting Measure: No National Metric

[Note: Work Practices Category complying actions also apply to this case including work practices and training.]

Example 2. RMP Administrative Penalty Order

Under an APO, Barker Chemical Company has been cited for non-compliance with requirements under the RMP regulations. Six storage tanks at the facility were lacking both pressure relief valves and corrosion analysis. The APO requires the facility to replace outdated pressure relief valves and do a correct corrosion analysis for the six tanks. The tanks have a total max capacity of 30,000 lbs of toluene diisocyanate, a CAA 112(r)(r) covered chemical.

- **Complying Actions:** Risk Management Plan Implemented;
- **Pollutants:** Toluene diisocyanate;
- **Amount and Unit:** 30,000 lbs; and
- **Media:** Air
- **Counted Under Reporting Measure: No National Metric**

Example 3. RMP Plan Implemented

Under a consent agreement , XYZ refinery has agreed to correct deficiencies identified in its RMP. The agreement requires the facility to fully implement the plan and will also require training of facility personnel. The facility includes 4 covered processes with a total maximum intended inventory of 300,000 pounds.

- **Complying Action**: Risk Management Plan Implemented;
- **Pollutant:** Extremely hazardous chemicals;
- **Amount and Unit**: 300,000 pounds; and
- **Media**: Air
  Counted Under Reporting Measure: No National Metric

[Note: Work Practices Category complying actions also apply to this case including applicable requirements of 40 C.F.R. Part 68 such as mechanical integrity, auditing, recordkeeping and Training.]

Example 4. Industry Standards Adopted

A facility is using an incorrect tank for chlorine storage of 2000 lbs (less than the RMP threshold), a CAA 112(r)(1) extremely hazardous substance. The violations were cited and the tanks were replaced with tanks meeting generally recognized good engineering practices.

Input for ICIS:

- **Complying Action:** Industry Standards Adopted;
- **Pollutant:** Chlorine
- **Amount and Unit:** 2,000 lbs
- **Media:** Air
  Counted Under Reporting Measure: No National Metric

4.8 Leak Detection and Repair - Stationary Sources

4.8.1 Background and Calculation Methodology

Under the Clean Air Act, fugitive emissions from a variety of equipment, including pumps, valves, flanges, connectors, and compressors, are controlled through implementing a Leak Detection and Repair program (LDAR). Through this program, equipment must be routinely monitored for leaks and if a leak is found, it must be repaired. If equipment leaks go undetected, fugitive emissions of volatile organic compounds (VOCs) and other hazardous chemicals will be emitted continually into the atmosphere. These emissions can contribute to smog and human health problems. The types of actions that apply to LDAR cases include leak detection to address the monitoring and leak detection aspects of the enforcement action and leak repair to address the process piping repair. Cases requiring implementation of leak repair activities are covered under On-going Releases Category. Cases that require implementation of a leak detection program are covered under Prevention of Future Releases Category.

To estimate potential emissions prevented through a leak monitoring/detection program, you can use the average emission factor approach described in EPA's *Protocol for Equipment Leak Emission Estimates*, EPA 453/R-95-017, Nov. 1995. This protocol uses an average emission factor by component type and is appropriate for estimating emissions for a large population of component sources with significant (greater than a few hours) operating times. The component types of average emission factors included in EPA's protocol document include valves, pump seals, open-ended lines (OELs), connectors, and flanges for Synthetic and Organic Chemical Manufacturing Industry (SOCMI) process units, refineries, marketing terminals, and oil and gas production operations. The step-by-step methodology is as follows:

1. Determine the case characteristics including, industry category, component types, number of each component type that will be monitored, the service each component is in (gas, light liquid, or heavy liquid), and the time period each component is in service per year.

2. Determine the average emission factors by component type and service from EPA's *Protocol for Equipment Leak Emission Estimates*, EPA 453/R-95-017, Nov. 1995, Tables 2-1, 2-2, 2-3, and/or 2-4. [This document is available at www.epa.gov/ttnchie1/efdocs/quiplks.pdf]

3. Calculate the average emissions using the following equation:

   Lbs/year TOC emission = sum for each component{Avg. emission factor (kg/hr/source) × (# of components) × hours of service/year × lb/454 g × 1000 g/kg}

4.8.2 Example

Example 1. Preventative LDAR Case

Under a CAA enforcement action, ABC Company a SOCMI facility will be required to implement a LDAR monitoring program. The program will include sampling of 160,000 connectors and 53,000 open-ended lines (OELs) for light liquid service. The components are in service all year round (8,760 hours/year).

Step 1: Case Characteristics

Industry category is SOCMI (use Table 2-1 of EPA's *Protocol for Equipment Leak Emission Estimates*); component types are connectors and open-ended lines; the number of each component monitored is 160,000 connectors and 53,000 open-ended lines; the type of service is light liquid.

Step 2: Average emission factors by component type and service

Connectors = 0.00183 kg TOC/hr/source
Open-ended lines = 0.0017 kg TOC/hr/source

Step 3: Calculation of average leak emissions prevented

For connectors, using an average emission factor of 0.00183 kg TOC/hr/source × 8,760 hours/yr × 160,000 connectors × 1000 g/1 kg × 1 lb/454 g = 5,649,621 lbs TOC

For OELs, using an average emission factor of 0.0017 kg TOC/hr/source × 8,760 hours/yr × 53,000 OELs × 1000 g/1 kg × 1 lb/454 g = 1,738,493 lbs TOC

Input for ICIS:

- **Complying Action:** Leak Detection (LDAR);
- **Pollutant:** TOC
- **Amount and Unit:** 7,388,114 lbs
- **Media:** Air
  Counted Under Reporting Measure: No National Metric

4.9 Asbestos Under TSCA/AHERA and CAA NESHAP and Lead-based Paint

4.9.1 Background and Calculation Methodology

Asbestos. The EPA is one of six agencies with the authority to regulate asbestos. The EPA's authority to do so is provided under both the Toxic Substances Control Act (TSCA) and the Clean Air Act (CAA). Under TSCA, EPA enforces the requirements of the Asbestos Ban and Phase-Out Rule (ABPO) and the Asbestos Hazard Emergency Response Act (AHERA). The ABPO Rule phases out and bans production of five specific types of asbestos-containing products including corrugated paper, rollboard, and flooring paper, as well as new uses of asbestos. AHERA prescribes asbestos management practices and abatement standards for public schools and private, not-for-profit schools. In addition, the EPA is authorized under the CAA at 40 CFR Part 61 Subpart M to enforce the requirements of the National Emissions Standards for Hazardous Air Pollutants regulations dealing with asbestos (Asbestos NESHAP). [***Note: asbestos was delisted under 40 CFR Part 63 as a source category but is still regulated by 40 CFR Part 61 Subpart M.]***

AHERA required EPA to develop regulations creating a comprehensive framework for addressing asbestos hazards in schools. The Act also required EPA to develop an accreditation program for individuals who conduct inspections for asbestos, to develop management plans, and to perform asbestos abatement work. Other provisions of AHERA require all public and private elementary and secondary schools to inspect for asbestos-containing building materials, develop management plans, and implement response actions in a timely fashion. The provisions of AHERA required management plans to be submitted to State agencies on or before May 9, 1989 and local education agencies (LEAs) were required to begin implementation of their management plans by July 9, 1989.

The Asbestos School Hazard Abatement Reauthorization Act of 1990 (ASHARA) amended AHEARA to stipulate that contractors working on asbestos abatement activities in schools, public, or commercial buildings need to have received proper accreditation (15 U.S.C. 2646a TSCA TITLE II AHERA). ASHARA requires that certified personnel perform asbestos abatement work in public and commercial buildings: inspectors, risk assessors, supervisors, abatement workers, and/or project designers (40 CFR Part 763, Appendix C to Subpart E Model Accreditation Plan).

Note: EPA can enforce this requirement at worksites, and may perform combined lead and asbestos inspections at child-occupied locations in public and commercial buildings. Although there has not been much enforcement of ASHARA, this is a strategy currently being contemplated within EPA as required by the FY12 OECA NPM Guidance. Region 10 plans to conduct these inspections.

Lead-based Paint. Deteriorated lead-based paint is a significant concern for older schools, houses, and buildings. Buildings constructed prior to 1978 may contain lead-based paint, which, if not properly maintained, can peel and become dust. This dust can then pose an inhalation and ingestion hazard to children. Exposures can also occur during renovation, remodeling, or demolition work. Children are susceptible to adverse health effects from extremely low exposures to environmental lead.

EPA adopted final lead hazard standards on January 5, 2001 that identify dangerous levels of lead in paint, dust and soil. These standards, at TSCA Section 403, can be found at: http://www.epa.gov/lead/pubs/leadhaz.htm.

Under TSCA Section 402, training/certification and work practice standards are required. Under the 402a regulations for abatement, all persons including school employees that perform lead-based paint activities in “pre-1978 housing” and in “child-occupied facilities” must be trained and certified to conduct this work. They must also adhere to certain work practice requirements. This applies to persons inspecting for lead-based paint, and also to those involved in abating lead-based paint hazards.

The Lead Renovation, Repair, and Painting Rule (RRP) includes updated certification and work practice requirements. Under the RRP regulations (402c), any activity that disturbs paint in housing and child-occupied facilities built before 1978, including remodeling, repair, maintenance, painting, electrical work, carpentry and window replacement, is subject to the requirements. Most minor repair activities of less than six square feet per interior room or 20 square feet of exterior project are exempt from the work practice requirements. However, this exemption does not apply to window replacement.

The Pre-Renovation Education Rule (TSCA Section 406(b)) directed EPA to develop requirements for renovators to distribute a lead hazard information pamphlet to housing owners and occupants before conducting renovations in pre-1978 housing. EPA published the requirements in a final rule on June 1, 1998. The Lead Renovation, Repair and Painting Final Rule, published on April 22, 2008, amends and supplements the 1999 rule. As of June 23, 2008, renovators were required to distribute a lead hazard information pamphlet to the owners and administrators of child-occupied facilities before beginning renovations in these facilities. Renovators must also make renovation information available to the parents or guardians of children under age six that attend these facilities. The rule defines child-occupied facilities as residential, public or commercial buildings built before 1978 where children under age six are present on a regular basis. Child care facilities and kindergarten and pre-kindergarten classrooms are examples of child-occupied facilities. As of December 22, 2008, contracts were required to use the new renovation-specific lead hazard information pamphlet, entitled *Renovate Right:*

Important Lead Hazard Information for Families, Child Care Providers and Schools, to comply with these requirements.

The Lead-Based Paint Disclosure Rule (Section 1018 of the Residential Lead-Based Paint Hazard Reduction Act of 1992) directed EPA and HUD to jointly issue regulations requiring disclosure of known lead-based paint and/or lead-based paint hazards by persons selling or leasing housing constructed before the phase out of residential lead-based paint use in 1978. Section 1018 requires sales and leasing contracts to include certain disclosure and acknowledgement language related to the lead-based paint hazards, and requires sellers and lessors of most residential housing built before 1978 to:

- Disclose the presence of known lead-based paint and/or lead-based paint hazards in the housing;
- Provide purchasers and lessees with any available records or reports pertaining to the presence of lead-based paint and/or lead-based paint hazards;
- Provide purchasers and lessees with a federally approved lead hazard information pamphlet; and
- Provide purchasers with a 10-day opportunity to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead-based paint hazards before the purchaser is obligated under any purchase contract.

The Prevention of Future Releases Category complying actions that apply to asbestos and lead-based paint cases include:

- Toxic Material Abatement (without existing release); and
- Preventative Management Plan Implemented.

