

MODEL PERMIT
FOR
RCRA SUBPART X
UNITS THAT TREAT ENERGETICS

DRAFT GUIDANCE

BY REGION VI

THROUGH THE SUBPART X PERMIT
WRITERS' WORKGROUP

AND

THE PERMITS AND STATE PROGRAMS
DIVISION

OFFICE OF SOLID WASTE

U.S. ENVIRONMENTAL PROTECTION
AGENCY

APRIL 92

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I. Introduction and Purpose

The purpose of this Model Permit is to assist permit writers in preparing Resource Conservation and Recovery Act (RCRA) hazardous waste management permits for facilities with open burning and/or open detonation units subject to the provisions of 40 CFR 264 Subpart X, "Miscellaneous Units." The document provides recommended language and format for permit conditions.

The Subpart X regulations are designed to cover miscellaneous units which are not regulated by Subparts I through O. (Subparts I through O regulate containers, tanks, surface impoundments, waste piles, land treatment units, landfills, and incinerators respectively). Although many different types of units may be subject to Subpart X, this document provides guidance on permit conditions for miscellaneous units that open burn or open detonate. However, this model can be easily amended and used as a model for other types of Subpart X units.

Modules I, II, IV, V, VII, and VIII were extracted from the September 1988 EPA document, *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)*; they were modified as necessary to address regulatory updates and to apply to Subpart X facilities conducting open burning/open detonation. Modules III, VI, and XI were developed for this document and are based in part on EPA regulations in 40 CFR Parts 264 and 270. They are designed to be as consistent as possible with earlier guidance documents, but provide additional material where necessary to respond to the unique requirements of Subpart X.

II. Instructions for Use

In developing a permit for a specific facility, permit writers should include the permit cover or authorization

sheet and Modules I (General Permit Conditions), II (General Facility Conditions) and III (Treatment of Energetic Wastes). The permit writer should also include other applicable Modules (e.g. Ground-Water Detection Monitoring, Post-Closure Care, Corrective Action for Regulated Units, etc.), omit the others and renumber the remaining accordingly. In addition, if the facility has regulated units other than the open burning/open detonation units (e.g. landfills, waste piles, etc.), the permit writer should include the appropriate Module(s) from *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)*.

In addition to recommended permit conditions, the Modules contain bracketed items that are either: (1) citations from RCRA/HSWA or RCRA regulations that should be included in the permit; (2) optional language or alternatives that require the permit writer to make a selection; or (3) explanatory notes (in bold type) that give guidance but should not be included in the permit. The major HSWA provisions are also identified in each Module to assist permit writers in deciding which provisions should be addressed by EPA or State permit writers when a State is only partially authorized.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PERMIT

FOR A HAZARDOUS WASTE MANAGEMENT FACILITY

Permittee _____ Facility
Identification _____ Number _____
_____ Permit
Number _____

Pursuant to the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq., commonly known as RCRA) and regulations promulgated thereunder by the U.S. Environmental Protection Agency (EPA) (codified and to be codified in Title 40 of the Code of Federal Regulations), a Permit is issued to [insert name of the Permittee] _____ (hereafter called the Permittee), to operate a hazardous waste [choose applicable management method: treatment, storage, and/or disposal] facility located in [insert name of city and state] _____, on [insert street address] _____, at latitude _____ and longitude _____, summarily described as follows:

[Note: The Permit Writer should insert a brief description of the facility here. This description should contain the following information: a summary of the types of waste management units (e.g., open burning, open detonation) permitted; whether or not the facility is required to conduct ground-water monitoring; how closure will be accomplished (e.g.,

clean closure or closure in place); the types of waste management units that may require post-closure; whether the facility is or will be taking corrective action; and whether the Permit includes any compliance schedules. Note also any special features associated with the operation and associated permit conditions.]

The Permittee must comply with all terms and conditions of this Permit. This Permit consists of the conditions contained herein (including those in any attachments) and the applicable regulations contained in 40 CFR Parts 260 through 266, 270, and 124, as specified in the Permit. Applicable regulations are those which are in effect on the date of issuance of the Permit, in accordance with 40 CFR 270.32(c).

This Permit is based on the assumption that the information submitted in the Part B Permit Application attached to the Permittee's letter dated _____, as modified by subsequent amendments [dated _____ and _____], (hereafter referred to as the Application) is accurate and that the facility will be [constructed and] operated as specified in the Application.

Any inaccuracies found in the submitted information may be grounds for the termination, revocation and reissuance, or modification of this Permit in accordance with 40 CFR 270.41, 270.42, and 270.43 and for enforcement action. The Permittee must inform EPA of any deviation from or changes in the information in the application which would affect the Permittee's ability to comply with the applicable regulations or permit conditions.

This Permit is effective as of _____, 19__ and shall remain in effect until _____, 19__ unless revoked and reissued under 40 CFR 270.41, terminated under 40 CFR 270.43, or continued in accordance with

270.51(a).

[Note: For land disposal facilities, add the following condition.]