ICIS reporting for Asbestos and lead-based paint cases uses a number of units metric, i.e., the number of schools or building units impacted by the action.

4.9.2 Examples

Example 1. Lead-based Paint – Abatement (Without Existing Release)

Under the lead-based point disclosure rule (1018), an apartment complex built prior to 1978 failed to provide the required pamphlet and failed to inform tenants if they were aware or not of the presence of lead-based paint and/or lead-based paint hazards. As part of the settlement of the violation, the complex owner offered to inspect for lead and abate lead-based paint. Abatement activities were performed on 100 of the apartment units. Input for ICIS would include the following:

- **Complying Action:** Toxic Material Abatement (without existing release);
- **Pollutant:** Lead paint;
- **Amount and Unit:** 100 housing units; and
- **Media:** Buildings/Housing/Schools
  Counted Under Reporting Measure: Toxic Substance Contamination Prevented (# of Housing Units, Schools, Buildings)

Example 2. Asbestos and Lead-based Paint – Abatement (Without Existing Release)

Under an AHERA and TSCA enforcement action, ten schools within the Monroe County School District will undergo asbestos abatement to remove asbestos-based insulation from school property. The schools will also undergo removal and replacement for lead-based paint. Input for ICIS would include the following:

- **Complying Action:** Toxic Material Abatement (without existing release);
- **Pollutant:** Asbestos;
- **Amount and Unit:** 10 Schools*; and
- **Media:** Buildings/Housing/Schools
  Counted Under Reporting Measure: Toxic Substance Contamination Prevented (# of Housing Units, Schools, Buildings)

AND

- **Pollutant:** Lead paint;
- **Amount and Unit:** "0" Schools; and
- **Media:** Buildings/Housing/Schools.

[**Note: Schools refers to the individual schools as opposed to school districts.]*

Example 3. Asbestos – Preventative Management Plan Implemented

Under an AHERA enforcement action, the Monroe County School District has been cited for a failure to conduct asbestos inspections at their 10 elementary/secondary schools. The school district will need to designate and train a person to oversee asbestos-related activities in the LEA and will need to utilize a properly accredited person to conduct the asbestos inspections. They will also need to provide custodial and maintenance staff with awareness and proper work practices training. Input for ICIS would include the following:

- **Complying Action:** Preventative Management Plan Implemented;
- **Pollutant:** Asbestos;
- **Amount and Unit:** 10 Schools; and
- **Media:** Buildings/Housing/Schools
  Counted Under Reporting Measure: Toxic Substance Contamination Prevented (# of Housing Units, Schools, Buildings)

[Note: Work Practices Category complying actions also apply to this case including Inspections and Training.]

4.10 Underground Injection Control (UIC) Program

4.10.1 Background and Calculation Methodology

The Safe Drinking Water Act (under SDWA Sections 1422/1423) established the Underground Injection Control (UIC) program to provide safeguards on underground injection operations in order to protect current and future underground sources of drinking water (USDW).

Underground injection is the technology of placing fluids underground into porous formations of rocks, through wells or other similar conveyance systems. The fluids injected may be water, wastewater, or water mixed with chemicals. Agribusiness and the chemical and petroleum industries use of underground injection for waste disposal. Since injection wells have the potential to contaminate sources of drinking water, the UIC program sets minimum design requirements to keep injected fluids within the well and the intended injection zone, or requires that injected fluids not cause a public water system to violate drinking water standards or otherwise adversely affect public health. These minimum requirements affect the citing of an injection well, and the construction, operation, maintenance, monitoring, testing, and ultimately closure of the well.

The On-going Releases Category covers cases involving UIC plug and abandon activities where there has been an active leak. The Prevention of Future Releases Category includes UIC plug and abandon actions where there has not been a leak. Prevention of Future Releases for Class V wells is not leak-dependent. Plug and abandon/closing/reclassification of a Class V well stops an ongoing release and prevents a future release.

The reporting metric for Prevention of Future Releases Category UIC cases is the number wells being plugged and abandoned by the action. The pollutant to report in ICIS is "wastewater".

4.10.2 Example

Example 1. Plug and Abandonment of Non-Leaking UIC Wells

A UIC case requires the plugging and abandonment of 10 injection wells at a mining facility. There is no current indication of contamination leaking from the wells into the surrounding aquifer.

- **Complying Actions:** Plug and Abandon UIC (w/o leaks)
- **Pollutant:** Wastewater
- **Amount and Unit:** 10 wells
- **Media:** Water (underground source of drinking water)
  Counted Under Reporting Measure: Underground Injection Wells Prevented from Leaking (# wells)

4.11 Underground Storage Tanks (USTs)

4.11.1 Background and Calculation Methodology

Subtitle I of RCRA provides EPA with regulatory authority for Underground Storage Tanks (USTs) and allows EPA to regulate petroleum and chemical products and hazardous wastes. An underground storage tank is defined as a tank, including its underground piping that is 10 percent or more beneath the surface of the ground. To be regulated by Subtitle I, the tank must store petroleum or a hazardous substance; certain tanks are excluded from this definition. For a complete list of exempt USTs, see 40 CFR, Part 280 at http://www.epa.gov/swerust1/fedlaws/cfr.htm.

For all non-exempt USTs, EPA has developed performance standards for tank design, construction, and installation. Additionally, requirements concerning leak detection, record keeping, reporting, corrective action, and closure have also have been promulgated.

The regulation of USTs is vital because leaks from an UST can cause fires and explosions, and contaminate groundwater, the primary source of drinking water in the United States. To protect human health and the environment, EPA developed several key regulations for the safe operation of USTs. As of December 1993, all new and existing USTs had to be equipped with a leak detection system, and by December1998, new and existing USTs had to be equipped with spill, overfill and corrosion protection. To ensure spill protection, USTs are required to be equipped with catch basins to contain spills. For overfill protection, USTs are required to be equipped with automatic shut off devices, overfill alarms or ball float valves. Finally, for corrosion protection, the tank and piping had to be made completely of non-corrodible material, or of steel having a corrosion-resistant coating and having cathodic protection, or of steel clad with a thick layer of non-corrodible material.

To address non-compliance, EPA or the state regulatory agency may take enforcement actions to ensure that the substandard UST replaced, upgraded or permanently closed. These pollution prevention actions may include monetary penalties and administrative or judicial enforcement actions.

The Prevention of Future Releases Category complying actions that apply to UST cases that are preventative in nature include:

- Secondary Containment;
- Implement Corrosion Protection System;
- Implement Tank Overfill/Spill Protection;
- Implement Release Detection System (UST); and
- Tank Closure.

ICIS reporting for UST cases includes reporting of the tank contents as the pollutant and an estimate of the liquid volume in gallons as the measurement metric. If the volume of liquid in the tank is unknown, then use the tank capacity.

4.11.2 Examples

Example 1. Non-leaking UST Administrative Penalty Order

Under an APO, Barker Chemical Company has been cited for non-compliance with requirements under the UST regulations. Six underground storage tanks at the facility were lacking both tank overfill/spill protection and release detection controls. The APO requires the facility to implement systems for both leak detection and overfill/spill protection for the six tanks. They must also supply proof of financial responsibility in case of a spill event. The tanks contain manufactured solvents including toluene in four 5,000-gallon tanks and benzene in two 500-gallon tanks. Actual tank liquid volumes are unknown.

- **Complying Actions:** Implement Tank Overfill/Spill Protection, Implement Release Detection System;
- **Pollutants:** Toluene;
- **Amount and Unit:** 20,000 gallons; and
- **Media:** Land
  Counted Under Reporting Measure: Underground Storage Tank Capacity Prevented From Release (Gallons)

AND

- **Pollutant:** Benzene;
- **Amount and Unit:** 1,000 gallons; and
- **Media:** Land
  Counted Under Reporting Measure: Underground Storage Tank Capacity Prevented From Release (Gallons)

Example 2. Non-leaking Tank Closure

ABC Gasoline Company is closing 25 service stations under an enforcement action involving both leaking and non-leaking USTs. Ten of the stations to be closed do not include leaking tanks and have two 2,000-gallon USTs each, one containing gasoline and the other containing diesel.

- **Complying Action:** Tank Closure;
- **Pollutants:** Gasoline;
- **Amount and Unit:** 20,000 gallons; and
- **Media:** Land
  Counted Under Reporting Measure: Underground Storage Tank Capacity Prevented From Release (Gallons)

AND

- **Complying Action:** Tank Closure;
- **Pollutant:** Diesel oil, No. 2;
- **Amount and Unit:** 20,000 gallons; and
- **Media:** Land

Counted Under Reporting Measure: Underground Storage Tank Capacity Prevented From Release (Gallons)

4.12 Wetlands Preservation

4.12.1 Background and Calculation Methodology

Section 404 of the CWA establishes a program to regulate the discharge of dredged fill material into all waters of the U.S., including wetlands. The activities regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry.

The purpose of the program is to ensure that alternatives that are less damaging to the aquatic environment are evaluated and implemented where possible. Permittees must show that they have taken steps to avoid wetlands impacts where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or create wetlands. The program is administered by the Army Corps of Engineers through individual or general permits and both the Army Corps of Engineers and EPA enforce the Section 404 provisions.

The Prevention of Future Releases Category complying action that applies to wetlands cases is “Wetlands Preservation”. This complying action is intended to capture activities that protect existing wetland areas and contribute to the ecological sustainability of a watershed. (Wetlands restoration and wetlands creation are covered under the “Removal and Restoration” category). For wetlands preservation efforts, you should report the acres of wetlands or linear feet of stream subject to the preservation effort. Identify “fill material” as the pollutant and the media impacted will be “Water (wetlands)”.

For preservation efforts where the wetlands impacted is a stream or river, report the environmental benefit as linear feet of stream or river restored. In the identification of units, you should indicate the size of the stream or river using the following options:

- Linear feet of small stream (defined as < 10 feet in width);
- Linear feet of medium stream (defined as 10-20 feet in width); or
- Linear feet of large stream (defined as > 20 feet in width).

4.12.2 Example

Example 1. Wetlands Preservation

For a case involving the preservation of a 10 acre wetlands area, the input to ICIS would be:

- **Complying Action:** Wetlands Preservation;
- **Pollutant:** Fill Material;
- **Amount and Unit:** 10 acres; and
- **Media:** Water (wetlands)

Counted Under Reporting Measure: Wetlands Preserved (Acres)

5. WORK PRACTICES CATEGORY

5.1 Overview and Complying Actions Included in the Category

Work practices include those actions that a facility conducts to better manage their environmental program and to inform the public/permitting authority of the toxicity, quantity, and location of their chemicals, waste streams, and emissions (e.g., auditing, environmental management review, site assessment, testing, recordkeeping, reporting). EPA does not currently try to quantify the environmental benefits of work practices but includes complying actions in this category for reporting purposes. Any complying action included in the removal and restoration, reduction of ongoing releases, and prevention of future releases categories may also be labeled as work practices. The work practices category includes both multi-program complying actions (e.g. training) and program specific complying actions (e.g. Hazardous Waste Identification - RCRA).

Table 5-1 presents the complying actions included in the work practices category along with their definition.

Table 5-1. Work Practices Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Multi-Program Complying Actions		
	Training	This category includes all training programs.
	Certification and Accreditation	This category includes all actions to comply with obtaining required certifications and accreditations.
	Labeling - Identification	This category applies to actions that require proper labeling for purposes of identifying the material or pollutant.
	Labeling – Material Management	This category applies to actions that require proper labeling for purposes of managing the material or product.
	Auditing	This category involves cases where environmental audit is included with the settlement/order as a means for identifying problems and reducing the likelihood of similar problems recurring.
	Cease Activity	This category includes all actions to stop current existing practices in response to a formal order (such as a FIFRA Stop Sale, Use or Removal Order, UIC or Wetlands Cease and Desist Order).
	Work Practices	This category includes any modification of business practice to facilitate the protection of human health and the environment. For example, a business may be sand-blasting part of a bridge without proper environmental protection and this practice is stopped. (Unlike BMP's, this type of pollutant reduction is not quantifiable.
	Record-keeping	This category includes types of record keeping ranging from records of sampling and analysis of hazardous waste to records of inspections and maintenance, e.g., requiring a facility to maintain underground storage tank monitoring records.
	Testing/Sampling	Laboratory or other types of testing and sampling to determine the hazard of a waste or the toxicity of a chemical or release.

Table 5-1. Work Practices Category Complying Actions and Definitions

Program Category	Complying Action	Definition
	Reporting	This category includes reporting required by regulations or permits, e.g., Tier II Reports, Form A/R Reports, DMR reports required under the NPDES regulations and Pesticide Production reports required under FIFRA Section 7.
	Environmental Management Review	This category covers conducting an environmental management review, which includes reviewing organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing, and maintaining an organization's environmental policy.
	Monitoring	This category includes monitoring activities performed to assess whether a pollutant release is occurring or if a water supply meets regulatory standards.
	Planning	This category covers actions requiring the development of or improvement to a plan (e.g., preparation of a Stormwater Pollution Prevention Plan). Implementation of a plan should be reported under individual implementation activities (e.g. use reduction, BMPs, etc.)
	Information Letter Response	This category includes compelling response by a recipient to a formal request for information .
	Notification	This category includes all actions requiring the provision of any sort of notification. Among others, includes advance notice of a regulated activity such as asbestos abatement work as well as notification to local emergency response officials about the storage of hazardous materials. This complying action also includes pamphlet distribution under the lead-based paint program.
	Permitting	This category includes participation in a required permit process by an un-permitted facility. E.g., an inspected facility storing hazardous wastes onsite without notification or permit.
	Financial Responsibility Requirements	This category includes actions that compel owners or operators to show that they have the financial resources to cleanup a site if a release occurs, correct environmental damage, and/or compensate third parties for injury to their properties or themselves.
	Provide Site Access	This category includes compelling facility/site owners to admit EPA officials entry to inspect or assess hazards. E.g., gaining entrance to a fenced, locked storage area containing potential leaking drums where admittance has been denied.
	Institutional Controls	Non-engineered instruments, such as administrative and legal controls, that minimize the potential for exposure to contamination and/or protect the integrity of a response action. These controls typically are designed to work by limiting land and/or resource use by providing information that helps modify or guide human behavior at a site.

Table 5-1. Work Practices Category Complying Actions and Definitions

Program Category	Complying Action	Definition
Program-Specific Complying Actions		
Hazardous Waste Management	Hazardous Waste Identification	This category includes efforts to determine the status of a waste material as a "Hazardous Waste."
	Manifesting	This category covers compliance with manifesting requirements for movement of hazardous waste.
	UST Release Detection	Management of procedures to determine whether a pollutant release is occurring from an underground storage tank.
Superfund Cleanup	RI/FS or RD (CERCLA)	Remedial Investigation (RI)/Feasibility Study (FS) or Remedial Design (RD). This category covers investigation and study of requirements for extensive cleanup of a hazardous waste site. E.g., evaluating where buried waste may have migrated into adjoining watercourses.
	Site Assessment/ Characterization (CERCLA)	This category includes collecting site samples and data to assess the severity of a contamination hazard. E.g., a site/facility where indications suggest an extensive cleanup may be required.
Clean Water Act Federal Stormwater Regulation	Stormwater Site Inspections	This category refers to the stormwater site BMP inspections required by federal stormwater regulations.
	Develop CMOM Program (CWA)	This category refers to developing a Capacity, Management, Operation and Maintenance (CMOM) Program and applies to municipalities and other entities managing sewage overflow prevention activities.
TSCA/AHERA Inspections	Asbestos Inspections	This category refers to asbestos inspections required under TSCA 203 (AHERA).
FIFRA	FIFRA Establishment Registration Obtained	This category refers to registration of Pesticide Producing Establishments under Section 7 of FIFRA.
	FIFRA Establishment Terminated	This category refers to termination or inactivation of Pesticide Producing Establishments under Section 7 of FIFRA.
	Product Registration	This category refers to obtaining EPA registration for a pesticide under Section 3 of FIFRA.
UIC	UIC Demonstrate Mechanical Integrity	Actions requiring owners or operators of underground injection wells to submit the results of internal and external mechanical integrity tests to the UIC Program Director. The data and information must include a description of the test(s) and the method(s) used.
Stationary Sources	General Duty CAA 112(r)(1)	Actions that comply with recognized and generally accepted industry standards and practices to maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur.

5.2 Multi-Program Complying Actions and Examples

5.2.1 Training

Below are examples of enforcement action requirements that would be entered into ICIS with the complying action "Training". No amounts or units are associated with these work practice complying actions.

Example 1. TSCA Asbestos

A Local Education Agency (LEA) did not ensure that all members of its maintenance and custodial staff who conduct activities that result in the disturbance of asbestos containing building material received both the 2 hour asbestos training and 14 hours of additional training. Enforcement action is taken citing the lack of training. To comply, the workers must obtain proper training.

Input for ICIS:

Complying Action: Training
Pollutant: NA
Amount/Unit: NA
Media: NA

Example 2. TSCA Section 402(a) Lead-based Paint

An audit of a lead-based paint activities training course being taught by an accredited training provider revealed that not all of the required components of the training course were being taught. Enforcement action is taken citing the training deficiencies of the course and to comply, the course provider must revise the training.

Input for ICIS:

Complying Action: Training
Pollutant: NA
Amount/Unit: NA
Media: NA

Example 3. TSCA Section 402(c) Lead-based Paint

A compliance monitoring inspection of a renovation site revealed that the renovator failed to provide training to their abatement workers for lead safe work practices they will be using in performing their assigned tasks. Enforcement action is taken citing the lack of training. To comply, the workers must obtain proper training.

Input for ICIS:

Complying Action: Training
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.2 Certification and Accreditation

Below is an example of an enforcement action that would be entered into ICIS with the complying action "TSCA Certification and Accreditation.". No amounts or units are associated with this work practice complying action.

Example 1. TSCA Lead-based Paint

A renovation firm performing lead-based paint renovations fails to obtain the required firm certification. As a result, EPA takes an enforcement action citing the lack of firm certification. To comply,

Input for ICIS:

Complying Action: Certification and Accreditation the company obtains the required firm certification.

Pollutant: NA
Amount/Unit: NA
Media: NA

Example 2. FIFRA

A commercial pesticide applicator applying Restricted Use Pesticides is not certified as required by FIFRA. EPA takes enforcement action citing failure to be a certified pesticide applicator. To comply, the applicator obtains commercial pesticide applicator certification.

Input for ICIS:

Complying Action: Certification and Accreditation
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.3 Labeling - Identification

Below are examples of enforcement action requirements that would be entered into ICIS with the complying action "Labeling - Identification". No amounts or units are associated with these work practice complying actions.

Example 1. TSCA Asbestos

A Local Education Agency did not attach warning labels immediately adjacent to friable and nonfriable asbestos containing building material located in routine maintenance areas. Enforcement action is taken to require labeling. To comply, the company labels the asbestos building materials.

Input for ICIS:

Complying Action: Labeling – Identification
Pollutant: NA
Amount/Unit: NA
Media: NA

Example 2. RCRA

Hazardous waste is stored in containers that are not properly labeled so that the contents are identified. Enforcement action is taken to require labeling. To comply, the company labels the containers.

Input for ICIS:

Complying Action: Labeling - Identification
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.4 Labeling – Material Management

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Labeling – Material Management". No amounts or units are associated with this work practice complying action.

Example 1. Pesticides

A company manufactures a pesticide that has been registered for treating nematodes and claims on the label that the product is effective against nematodes, and army caterpillars. The claim on the label that the pesticide is effective against army caterpillars is beyond what the pesticide has been registered for. The agency inspects the facility producing the nematicide and discovers the non-compliant claim on the label. The agency orders the registrant to remove the claim on the product about treating army caterpillars from the label. The amount of product manufactured annually is CBI protected.

Input for ICIS:

Complying Action: Labeling – Material Management
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.5 Cease Activity

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Cease Activity". No amounts or units are associated with this work practice complying action.

Example 1. FIFRA

Under a Stop Sale Use and Removal Order (SSURO), NMO company has agreed to remove from sale all unregistered pesticides until either labels have been revised or product has been registered.

Input for ICIS:

Complying Action: Cease Activity
Pollutant: NA
Amount/Unit: NA
Media: NA

Example 2. Wetlands

Under a CWA 404 Cease and Desist order, a construction company is required to stop activities that include filling in a wetlands area until further investigation is conducted.

Input for ICIS:

Complying Action: Cease Activity
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.6 Work Practices

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Work Practices". No amounts or units are associated with this work practice complying action.

Example 1. Work Practices

Example, a business may be sandblasting part of a bridge without proper environmental protection and this practice is stopped (unlike BMPs this type of pollutant reduction is not quantifiable).

Input for ICIS:

Complying Action: Work Practices
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.7 Reporting

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Reporting." No amounts or units are associated with this work complying action.

Example 1. SDWA

Under SDWA, a facility was required to report to the State a violation of the total coliform monitoring requirements, but failed to do so. As issued, the Order included injunctive relief mandating reporting of future violations of total coliform monitoring requirements to the State, per the regulations.

Input for ICIS:

Complying Action: Reporting
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.8 Monitoring

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Monitoring". No amounts or units are associated with this work practice complying action.

Example 1. RCRA

Under a RCRA corrective action, a facility was required to monitor groundwater wells for Trichloroethylene. Upon inspection, it was found that the monitoring was not conducted as specified by the order and to comply the facility will need to conduct the monitoring.

Input for ICIS:

Complying Action: Monitoring
Pollutant: NA
Amount/Unit: NA
Media: NA

Example 2. SDWA

Under SDWA, a facility was required to monitor its water for total coliform bacteria monthly, but failed to do so. As issued, the Order included injunctive relief mandating subsequent monthly total coliform monitoring, per the regulations.

Input for ICIS:

Complying Action: Monitoring
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.9 Planning

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Planning". No pollutants, amounts or units are associated with this work practice complying action.

Example 1. TSCA AHERA

A public school system is required to have an approved asbestos management plan in place at each school, but has not developed such a plan for one or more schools in the school district. EPA cites the school district for failure to have an approved asbestos management plan in place for those schools. To comply, the school district develops and submits for approval asbestos management plans for each school.

Input for ICIS:

Complying Action: Planning
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.10 Notification

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Notification." No amounts or units are associated with this work complying action.

Example 1. SDWA

Under SDWA, a municipality was required to notify its customers of its failure to monitor for total coliform bacteria during a given period, but failed to do so. As issued, the Order required the system to notify the public of its violation of total coliform monitoring requirements, per the regulations.

Input for ICIS:

Complying Action: Notification
Pollutant: NA
Amount/Unit: NA
Media: NA

5.2.11 Information Letter Response

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Information Letter Response". No pollutants, amounts or units are associated with this work practice complying action.

Example 1. Clean Air Act

CAA example (could also apply to any other statute with information gathering authority): A company refuses to respond to a Section 114 information request letter. As a result, EPA issues an enforcement action citing the company for failing to comply with the 114 request. To comply, the company files its response to the 114 information request.