This Permit shall be reviewed by the Regional Administrator five years after the date of Permit issuance or reissuance and shall be modified as necessary, as provided in 40 CFR 270.41. [40 CFR 270.50(d)]

[Signature]

Date

[Insert name and title

of person

authorized to issue the

Permit]

MODULE I - GENERAL PERMIT CONDITIONS

[Note: This permit module contains the general conditions required for all RCRA permits by 40 CFR Part 270. This module must be included in all RCRA Permits, except the following optional permit conditions: I.E.12, I.E.14, and I.I.]

[Note: The Permit Writer should refer to the *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

I.A.

EFFECT OF PERMIT

The Permittee is allowed to **[insert appropriate method: treat, store, and/or dispose on-site]** hazardous waste in accordance with the conditions of this Permit. Any **[storage, treatment, and/or disposal]** of hazardous waste not authorized in this Permit is prohibited. Subject to 40 CFR 270.4, compliance with this Permit generally constitutes compliance, for purposes of enforcement, with Subtitle C of RCRA. Issuance of this Permit does not convey any property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, any infringement of state or local law or regulations, or preclude compliance with any other Federal, State, and/or local laws and/or regulations governing the treatment and handling of explosives. Compliance with the terms of this Permit does not constitute a defense to any order issued or any action brought under Sections 3008(a), 3008(h), 3013, or 7003 of RCRA; Sections 106(a), 104 or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et seq., commonly known as CERCLA), or any other law providing for protection of public health or the environment. [40 CFR 270.4, 270.30(g)]

I.B. PERMIT ACTIONS

I.B.1. Permit Modification, Revocation and Reissuance, and Termination

This Permit may be modified, revoked and reissued, or terminated for cause, as specified in 40 CFR 270.41,

270.42, and 270.43. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee, does not stay the applicability or enforceability of any permit condition. [40 CFR 270.4(a) and 270.30(f)]

I.B.2. Permit Renewal

This Permit may be renewed as specified in 40 CFR 270.30(b) and Permit Condition I.E.2. Review of any application for a Permit renewal shall consider improvements in the state of control and measurement technology, as well as changes in applicable regulations. [40 CFR 270.30(b), HSWA Sec. 212]

I.C. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby. [40 CFR 124.16(a)]

I.D. DEFINITIONS

For purposes of this Permit, terms used herein shall have the same meaning as those in 40 CFR Parts 124, 260, 264, 266, 268, and 270, unless this Permit specifically provides otherwise; where terms are not defined in the regulations or the Permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term. "Regional Administrator" means the Regional Administrator of EPA Region _____, or his designee or authorized representative.

I.E. DUTIES AND REQUIREMENTS

I.E.1. Duty to Comply

The Permittee shall comply with all conditions of this Permit, except to the extent and for the duration such noncompliance is authorized by an emergency Permit. Any

Permit noncompliance, other than noncompliance authorized by an emergency Permit, constitutes a violation of RCRA and is grounds for enforcement action; for Permit termination, revocation and reissuance, or modification; or for denial of a Permit renewal application. [40 CFR 270.30(a)]

I.E.2. Duty to Reapply

If the Permittee wishes to continue an activity allowed by this Permit after the expiration date of this Permit, the Permittee shall submit a complete application for a new Permit at least 180 days prior to Permit expiration. [40 CFR 270.10(h), 270.30(b)]

I.E.3. Permit Expiration

Pursuant to 40 CFR 270.50, this Permit shall be effective for a fixed term not to exceed ten years. As long as EPA is the Permit-issuing authority, this Permit and all conditions herein will remain in effect beyond the Permit's expiration date, if the Permittee has submitted a timely, complete application (see 40 CFR 270.10, 270.13 through 270.29) and, through no fault of the Permittee, the Regional Administrator has not issued a new Permit, as set forth in 40 CFR 270.51.

I.E.4. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittee, in an enforcement action that it would have been necessary, to halt or reduce the Permitted activity in order to maintain compliance with the conditions of this Permit. [40 CFR 270.30(c)]

I.E.5. Duty to Mitigate

In the event of noncompliance with this Permit, the Permittee shall take all reasonable steps to minimize releases to the environment and shall carry out such measures, as are reasonable, to prevent significant adverse impacts on human health or the environment. [40 CFR 270.30(d)]

I.E.6. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit. [40 CFR 270.30(e)]

I.E.7. Duty to Provide Information

The Permittee shall furnish to the Regional Administrator, within a reasonable time, any relevant information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this Permit. [40 CFR 264.74(a), 270.30(h)]

I.E.8. Inspection and Entry

Pursuant to 40 CFR 270.30(i), the Permittee shall allow the Regional Administrator, or an authorized representative, upon the presentation of credentials and other documents, as may be required by law, to:

- I.E.8.a. Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Permit;
- I.E.8.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;

- I.E.8.c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and
- I.E.8.d. Sample or monitor, at reasonable times, for the purposes of assuring Permit compliance or as otherwise authorized by RCRA, any substances or parameters at any location.

I.E.9. Monitoring and Records

The Regional Administrator may require such testing by the permittee, and may make such modifications to this permit, deemed necessary to ensure implementation of new regulations or requirements, or to ensure protection of human health and the environment.