Input for ICIS:

Complying Action: Information Letter Response
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3 Program-Specific Complying Actions and Examples

5.3.1 Hazardous Waste Identification

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Hazardous Waste Identification". No amounts or units are associated with this work practice complying action.

Example 1. RCRA

An inspection of a phosphoric acid plant has identified waste materials that may be hazardous due to noncompliance with a TCLP test. Under an enforcement action, the facility is required to test the waste material to determine whether it is a hazardous waste and if so will need to address proper handling, storage, and disposal of the material.

Input for ICIS:

Complying Action: Hazardous Waste Identification
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.2 Financial Responsibility Requirements

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Financial Responsibility Requirements.". No amounts or units are associated with this work practice complying action.

Example 1. RCRA Financial Responsibility

RCRA TSD facility is required to have an adequate financial assurance mechanism in place to ensure the financial capacity to perform future clean-ups in the case of a future release or contamination. The company either has no financial assurance mechanism in place or is using an inadequate mechanism. EPA issues enforcement action citing the failure to have the required financial assurance. To comply, the company obtains proper financial assurance.

Input for ICIS:

Complying Action: Financial Responsibility Requirements
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.3 Develop CMOM Program

Below is an example of an enforcement action that would be entered into ICIS with the complying action "Develop CMOM Program". No amounts or units are associated with this work practice complying action.

Example 1. CWA – Sanitary Sewer Overflow (SSO)

Under a judicial consent decree, a large municipality is required to develop a Capacity, Management, Operation and Maintenance (CMOM) Program. The municipality is required to submit to EPA a self-assessment of its collection system maintenance program to ensure that it

Input for ICIS:

Complying Action: Develop CMOM Program
Pollutant: NA

is effectively eliminating SSOs from its collection system. The self-assessment must include a corrective action plan to address any differences noted during the self-assessment and a schedule for its implementation.

Amount/Unit: NA
Media: NA

5.3.4 FIFRA Establishment Registration Obtained

Below is an example of an enforcement action that would be entered into ICIS with the complying action “FIFRA Establishment Registration Obtained”. No amounts or units are associated with this work practice complying action.

Example 1. FIFRA Establishment Registration Obtained

A company producing a registered pesticide is manufacturing the product at a facility not currently registered with EPA as a Pesticide Producing Establishment. EPA takes enforcement action. To comply, the company obtains an Establishment Registration Number for its pesticide manufacturing facility.

Input for ICIS:

Complying Action: FIFRA Establishment Registration Obtained
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.5 FIFRA Establishment Terminated

Below is an example of an enforcement action that would be entered into ICIS with the complying action “FIFRA Establishment Registration Obtained”. No amounts or units are associated with this work practice complying action.

Example 1. FIFRA Establishment Terminated

A company is currently registered as a pesticide producing establishment but no longer does pesticide production and fails to comply with other Section 7 requirements. EPA takes enforcement action. As part of the effort to return to compliance, the company requests that its Establishment Registration be permanently terminated or temporarily inactivated.

Input for ICIS:

Complying Action: FIFRA Establishment Terminated
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.6 Underground Storage Tank Release Detection

Below is an example of an enforcement action that would be entered into ICIS with the complying action “Underground Storage Tank Release Detection”. No amounts or units are associated with this work practice complying action.

Example 1. UST Release Detection

A gas station has no operational release detection mechanism on its UST system. EPA takes enforcement action citing failure to have an installed and/or operational release detection mechanism. To comply, the gas station installs an acceptable release detection mechanism on its underground storage tanks and ensures it is operational.

Input for ICIS:

Complying Action: UST Release Detection
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.7 FIFRA Product Registration Requirements

Below is an example of an enforcement action that would be entered into ICIS with the complying action “Product Registration ”. No amounts or units are associated with this work practice complying action.

Example 1. FIFRA Product Registration

A company sells an unregistered pesticide product. EPA determines that the product should be registered under FIFRA and initiates an enforcement action citing the company's sale/distribution of an unregistered pesticide. To comply, the company obtains registration for the product.

Input for ICIS:

Complying Action: Product Registration
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.8 UIC Demonstrate Mechanical Integrity

Below is an example of an enforcement action that would be entered into ICIS with the complying action “UIC Demonstrate Mechanical Integrity”. No amounts or units are associated with this work practice complying action.

Example 1. SDWA UIC

During a UIC inspection, ABC Company has failed to demonstrate and document the mechanical integrity of their underground injection wells used for the disposal of contaminated wastewater.

Input for ICIS:

Complying Action: UIC Demonstrate Mechanical Integrity
Pollutant: NA
Amount/Unit: NA
Media: NA

5.3.9 FIFRA Pesticide Claim Removed

Below is an example of an enforcement action that would be entered into ICIS with the complying action “Pesticide Claim Removed”. No amounts or units are associated with this work practice complying action.

Example 1. Pesticide Claim Removed

A registrant manufactures a pesticide that has been registered for treating nematodes and claims on the label that the product is also effective against army caterpillars. The claim on the label that the pesticide is effective against army caterpillars is beyond what the pesticide is registered for. EPA inspects the facility producing the nematicide and discovers the non-compliant claim on the label. The Agency orders the registrant to remove the claim on the product label.

Input for ICIS:

Complying Action: Pesticide Claim Removed
Pollutant: NA
Amount/Unit: NA
Media: NA

APPENDIX A

CCDS Form

OECA Enforcement Case Conclusion Data Sheet — ***FY2014***

A. Case and Facility Background

1. (a) Enforcement Action ID _ _ - _ _ _ _ - _ _ _ _
   (b) Enforcement Action Name _________________

   Judicial District: _____________________
   Court Docket Number: _____________________
   Court Case Name: _____________________
   DOJ Number: _____________________
   DOJ Case Name: _____________________

2. (a) CERCLIS Site ID _ _ - _ _ _ _ - _ _ _ _
   (b) CERCLIS Site Name _____________________

3. Final Order Type

   Judicial
   ____(a) Consent Decree or Court Order Resolving a Civil Judicial Action
   ____(b) Judicial Order Amending or Enforcing Consent Decree
   ____(c) Proposed Judicial Settlement
   ____(d) Enforceable Final Order Activity Producing Results
   ____(e) Non-Lead Participant in Multi-Regional Case
   ____(f) Post-Final Order Record of Decision (ROD)

   Administrative
   ____(a) Administrative Compliance Order
   ____(b) Amendment to Administrative Order or Consent Agreement
   ____(c) Administrative Penalty Order Order (with or without injunctive relief)
   ____(d) Proposed Administrative Settlement
   ____(e) Enforceable Final Order Activity Producing Results
   ____(f) EPA/Customs Import Enforcement Action
   ____(g) Federal Facility Agreement (FFA)
   ____(h) Federal Facility Compliance Agreement
   ____(i) Federal Facility Record of Decision (ROD)
   ____(j) Post-Final Order Record of Decision (ROD) (not Federal Facility)
   ____(k) Final Order Revoking or Suspending a Permit
   ____(l) Notice of Determination
   ____(m) Non-Lead Participation in Multi-Regional Case
   ____(n) Superfund Administrative Order for Cost Recovery
   ____(o) Stipulated Penalty Assessed Against Previous Action

4. Was Alternative Dispute Resolution used in this action? (Y/N) _____

5. Was an Environmental Management System requested? (Y/N) _____

6. (a) Administrative Conclusion Dates: ____________Final Order Issued: ____________ Estimated Termination Date: _____________

   Actual Termination Date: _______________ Most Recent Amendment Date: _______________

   Agreement in Principle Date: _______________

   (b) Civil Judicial Conclusion Dates: CD Lodged____________ CD Entered: ___________ Estimated Termination Date: ____________

7. Defendant(s)/Respondent(s) ____

8. Enforcement Case Summary for Public Distribution: ____

____

____

____

____

____

(Sensitive comments) ____

____

____

____

9. Federal Statute(s) violated (e.g., CAA, EPCRA, etc.) (Not U.S.C. or CFR) ___________, ___________, ___________

___________, ___________, ___________, ___________, ___________, ___________ ___________

10. National Enforcement Initiative (Y/N) ______ If Yes, √ option(s) below:

( ) Air Toxics ( ) Combined Animal Feeding Operations: ____ CAFO ____ CAFO Regional Initiative Areas

( ) Energy Extraction ( ) Mining/Mineral Processing: ____Mining ____Mineral Processing

( ) Municipal Infrastructure: __CSO $\geq$ 50K __SSO > 50K __ MS4 population > 10,000

( ) NSR/PSD: __Coal Fired Power Plants __Cement __Glass __Acid

11. Is this a Multi-Regional case: (Y/N) _____

12. Facility Information

(a) Facility Name(s): ____

(b) Facility Address(s) Street: _________________City:____________________County: _____________ St: ____ Zip: ______

B. Penalty (if there is no penalty or cost recovery, enter 0 and proceed to #17; if there is Cost Recovery, proceed to #16)

13 (a) Notice Pleading? (Y/N) _____
(b) For multimedia actions, Cash Civil Penalty Amount Required by statute:

Statute	Amount
_____________	$______________
_____________	$______________

14. Penalty Assessed to be Paid to:

a. EPA $______________

b. Federal Agency/Dept. Other than EPA: $_______________
c. State/Local Agency: $_______________

15. Total Penalty Collected (if known): $_______________

C. Cost Recovery

16. Amount of cost recovery required: $___________ EPA $___________ State and/or Local Government $___________ Other

D. Supplemental Environmental Project (SEP) Information (Y/N) If Yes, for each SEP provide the following:

17. Is Environmental Justice addressed by impact of SEP? (Y/N) _____

18. SEP description: ____

____

19. Category of SEP(s)

- __ (a) Public Health
- __ (b) Pollution Prevention (Complete Q. 21)
  - __ (1) Equipment/technology modifications
  - __ (2) Process/procedure modification
  - __ (3) Product reformulation/redesign
  - __ (4) Raw materials substitution
  - __ (5) Improved housekeeping/O&M/training/inventory-control
  - __ (6) In-process recycling
  - __ (7) Energy efficiency/conservation
- __ (c) Pollution Reduction (Complete Q. 21)
- __ (d) Environmental Restoration and Protection
- __ (e) Assessments and Audits
- __ (f) Environmental Compliance Promotion
- __ (g) Emergency Planning and Preparedness
- __ (h) Other Program Specific SEP

20. Cost of SEP. Cost calculated by the Project Model is required. $_________________________

21. Quantitative environmental pollutants and/or chemicals and/or waste-streams, amount of reductions/eliminations (e.g., emissions/discharges) SEP (cont'd)

Pollutant/Chemical/Waste Stream	**Amount**	Unit	Impacted Media
_________________________	___________	_________	______________
_________________________	___________	_________	______________
_________________________	___________	_________	______________
_________________________	___________	_________	______________

Units	**Impacted Media (applicable to Removal and Restoration)**
Pounds	Land, Soil
Cubic Yards	Land, Soil, Water (navigable/surface), Water (ground)
Acres	Water (wetlands)
Linear Feet ss	Water (wetlands)
Linear Feet ms	Water (wetlands)
Linear Feet ls	Water (wetlands)

Units	**Impacted Media (applicable to Reduction on Ongoing Release)**
BTUs	Air

Gallons	Land, Soil
Pounds	Air, Land, Soil, Water (navigable/surface), Water (wastewater to POTW)
Pounds/yr	Air, Land, Soil, Water (navigable/surface), Water (wastewater to POTW)
Cubic Yards	Air, Land, Soil, Water (ground), Water (navigable/surface), Water (wastewater to POTW)
People	Water (drinking)
Buildings	Buildings/Housing/Schools
Schools	Buildings/Housing/Schools
Single Family Housing (SF Housing)	Buildings/Housing/Schools
Multi-Family Housing (MF Housing)	Buildings/Housing/Schools
Wells	Water (underground source)

Units	**Impacted Media (applicable to Prevention of Future Release)**
Acres	Water (wetlands)
Cubic Yards	Land, Soil
Pounds	Air, Land, Water (navigable/surface)
Pounds/yr	Air, Land, Water (navigable/surface)
Gallons	Land, Soil, Water (navigable/surface)
Gallons/yr	Land, Soil, Water (navigable surface)
Buildings	Buildings/Housing/Schools
Schools	Buildings/Housing/Schools
Single Family Housing (SF Housing)	Buildings/Housing/Schools
Multi-Family Housing (MF Housing)	Buildings/Housing/Schools
Wells	Water (underground source)

E. Cost of Complying Action(s)/Injunctive Relief (Non-SEP) (APO's w/o inj. relief [3(c) above], Superfund Admin. Cost Recovery Agreements [3(n) above] SKIP THIS SECTION)

22. Cost of actions. (Actual cost data supplied by violator is preferred figure.): $ ______________________ (core program)

Indicate OECA National Enforcement Initiative(s) amounts below (if applicable):

NEI: ________________________; $ ________________

NEI: ________________________; $ ________________

NEI: ________________________; $ ________________

F. Quantitative Environmental Impacts

23. What action did the violator accomplish prior to receipt of settlement/order or will take to return to compliance or meet additional requirements (other than what has already been reported on the Inspection Conclusion Data Sheet (ICDS)). This may be due to settlement/order requirements or otherwise required by statute or regulation (e.g. actions related to an APO which did not specify compliance requirements). Select the appropriate outcome category and action from the list below.

Outcome Category	Complying Action
Removal and Restoration	Ex-Situ Treatment In-Situ Treatment Removal of Carcass Debris Removal of Contaminated Media Removal of Released Pollutants (includes oil spills) Wetlands Creation Wetlands Restoration

Outcome Category	Complying Action
Reduction of Ongoing Releases	Implement BMP: Surface Water Runoff Implement BMP: Lagoon/Storage Pond Leaks or Spills Implement BMP: Manure Over Application

	Implement BMP: Animal Bedding Leachate Implement BMP: Silage Leachate Implement BMP: Proper Carcass Disposal HW Use Reduction HW Treatment HW Disposal Change HW Storage Change HW Waste Containment Use Reduction Treatment Disposal Change Storage Change Waste Containment Heat Reduction NPDES Discharge Change NPDES Process Change Implement BMP: Stormwater from Existing Construction Activities Implement BMP: Industrial Stormwater Implement BMP: Separate Municipal Stormwater Systems (MS4s) Implement BMP: Other CSO Flow Reduction CSO Primary or Secondary Treatment SSO CMOM SDWA Process Change Biosolids Process Change Pesticide Destroyed (In Commerce) Import Pesticide Returned to Foreign Origin Pesticide Returned to Compliance by Manufacturer/Producer (Domestic) Proper Pesticide Use Cease Pesticide Sale, Distribution Pesticide Advertising Claim Removed Secondary Containment Change (on-going) Pesticide Container Change (on-going) Offset Project (mobile sources) Retire Pollution Credits (mobile sources) Retire Pollution Credits (stationary sources) Replace or Remediate Engines/Vehicles (In Commerce) Source Reduction Emissions Change Leak Repair (LDAR) Abatement (non-removal remediation) Implement Asbestos Management Plan Handling PCBs (disposal change) UIC Plug and Abandon (w/ leaks) Tank Repair Tank Removal Tank Storage Change

Prevention of Future Releases	Proper Waste Transport Proper Waste Storage Proper Waste Containment Proper Waste Disposal Proper Waste Export Cathodic Protection System Maintenance/Repair Oil Storage Change Compliance/Warranty Schedule Change Replace or Remediate Engines/Vehicles (Future Production) Plan Implementation Pesticide Production Ceased Pesticide Label Revised (Future Production)

	Pesticide Advertising Claim Removed (Future Production) Pesticide Manufacturing Change Pesticide Container Change Pesticide Secondary Containment Change Leak Detection (LDAR) Risk Management Plan Implemented Industry Standards Adopted Toxic Material Abatement (w/o existing release) Preventative Management Plan Implemented Plug and Abandon (w/o leaks) Secondary Containment (UST) Implement Corrosion Protection System Implement Tank Overfill/Spill Protection Implement Release Detection System (UST) Tank Closure Wetlands Preservation

24. Quantitative environmental impact of actions described in item #23: (Add additional pollutants on blank sheet). For each action, provide the following:

Complying Action: ____

Pollutant/Chemical/Waste Stream	Amount	Unit	Impacted Media	NEI (please specify)
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________

Complying Action: ____

Pollutant/Chemical/Waste Stream	Amount	Unit	Impacted Media	NEI (please specify)
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________

Complying Action: ____

Pollutant/Chemical/Waste Stream	Amount	Unit	Impacted Media	NEI (please specify)
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________
______________	________	______	________	____________

Complying Action: ____

Pollutant/Chemical/Waste Stream	Amount	Unit	Impacted Media	NEI (please specify)
______________	________	______	________	____________

Units	Impacted Media (applicable to Removal and Restoration)
Pounds	Land, Soil
Cubic Yards	Land, Soil, Water (navigable/surface), Water (ground)
Acres	Water (wetlands)
Linear Feet ss	Water (wetlands)
Linear Feet ms	Water (wetlands)
Linear Feet ls	Water (wetlands)

Units	Impacted Media (applicable to Reduction on Ongoing Release)
BTUs	Air
Gallons	Land, Soil
Pounds	Air, Land, Soil, Water (navigable/surface), Water (wastewater to POTW)
Pounds/yr	Air, Land, Soil, Water (navigable/surface), Water (wastewater to POTW)
Cubic Yards	Air, Land, Soil, Water (ground), Water (navigable/surface), Water (wastewater to POTW)
People	Water (drinking)
Buildings	Buildings/Housing/Schools
Schools	Buildings/Housing/Schools
Single Family Housing (SF Housing)	Buildings/Housing/Schools
Multi-Family Housing (MF Housing)	Buildings/Housing/Schools
Wells	Water (underground source)

Units	Impacted Media (applicable to Prevention of Future Release)
Acres	Water (wetlands)
Cubic Yards	Land, Soil
Pounds	Air, Land, Water (navigable/surface)
Pounds/yr	Air, Land, Water (navigable/surface)
Gallons	Land, Soil, Water (navigable/surface)
Gallons/yr	Land, Soil, Water (navigable surface)
Buildings	Buildings/Housing/Schools
Schools	Buildings/Housing/Schools
Single Family Housing (SF Housing)	Buildings/Housing/Schools
Multi-Family Housing (MF Housing)	Buildings/Housing/Schools
Wells	Water (underground source)

(Note: When entering quantitative data into ICIS, the system will automatically filter the possible selection for complying action types, units, and potentially impacted media).

G. Non-Quantitative Activities/Impacts (Non-SEP) Choose all that apply:

Outcome Category	Complying Action
Work Practices	Training Certification and Accreditation Labeling - Identification Labeling – Material Management Auditing Cease Activity Record-keeping Testing/Sampling Reporting

	Environmental Management Review General Duty CAA 112(r)(1) Monitoring Planning Information Letter Response Notification Permitting Hazardous Waste Identification Manifesting UST Release Detection Financial Responsibility Requirements Institutional Controls RI/FS or RD (CERCLA) Site Assessment/ Characterization (CERCLA) Provide Site Access (CERCLA) Storm Water Site Inspections Asbestos Inspections Develop CMOM Program (CWA) FIFRA Establishment Registration Obtained FIFRA Establishment Terminated Product Registration UIC Demonstrate Mechanical Integrity Work Practices

APPENDIX B

Reporting Policy – Guidelines

Interim Guidance on Reporting Volume of Contaminated Media Addressed and Injunctive Relief Value for Certain Types of CERCLA 107 and/or 122 Cash-Out Settlements

Reporting FIFRA/TSCA CBI Outcome Data

Interim Guidance on Reporting Volume of Contaminated Media Addressed and Injunctive Relief Value for Certain Types of CERCLA107 and/or 122 Cash-Out Settlements

This guidance revises and supersedes the November 2003 Case Conclusion Data Sheet Guidance on reporting Volume of Contaminated Media Addressed (VCMA) for certain CERCLA cash-out settlements in ICIS. The previous guidance precluded the reporting of VCMA for all CERCLA cash-out settlements. This interim guidance provides for limited exceptions for which VCMA should be reported for cash-out settlements pursuant to sections 107 and/or 122 of CERCLA

Scope

For purposes of this guidance, the term "cash-out settlement" means a judicial or administrative settlement under CERCLA §107 or 122 in which a potentially responsible party (PRP) commits to pay funds to EPA in settlement of the PRP's liability for some or all of EPA's future costs at a site. VCMA should **only** be reported in ICIS for those cash-out settlements where monies are placed into a CERCLA site-specific special account for the purposes of providing funding to EPA to perform a CERCLA removal or remedial response action. However, VCMA should not be reported in ICIS with respect to any portion of the cash-out settlement proceeds that is designated for site study, remedy design or institutional controls or to pay for oversight of a PRP-conducted removal or remedial action. **In addition, Regions should only report VCMA when there has been an estimate of future response costs exists based on the Record of Decision or Action Memorandum or where other available data from which a reasonable estimate of the volume of contaminated media can be calculated. Where the cash settlement covers only a portion of the future response and a pro-rated portion of the VCMA is to be reported and no ROD cost estimate exists, Regions should base that calculation on the total estimated response costs used in filing the Bankruptcy Proof of Claim or other response cost estimate used as the basis for the settlement. All such calculations should be clearly documented to the site file including any and all references to supporting documents used to develop the calculations.**

Reporting Requirements for VCMA and Value of Complying Actions in ICIS

When reporting the VCMA in ICIS, Regions should only report the portion of the VCMA directly attributable to the dollar amount designated for future response actions. Even if 100% of the settlement proceeds are placed into a special account, if the settlement or the 10- point settlement analysis designates a specific portion of the settlement proceeds as being associated with past response costs and another for future response costs, the Region should only calculate the VCMA for the monies designated to pay for future response costs.

Example

> On March 11, 2008, EPA entered into a bankruptcy settlement with W.R. Grace which resolves the 2003 judgment (in 2003, the federal district court in Montana awarded EPA over $54 million for cleanup costs incurred by EPA through Dec. 31, 2001) as well as continuing cleanup costs EPA has incurred since Dec. 31, 2001 and will incur in

> the future. EPA will place the settlement proceeds into a special account within the Superfund that will be used to finance future cleanup work at the site.
>
> Of the $250 million in settlement proceeds, $59 million is to cover past response costs already incurred by EPA (i.e., cost recovery). This amount should be recorded in ICIS as Cost Recovery. The remaining $191 million which will be placed into a site-specific special account for future response work at the Libby Montana Superfund Site should be reported as PRP-funded Response Actions Injunctive Relief (aka Value of Complying Action) in ICIS on an interim basis in FY08.

In this case the Region would only report the VCMA associated with the $191 Million designated for future work.

In addition, if the amount placed into a special account is not expected to cover the cost of the entire future response action, the Region should only report the amount of VCMA in ICIS that is estimated to be associated with the cash-out proceeds. For example, if the cash-out proceeds represent only 90% of the projected cost of the remedy selected in the Record of Decision (ROD), the Region should only report 90% of the total VCMA associated with the ROD remedy in ICIS.

Another example may be where the Fund has completed a portion of the removal or remedial action and EPA enters into a settlement from which the proceeds will pay for a portion of the response action. For example, if EPA has completed 60% of a $10 million remedial action and receives $5 million in a settlement to settle past costs and complete the remainder of the response action, Regions should report 40% of the total VCMA associated with the response action, $4 million in Injunctive Relief/Value of Complying Actions, and the remaining $1 million as cost recovery.

Finally, in no case should the Injunctive Relief/Value of Complying Action ever exceed the total estimated future response costs based documentation in the Record of Decision or Action Memorandum.

Reporting FIFRA/TSCA CBI Outcome Data

There are CBI concerns related to publically reporting environmental benefit data associated with FIFRA enforcement actions. OECA has a performance measure looking at environmental benefit outcomes from our enforcement actions and the FIFRA program may be missing out on reporting these outcomes and in turn the program may appear as a weak performer.

A solution to the problem was discussed with members of OGC, HQ, and Region program offices so that we have consistent and accurate tracking of FIFRA enforcement action outcomes in our data systems and publically releasable information on the Agency's Enforcement and Compliance History On-line (ECHO) website. Regions can enter all of the traditional data into ICIS for an enforcement action and on the complying action/injunctive relief screen they can do the following:
enter a 0 for the amount;
Pounds for the unit and;
enter Pesticides as the pollutant name.

The detailed information must be maintained by the Region and the Region will have the option of reporting to HQ an aggregate number of pounds of pesticide at mid-year and end-of-year manually with the certification workbook.

<u>Responsibilities of ICIS Data Entry Points of Contact Regarding Potential FIFRA/TSCA CBI Data</u>

If any of the CCDS information you obtain contains estimated environmental benefits you should check with the case contact and make sure the estimate does not contain any FIFRA production information. If the answer is NO, then you're ok and can enter all the info in ICIS. If the answer is Yes, your follow up question to them is: "Did you inform the registrant that this information will be part of a public record and is the registrant ok with this?" The registrant will either say Yes it is ok or No do not disclosure the information.

If the respondent provides this information knowing that EPA plans to make this figure public, then there is no CBI concern. However, if EPA did not indicate what use would be made of the figure, then the company might still consider the information confidential. Therefore, please confirm the circumstances under which the respondent provided the figure to EPA. The actual CBI information should be handled according to CBI rules.

In order to report aggregate quantities of pesticide outcomes and avoid any potential disclosure of FIFRA CBI information, aggregate quantities should only be reported if there are at least three (3) cases for which CBI-protected data is being reported in the aggregation. If two or fewer cases exist, the data should not be reported. Since these quantities will be reported separately in outcome reporting categories, the three (3) case threshold should be applied to each outcome reporting category.

This solution will allow Regions to track these FIFRA *cases* consistently. It will allow Regions to receive "credit" for achieving an environmental benefit outcome from these cases without releasing the CBI information, and it will allow the complete and accurate entry and accounting of these actions in the enforcement database of record.

APPENDIX C

Data Quality Checkpoints

Overall Environmental Benefit checkpoints

Following are items which should be carefully reviewed when reporting CCDS environmental benefits data, and may be used for peer review of the benefit calculations:

- Case will result in quantifiable pollutant reduction/elimination or proper management to reduce likelihood of future release.
- Case benefits are clearly indicated as the result of either core program activities or an OECA National Priority area.
- Federal law/section(s) violated match the Direct and/or Preventative complying action type(s) selected.
- All applicable complying actions are selected
- Pollutant reductions are calculated using documented case specific loading, emission or concentration data to the extent the information are available. Otherwise, use sector and/or parameter default values provided in the CCDS guidance.
- A documented step-by-step calculation is provided for cases where HQ requests information to conduct a QA review. When identifying the methodology used, be sure to include the following information:
  - ✓ Out-of-compliance pollutant concentration level(s)
  - ✓ Out-of-compliance timeframe
  - ✓ Pollutant loading, emissions or exceedance levels
  - ✓ Process capacity and flow rate (where applicable)
  - ✓ Permit discharge level (where applicable)
  - ✓ Area of contamination addressed (where applicable)
  - ✓ Pollutant density and unit conversion factors (where applicable)
  - ✓ Post enforcement complying action pollution reduction, elimination, or prevention amounts
  - ✓ Copy of completed excel calculator tool sheet for: CAFO, CSO, SSO, Industrial Construction & Industrial Non-construction cases.
  - ✓ Contact name & number of person completing the calculation.
- If errors are found in calculations, the calculations should be revised using approved CCDS guidance.
- Both hard and electronic copies of environmental benefit calculations used to estimate all environmental benefit amounts over 5 million, regardless of unit should be maintained. The hard copies should be kept with the case file. The electronic copies should be provided to headquarters.

APPENDIX D

CAFO Methodology Look-up Tables

Table D-1. Typical Pollutant Concentrations (lb/d/1000# of animal) in As Excreted Manure for Beef and Dairy Cattle

Pollutant	Lactating Dairy Cow	Dry Cow	Heifer	Beef Cow
Manure	80.00	82.00	85.00	63.00
TS	10.00	9.50	9.14	7.30
COD	8.90	8.50	8.30	6.00
BOD_5	1.60	1.20	1.30	1.20
N	0.45	0.35	0.31	0.33
P	0.07	0.05	0.04	0.12
K	0.26	0.23	0.24	0.26

Source: USDA=s Agricultural Waste Management Field Handbook, Chapter 4.

Table D-2. Typical Pollutant Concentrations (lb/d/1000# of animal) in As Excreted Manure for Swine

Pollutant	Grower Pig (40-220 lb)	Replacement Gilt	Sow Gestation	Sow Lactation	Boar	Nursery Pig (0-40 lb)
Manure	63.4	32.8	27.2	60.0	20.5	106.0
TS	6.34	3.28	2.50	6.00	1.90	10.60
COD	6.06	3.12	2.37	5.73	1.37	9.80
BOD_5	2.08	1.08	0.83	2.00	0.65	3.40
N	0.42	0.24	0.19	0.47	0.15	0.60
P	0.16	0.08	0.06	0.15	0.05	0.25
K	0.22	0.13	0.12	0.30	0.10	0.35

Source: USDA’s Agricultural Waste Management Field Handbook, Chapter 4.

Table D-3. Typical Supernate Pollutant Concentrations (lbs/1000 gal) in Lagoons and Runoff Ponds[a]

Pollutant	Dairy Anaerobic Lagoon	Dairy Aerobic Lagoon	Beef Feedlot Runoff Pond	Swine Anaerobic Lagoon
TS*	20.82	4.17	25.00	20.83
COD	12.50	1.25	11.67	10.00
BOD_5	2.92	0.29	-	3.33
N	1.67	0.17	1.67	2.91
P	0.48	0.08	-	0.63
K	4.17	-	7.50	3.16

a - Source: USDA=s Agricultural Waste Management Field Book, Chapter 4;
the TS value is calculated as the sum of the volatile solids + fixed solids concentrations.

Table D-4. Typical Manure Recoverability Factors and Nitrogen/Phosphorus Losses by Animal Type

Animal Type	Recoverability Factor	Nitrogen Losses (percent loss)	Phosphorus Losses (percent loss)
Beef Cows	0.98	60.0	15.1
Milk Cows	0.98	59.8	14.1
Heifers	0.98	70.0	15.4
Breeding Hogs	0.95	75.0	15.4
Hogs for Slaughter	0.95	75.0	14.9

Source: USDA=s Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients: Spatial and Temporal Trends for the United States, December 2000.

Table D-5. Typical Animal Weight and Manure Density for Beef and Dairy Cattle

Animal Type	Animal Weight (lbs)	Manure Density (lb/cu. ft.)
Beef Cattle	877	62
Mature Dairy Cattle	1,350	62
Heifers	550	62

Source: Cost Methodology Report for Beef and Dairy Animal Feeding Operations, EPA-821-R-01-019, January 2001.

Table D-6. Typical Crop Uptake Values

Crop Type	Nitrogen (lbs N/yield unit)	Phosphorus (lbs P/yield unit)
Corn for grain	0.80 lbs/bushel	0.15 lbs/bushel
Corn for silage	7.09 lbs/ton	1.05 lbs/ton
Soybeans	3.55 lbs/bushel	0.36 lbs/bushel
Sorghum for grain	0.98 lbs/bushel	0.18 lbs/bushel
Sorghum for silage	14.76 lbs/ton	2.44 lbs/ton
Cotton (lint and seed)	15.19 lbs/bale	1.89 lbs/bale
Barley	0.90 lbs/bushel	0.18 lbs/bushel
Winter wheat	1.02 lbs/bushel	0.20 lbs/bushel
Durum wheat	1.29 lbs/bushel	0.22 lbs/bushel
Other spring wheat	1.39 lbs/bushel	0.23 lbs/bushel
Oats	0.59 lbs/bushel	0.11 lbs/bushel
Rye for grain	1.07 lbs/bushel	0.18 lbs/bushel
Rice	1.25 lbs/bag	0.29 lbs/bag
Peanuts for nuts (w/pods)	0.04 lbs/lb	0.003 lbs/lb
Sugar beets for sugar	4.76 lbs/ton	0.94 lbs/ton
Tobacco (IN, MO, OH, and WV)	0.0298 lbs/lb	0.0024 lbs/lb
Tobacco (KY)	0.0299 lbs/lb	0.0024 lbs/lb
Tobacco (NC)	0.0329 lbs/lb	0.0020 lbs/lb
Tobacco (TN)	0.0302 lbs/lb	0.0023 lbs/lb
Tobacco (VA)	0.0322 lbs/lb	0.0021 lbs/lb
Tobacco (all other states)	0.0330 lbs/lb	0.0020 lbs/lb
Potatoes	0.36 lbs/bag	0.06 lbs/bag
Sweet Potatoes	0.13 lbs/bushel	0.02 lbs/bushel
Alfalfa hay	50.40 lbs/ton	4.72 lbs/ton
Small grain hay	25.60 lbs/ton	4.48 lbs/ton
Other tame hay/Wild hay	19.80 lbs/ton	15.30 lbs/ton
Grass silage	13.60 lbs/ton	1.60 lbs/ton
Sorghum hay	2.39 lbs/ton	1.01 lbs/ton

Source: USDA=s Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients: Spatial and Temporal Trends for the United States, December 2000.

Table D-7. Animal Bedding Leachate Characteristics

	BOD (mg/L)	Solids (%)	Nitrogen (lb/ton)	Phosphorus (lb/ton)	Potassium (lb/ton)
Average Bedding Concentrations	20,000[a]	15[a]	21.3[b]	23.2[b]	24.8[b]
Typical losses for uncovered storage piles[c]			35%	20%	20%

[a] BOD and solids information is for typical dairy manure characteristics from "Baseflow Silgae Leachate Control" [3]. Since animal bedding contains manure, it is assumed that the bedding leachate characteristics will be similar to manure.
[b]Nitrogen, phosphorus, and potassium concentrations in bedding are the average bedding concentrations presented in Table 8-4 of the CAFOs TDD [4].
[c]Nitrogen, Phosphorus, and potassium losses are calculated from Table 11-9 in the feedlot industry sector profile presenting the percent of nutrients retained for unroofed bedding and manure storage piles [2].

Table D-8. Unit Weights of Typical Bedding Materials

Material	Loose (lb/ft^3)	Chopped (lb/ft^3)
Legume hay	4.25	6.5
Nonlegume hay	4	6
Straw	2.5	7
Wood shavings	9	
Sawdust	12	
Soil	75	
Sand	105	
Ground limestone	95	
Other (Default)	4.9	

Source:Agricultural Waste Characteristics, Table 4-3 [1].
[a]The default unit weight is the average of the unit weights for hay, straw, and wood shavings, which are the most common bedding materials.

References

(1) *Agricultural Waste Characteristics.* Agricultural Waste Management Field Handbook. Chapter 4. USDA SCS. Clyde Barth, Timothy Powers; James Rickman.

(2) Feedlot Industry Sector Profile. Revised Draft Report. USEPA. December 30,1998

(3) *Base Flow Silage Leachate Control.* USDA NRCS. Paper No. 94-25 60. Peter E. Wright, and Peter L. Vanderstappen. December 1994.

(4) *Development Document for the Final Revision to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations.* USEPA. EPA-821-R-03-001. December 2002.

Table D-9. Silage Leachate Generation Rates

Moisture Content (%)	Leachate Generation Rate by Source (gal/ton)						Average Leachate Generation Rate (gal/ton)
	[2]	[6]*	[7]	[8]	[11]*		
>85	75	76.3		75			75
85	50		79	50	50	62	60
80	30	16.5		30	20	30	25
75	5			5	5	5	5
70	2.5	7.5		2.5	2.5	2.5	3

*** Note: values approximated from graph.**

Table D-10. Storage Capacities for Tower Silos

Silo Dimensions		Crop		
Diameter (ft)	Settled Depth (ft)	Corn* (tons)	Alfalfa* (tons)	Other** (tons)
12	30	74	83	79
12	40	102	116	109
12	50	132	150	141
14	40	143	163	153
14	50	185	212	199
14	55	206	237	222
16	50	246	287	267
16	60	303	355	329
16	65	330	389	360
18	50	317	373	345
18	60	388	463	426
18	70	461	554	508
20	60	486	586	536
20	70	576	703	640
20	80	668	821	745
24	60	712	876	794
24	70	844	1,052	948
24	80	977	1,230	1,104
24	90	1,110	1,409	1,260
30	80	1,628	1,994	1,811
30	90	1,877	2,287	2,082
30	100	2,127	2,581	2,354

Source: *How to Handle Seepage from Farm Silos.* Ministry of Agriculture, Food & Rural Affairs. Ontario, Canada. November 2004. [6]
*Assumes a moisture content of 70 percent and silage density of 45 lb/ft^3.
**Capacities for other crops is the calculated average of the capacities for corn and alfalfa.

Table D-11. Storage Capacities for Horizontal Silos

Height (ft)	Width (ft)	Silo Capacity (tons)* Silo Length (ft)																				
		100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
8	20	360	396	432	468	504	540	576	612	648	684	720	756	792	828	864	900	936	972	1,008	1,044	1,080
8	24	432	475	518	562	605	648	691	734	778	821	864	907	950	994	1,037	1,080	1,123	1,166	1,210	1,253	1,296
8	30	540	594	648	702	756	810	864	918	972	1,026	1,080	1,134	1,188	1,242	1,296	1,350	1,404	1,458	1,512	1,566	1,620
8	40	720	792	864	936	1,008	1,080	1,152	1,224	1,296	1,368	1,440	1,512	1,584	1,656	1,728	1,800	1,872	1,944	2,016	2,088	2,160
8	50	900	990	1,080	1,170	1,260	1,350	1,440	1,530	1,620	1,710	1,800	1,890	1,980	2,070	2,160	2,250	2,340	2,430	2,520	2,610	2,700
8	60	1,080	1,188	1,296	1,404	1,512	1,620	1,728	1,836	1,944	2,052	2,160	2,268	2,376	2,484	2,592	2,700	2,808	2,916	3,024	3,132	3,240
10	20	450	495	540	585	630	675	720	765	810	855	900	945	990	1,035	1,080	1,125	1,170	1,215	1,260	1,305	1,350
10	24	540	594	648	702	756	810	864	918	972	1,026	1,080	1,134	1,188	1,242	1,296	1,350	1,404	1,458	1,512	1,566	1,620
10	30	675	743	810	878	945	1,013	1,080	1,148	1,215	1,283	1,350	1,418	1,485	1,553	1,620	1,688	1,755	1,823	1,890	1,958	2,025
10	40	900	990	1,080	1,170	1,260	1,350	1,440	1,530	1,620	1,710	1,800	1,890	1,980	2,070	2,160	2,250	2,340	2,430	2,520	2,610	2,700
10	50	1,125	1,238	1,350	1,463	1,575	1,688	1,800	1,913	2,025	2,138	2,250	2,363	2,475	2,588	2,700	2,813	2,925	3,038	3,150	3,263	3,375
10	60	1,350	1,485	1,620	1,755	1,890	2,025	2,160	2,295	2,430	2,565	2,700	2,835	2,970	3,105	3,240	3,375	3,510	3,645	3,780	3,915	4,050
12	20	540	594	648	702	756	810	864	918	972	1,026	1,080	1,134	1,188	1,242	1,296	1,350	1,404	1,458	1,512	1,566	1,620
12	24	648	713	778	842	907	972	1,037	1,102	1,166	1,231	1,296	1,361	1,426	1,490	1,555	1,620	1,685	1,750	1,814	1,879	1,944
12	30	810	891	972	1,053	1,134	1,215	1,296	1,377	1,458	1,539	1,620	1,701	1,782	1,863	1,944	2,025	2,106	2,187	2,268	2,349	2,430
12	40	1,080	1,188	1,296	1,404	1,512	1,620	1,728	1,836	1,944	2,052	2,160	2,268	2,376	2,484	2,592	2,700	2,808	2,916	3,024	3,132	3,240
12	50	1,350	1,485	1,620	1,755	1,890	2,025	2,160	2,295	2,430	2,565	2,700	2,835	2,970	3,105	3,240	3,375	3,510	3,645	3,780	3,915	4,050
12	60	1,620	1,782	1,944	2,106	2,268	2,430	2,592	2,754	2,916	3,078	3,240	3,402	3,564	3,726	3,888	4,050	4,212	4,374	4,536	4,698	4,860
14	20	630	693	756	819	882	945	1,008	1,071	1,134	1,197	1,260	1,323	1,386	1,449	1,512	1,575	1,638	1,701	1,764	1,827	1,890
14	24	756	832	907	983	1,058	1,134	1,210	1,285	1,361	1,436	1,512	1,588	1,663	1,739	1,814	1,890	1,966	2,041	2,117	2,192	2,268
14	30	945	1,040	1,134	1,229	1,323	1,418	1,512	1,607	1,701	1,796	1,890	1,985	2,079	2,174	2,268	2,363	2,457	2,552	2,646	2,741	2,835
14	40	1,260	1,386	1,512	1,638	1,764	1,890	2,016	2,142	2,268	2,394	2,520	2,646	2,772	2,898	3,024	3,150	3,276	3,402	3,528	3,654	3,780
14	50	1,575	1,733	1,890	2,048	2,205	2,363	2,520	2,678	2,835	2,993	3,150	3,308	3,465	3,623	3,780	3,938	4,095	4,253	4,410	4,568	4,725
14	60	1,890	2,079	2,268	2,457	2,646	2,835	3,024	3,213	3,402	3,591	3,780	3,969	4,158	4,347	4,536	4,725	4,914	5,103	5,292	5,481	5,670
16	20	720	792	864	936	1,008	1,080	1,152	1,224	1,296	1,368	1,440	1,512	1,584	1,656	1,728	1,800	1,872	1,944	2,016	2,088	2,160
16	24	864	950	1,037	1,123	1,210	1,296	1,382	1,469	1,555	1,642	1,728	1,814	1,901	1,987	2,074	2,160	2,246	2,333	2,419	2,506	2,592
16	30	1,080	1,188	1,296	1,404	1,512	1,620	1,728	1,836	1,944	2,052	2,160	2,268	2,376	2,484	2,592	2,700	2,808	2,916	3,024	3,132	3,240
16	40	1,440	1,584	1,728	1,872	2,016	2,160	2,304	2,448	2,592	2,736	2,880	3,024	3,168	3,312	3,456	3,600	3,744	3,888	4,032	4,176	4,320
16	50	1,800	1,980	2,160	2,340	2,520	2,700	2,880	3,060	3,240	3,420	3,600	3,780	3,960	4,140	4,320	4,500	4,680	4,860	5,040	5,220	5,400
16	60	2,160	2,376	2,592	2,808	3,024	3,240	3,456	3,672	3,888	4,104	4,320	4,536	4,752	4,968	5,184	5,400	5,616	5,832	6,048	6,264	6,480
18	20	810	891	972	1,053	1,134	1,215	1,296	1,377	1,458	1,539	1,620	1,701	1,782	1,863	1,944	2,025	2,106	2,187	2,268	2,349	2,430
18	24	972	1,069	1,166	1,264	1,361	1,458	1,555	1,652	1,750	1,847	1,944	2,041	2,138	2,236	2,333	2,430	2,527	2,624	2,722	2,819	2,916

Table D-11. Storage Capacities for Horizontal Silos

Height (ft)	Width (ft)	Silo Capacity (tons)* Silo Length (ft)																				
		100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
18	30	1,215	1,337	1,458	1,580	1,701	1,823	1,944	2,066	2,187	2,309	2,430	2,552	2,673	2,795	2,916	3,038	3,159	3,281	3,402	3,524	3,645
18	40	1,620	1,782	1,944	2,106	2,268	2,430	2,592	2,754	2,916	3,078	3,240	3,402	3,564	3,726	3,888	4,050	4,212	4,374	4,536	4,698	4,860
18	50	2,025	2,228	2,430	2,633	2,835	3,038	3,240	3,443	3,645	3,848	4,050	4,253	4,455	4,658	4,860	5,063	5,265	5,468	5,670	5,873	6,075
18	60	2,430	2,673	2,916	3,159	3,402	3,645	3,888	4,131	4,374	4,617	4,860	5,103	5,346	5,589	5,832	6,075	6,318	6,561	6,804	7,047	7,290

Source: *How to Handle Seepage from Farm Silos.* Ministry of Agriculture, Food & Rural Affairs. Ontario, Canada. November 2004. [6]
*Assumes moisture content of 70 percent and silage density of 45 lb/ft^3.

Table D-12. Silage Leachate Characteristics

Parameter	Range Provided in Literature (mg/L)	Midpoint of Range (mg/L)
Total solids	5 percent*	5 percent*
BOD_5	12,000 – 90,000	50,000
Nitrogen	1,500 – 4,400	3,000
Phosphorus	300 - 600	450
Potassium	3,400 – 5,200	4,300

Source: Base flow of silage leachate control, Paper No. 94-25 60, American Society of Agricultural Engineers (ASAE)[2].
*Typical silage density is 45 lbs/ft^3 (1.6 lbs/L) [6].

APPENDIX E

Mobile Sources Look-up Table

Table E-1. Load Factors and Activity Rates by Engine/Equipment Category

Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)	Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)
2-Stroke Motorcycles: Off-Road	1.00	1600*	4-Stroke Motorcycles: Off-Road	1.00	1600
2-Stroke Snowmobiles	0.34	57	4-Stroke Snowmobiles	0.34	57
2-Stroke All Terrain Vehicles	1.00	1608*	4-Stroke All Terrain Vehicles	1.00	1608
2-Stroke Golf Carts	0.46	1080	4-Stroke Golf Carts	0.46	1080
2-Stroke Specialty Vehicle Carts	0.58	65	4-Stroke Specialty Vehicle Carts	0.58	65
2-Stroke Asphalt Pavers	0.66	392	4-Stroke Asphalt Pavers	0.66	392
2-Stroke Tampers/Rammers	0.55	160	4-Stroke Tampers/Rammers	0.55	160
2-Stroke Plate Compactors	0.55	166	4-Stroke Plate Compactors	0.55	166
2-Stroke Concrete Pavers	0.55	0	4-Stroke Concrete Pavers	0.55	0
2-Stroke Rollers	0.62	621	4-Stroke Rollers	0.62	621
2-Stroke Scrapers	0.70	540	4-Stroke Scrapers	0.70	540
2-Stroke Paving Equipment	0.59	175	4-Stroke Paving Equipment	0.59	175
2-Stroke Surfacing Equipment	0.49	488	4-Stroke Surfacing Equipment	0.49	488
2-Stroke Signal Boards	0.72	318	4-Stroke Signal Boards	0.72	318
2-Stroke Trenchers	0.66	402	4-Stroke Trenchers	0.66	402
2-Stroke Bore/Drill Rigs	0.79	107	4-Stroke Bore/Drill Rigs	0.79	107
2-Stroke Excavators	0.53	378	4-Stroke Excavators	0.53	378
2-Stroke Concrete/Industrial Saws	0.78	610	4-Stroke Concrete/Industrial Saws	0.78	610
2-Stroke Cement & Mortar Mixers	0.59	84	4-Stroke Cement & Mortar Mixers	0.59	84
2-Stroke Cranes	0.47	415	4-Stroke Cranes	0.47	415
2-Stroke Graders	0.64	504	4-Stroke Graders	0.64	504
2-Stroke Off-highway Trucks	0.80	450	4-Stroke Off-highway Trucks	0.80	450
2-Stroke Crushing/Proc. Equipment	0.85	241	4-Stroke Crushing/Proc. Equipment	0.85	241
2-Stroke Rough Terrain Forklifts	0.63	413	4-Stroke Rough Terrain Forklifts	0.63	413
2-Stroke Rubber Tire Loaders	0.71	512	4-Stroke Rubber Tire Loaders	0.71	512
2-Stroke Rubber Tire Dozers	0.75	900	4-Stroke Rubber Tire Dozers	0.75	900
2-Stroke Tractors/Loaders/Backhoes	0.48	870	4-Stroke Tractors/Loaders/Backhoes	0.48	870
2-Stroke Crawler Dozer	0.80	700	4-Stroke Crawler Tractors	0.80	700
2-Stroke Skid Steer Loaders	0.58	310	4-Stroke Skid Steer Loaders	0.58	310
2-Stroke Off-Highway Tractors	0.70	155	4-Stroke Off-Highway Tractors	0.70	155
2-Stroke Dumpers/Tenders	0.41	127	4-Stroke Dumpers/Tenders	0.41	127
2-Stroke Other Construction Equipment	0.48	371	4-Stroke Other Construction Equipment	0.48	371
2-Stroke Aerial Lifts	0.46	361	4-Stroke Aerial Lifts	0.46	361

Table E-1. Load Factors and Activity Rates by Engine/Equipment Category

Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)	Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)
2-Stroke Forklifts	0.30	1800	4-Stroke Forklifts	0.30	1800
2-Stroke Sweepers/Scrubbers	0.71	516	4-Stroke Sweepers/Scrubbers	0.71	516
2-Stroke Other General Industrial Equipment	0.54	713	4-Stroke Other General Industrial Equipment	0.54	713
2-Stroke Other Material Handling Equipment	0.53	386	4-Stroke Other Material Handling Equipment	0.53	386
2-Stroke Refrigeration	0.46	605	4-Stroke Industial AC\Refrigeration	0.46	605
2-Stroke Terminal Tractors	0.78	827	4-Stroke Terminal Tractors	0.78	827
2-Stroke Lawn mowers (Residential)	0.33	25	4-Stroke Lawn mowers (Residential)	0.33	25
2-Stroke Lawn mowers (Commercial)	0.33	406	4-Stroke Lawn mowers (Commercial)	0.33	406
2-Stroke Rotary Tillers < 6 HP (Residential)	0.40	17	4-Stroke Rotary Tillers < 6 HP (Residential)	0.40	17
2-Stroke Rotary Tillers < 6 HP (Commercial)	0.40	472	4-Stroke Rotary Tillers < 6 HP (Commercial)	0.40	472
2-Stroke Chain Saws < 6 HP (Residential)	0.70	13	4-Stroke Chain Saws < 6 HP (Residential)	0.70	13
2-Stroke Chain Saws < 6 HP (Commercial)	0.70	303	4-Stroke Chain Saws < 6 HP (Commercial)	0.70	303
2-Stroke Trimmers/Edgers/Brush Cutters	0.91	9	4-Stroke Trimmers/Edgers/Brush Cutters	0.91	9
2-Stroke Trimmers/Edgers/Brush Cutters	0.91	137	4-Stroke Trimmers/Edgers/Brush Cutters	0.91	137
2-Stroke Leafblowers/Vacuums (Residential)	0.94	10	4-Stroke Leafblowers/Vacuums (Residential)	0.94	10
2-Stroke Leafblowers/Vacuums (Commercial)	0.94	282	4-Stroke Leafblowers/Vacuums (Commercial)	0.94	282
2-Stroke Snowblowers (Residential)	0.35	8	4-Stroke Snowblowers (Residential)	0.35	8
2-Stroke Snowblowers (Commercial)	0.35	136	4-Stroke Snowblowers (Commercial)	0.35	136
2-Stroke Rear Engine Riding Mowers (Res.)	0.38	36	4-Stroke Rear Engine Riding Mowers (Res.)	0.38	36
2-Stroke Rear Engine Riding Mowers (Comm.)	0.38	569	4-Stroke Rear Engine Riding Mowers (Comm)	0.38	569
2-Stroke Front Mowers (Residential)	0.65	86	4-Stroke Front Mowers (Residential)	0.65	86
2-Stroke Front Mowers (Commercial)	0.65	86	4-Stroke Front Mowers (Commercial)	0.65	86
2-Stroke Shredders < 6 HP (Residential)	0.80	50	4-Stroke Shredders < 6 HP (Residential)	0.80	50
2-Stroke Shredders < 6 HP (Commercial)	0.80	50	4-Stroke Shredders < 6 HP (Commercial)	0.80	50
2-Stroke Lawn & Garden Tractors (Residential)	0.44	45	4-Stroke Lawn & Garden Tractors (Residential)	0.44	45
2-Stroke Lawn & Garden Tractors (Commercial)	0.44	721	4-Stroke Lawn & Garden Tractors (Commercial)	0.44	721
2-Stroke Wood Splitters (Residential)	0.69	76	4-Stroke Wood Splitters (Residential)	0.69	76
2-Stroke Wood Splitters (Commercial)	0.69	76	4-Stroke Wood Splitters (Commercial)	0.69	76
2-Stroke Chippers/Stump Grinders (Res.)	0.78	488	4-Stroke Chippers/Stump Grinders (Res.)	0.78	488
2-Stroke Chippers/Stump Grinders (Comm.)	0.78	488	4-Stroke Chippers/Stump Grinders (Comm.)	0.78	488
2-Stroke Commercial Turf Equipment (Res.)	0.60	682	4-Stroke Commercial Turf Equipment (Res.)	0.60	682

Table E-1. Load Factors and Activity Rates by Engine/Equipment Category

Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)	Equipment Description	Load Factor (fraction of power)	Activity (hrs/ yr)
2-Stroke Commercial Turf Equipment (Comm)	0.60	682	4-Stroke Commercial Turf Equipment (Comm)	0.60	682
2-Stroke Other Lawn & Garden Equipment	0.58	61	4-Stroke Other Lawn & Garden Equipment	0.58	61
2-Stroke Other Lawn & Garden Equipment	0.58	61	4-Stroke Other Lawn & Garden Equipment	0.58	61
2-Stroke 2-Wheel Tractors	0.62	286	4-Stroke 2-Wheel Tractors	0.62	286
2-Stroke Agricultural Tractors	0.62	550	4-Stroke Agricultural Tractors	0.62	550
2-Stroke Combines	0.74	125	4-Stroke Combines	0.74	125
2-Stroke Balers	0.62	68	4-Stroke Balers	0.62	68
2-Stroke Agricultural Mowers	0.48	175	4-Stroke Agricultural Mowers	0.48	175
2-Stroke Sprayers	0.65	80	4-Stroke Sprayers	0.65	80
2-Stroke Tillers > 6 HP	0.71	43	4-Stroke Tillers > 5 HP	0.71	43
2-Stroke Swathers	0.52	95	4-Stroke Swathers	0.52	95
2-Stroke Hydro Power Units	0.56	450	4-Stroke Hydro Power Units	0.56	450
2-Stroke Other Agricultural Equipment	0.55	124	4-Stroke Other Agricultural Equipment	0.55	124
2-Stroke Irrigation Sets	0.60	716	4-Stroke Irrigation Sets	0.60	716
2-Stroke Light Commercial Generator Set	0.68	115	4-Stroke Light Commercial Generator Sets	0.68	115
2-Stroke Light Commercial Pumps	0.69	221	4-Stroke Light Commercial Pumps	0.69	221
2-Stroke Light Commercial Air Compressors	0.56	484	4-Stroke Light Commercial Air Compressors	0.56	484
2-Stroke Light Commercial Gas Compressors	0.85	6000	4-Stroke Light Commercial Gas Compressors	0.85	6000
2-Stroke Light Commercial Welders	0.68	408	4-Stroke Light Commercial Welders	0.68	408
2-Stroke Light Commercial Pressure Wash	0.85	115	4-Stroke Light Commercial Pressure Washers	0.85	115
2-Stroke Logging Equipment Chain Saws > 6 HP	0.70	303	4-Stroke Logging Equipment Chain Saws > 6 HP	0.70	303
2-Stroke Logging Equipment Shredders > 6 HP	0.80	50	4-Stroke Logging Equipment Shredders > 6 HP	0.80	50
2-Stroke Logging Equipment Skidders	0.70	350	4-Stroke Logging Equipment Skidders	0.70	350
2-Stroke Logging Equipment Fellers/Bunchers	0.70	0	4-Stroke Logging Equipment Fellers/Bunchers	0.70	0
2-Stroke Airport Support Equipment	0.56	681	4-Stroke Airport Support Equipment	0.56	681
2-Stroke Other Underground Mining Equipment	0.80	260	4-Stroke Other Underground Mining Equipment	0.80	260
2-Stroke Other Oil Field Equipment	0.90	1104	4-Stroke Other Oil Field Equipment	0.90	1104

Source: Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling. U.S. EPA, April 2004, EPA 420-P-04-005. Appendix A

APPENDIX F

OECA Environmental Benefits Calculation Tools

Calculator Tools Available at:
http://intranet.epa.gov/oeca/oc/pmod/ccdscalculatortools/index.html

Combined Sewer Overflow (CSO) Pollutant Reduction Calculator Tool
Sanitary Sewer Overflow (SSO) Pollutant Reduction Calculator Tool
Construction Stormwater Pollutant Reduction Calculator Tool
Industrial Non-Construction Stormwater Pollutant Reduction Calculator Tool
CAFO Stormwater Violations Pollutant Reduction Calculator Tool
Hazardous Waste Speciation Calculator Tool
Mobile Source Calculators
- Highway Diesel Vehicles and Engines (Heavy Duty)
- Highway Motorcycle
- Light Duty Trucks
- Non-Road Compression Ignition (Diesel) Engines
- Recreation Vehicles
- Small Non-Road Spark Ignition (Gasoline) Engines

Produced Water Brine Calculation Form
PSD/NSR Calculator Tool