I.E.9.a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by the Regional Administrator. Laboratory methods must be those specified in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Standard Methods of Wastewater Analysis*, or an equivalent method, as specified in the Waste Analysis Plan (See Permit Attachment II-1). [40 CFR 270.30(j)(1)]

I.E.9.b. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this Permit, the certification required by 40 CFR 264.73(b)(9), and records of all data used to complete the application for this Permit for a period of at least 3 years from the date of the sample, measurement, report, record, certification, or application. These periods may be extended by request of the Regional Administrator at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility. **[For tanks and land treatment, storage, and disposal units: The Permittee shall maintain records from all ground-water**

monitoring wells and associated ground-water surface elevations for the active life of the facility, and for disposal facilities for the post-closure care period as well.] [40 CFR 264.74(b) and 270.30(j)(2)] These requirements will also be applicable to open burning/open detonation units if ground-water monitoring is required.

I.E.9.c. Pursuant to 40 CFR 270.30(j)(3), records of monitoring information shall specify:

- i. The dates, exact place, and times of sampling or measurements;
- ii. The individuals who performed the sampling or measurements;
- iii. The dates analyses were performed;
- iv. The individuals who performed the analyses;
- v. The analytical techniques or methods used; and
- vi. The results of such analyses.

I.E.10. Reporting Planned Changes

The Permittee shall give notice to the Regional Administrator, as soon as possible, of any planned physical alterations or additions to the Permitted facility. [40 CFR 270.30(1)(1)]

I.E.11. Reporting Anticipated Noncompliance

The Permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. [40 CFR 270.30(1)(2)]

I.E.12. Certification of Construction or Modification

[Note: This condition only applies if the facility is new, modified, or contains, or will contain, new units, unit expansions, or modified units. Delete this condition if the Permit is for an existing facility containing existing units only.]

The Permittee may not commence **[insert appropriate method: treatment, storage, or disposal]** of hazardous waste **[insert as appropriate: "at the facility" or "in the modified portion of the facility"]** until the Permittee has submitted to the Regional Administrator, by certified mail or hand delivery, a letter signed by the Permittee and a registered professional engineer stating that the facility has been constructed or modified in compliance with the Permit; and

I.E.12.a. The Regional Administrator has inspected the modified or newly constructed facility and finds it is in compliance with the conditions of the Permit; or

I.E.12.b. The Regional Administrator has either waived the inspection or has not within 15 days notified the Permittee of his intent to inspect. [40 CFR 270.30(1)(2)]

I.E.13. Transfer of Permits

This Permit is not transferable to any person, except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the Permit pursuant to 40 CFR 270.40. Before transferring ownership or operation of the facility during its operating life, the Permittee shall notify the new owner or operator in writing of the requirements of 40 CFR Parts 264 and 270 and this Permit. [40 CFR 270.30(1)(3), 264.12(c)]

I.E.14. Twenty-Four Hour Reporting

I.E.14.a. The Permittee shall report to the Regional Administrator any noncompliance which may endanger health or the environment. Any such information shall be reported orally

within 24 hours from the time the Permittee becomes aware of the circumstances. The report shall include the following:

- i. Information concerning release of any hazardous waste that may cause an endangerment to public drinking water supplies.
- ii. Any information of a release or discharge of hazardous waste, or of a fire or explosion from the hazardous waste management facility which could threaten the environment or human health outside the facility.

I.E.14.b. The description of the occurrence and its cause shall include:

- i. Name, address, and telephone number of the owner or operator;
- ii. Name, address, and telephone number of the facility;
- iii. Date, time, and type of incident;
- iv. Name and quantity of materials involved;
- v. The extent of injuries, if any;
- vi. An assessment of actual or potential hazards to the environment and human health outside the facility, where this is applicable; and
- vii. Estimated quantity and disposition of recovered material that resulted from the incident.

I.E.14.c. A written submission shall also be provided within five days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its

cause; the period(s) of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and, if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Regional Administrator may waive the five-day written notice requirement in favor of a written report within 15 days. [40 CFR 270.30(1)(6)]

I.E.15. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, Permit Conditions I.E.10. - 15., at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Condition I.E.14 [40 CFR 270.30(1)(10)]

I.E.16. Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts in the Permit application, or submitted incorrect information in a Permit application or in any report to the Regional Administrator, the Permittee shall promptly submit such facts or information. [40 CFR 270.30(1)(11)]

I.F. SIGNATORY REQUIREMENT

All applications, reports, or information submitted to or requested by the Regional Administrator, his designee, or authorized representative, shall be signed and certified in accordance with 40 CFR 270.11 and 270.30(k).

I.G. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE REGIONAL ADMINISTRATOR

All reports, notifications, or other submissions which are required by this Permit to be sent or given to the Regional Administrator should be sent by certified mail or given to:

[Note: Provide the address and telephone number of the Regional Administrator or appropriate Regional Division Director.]

I.H. CONFIDENTIAL INFORMATION

In accordance with 40 CFR 270.12, the Permittee may claim confidential any information required to be submitted by this Permit.

I.I. DOCUMENTS TO BE SUBMITTED PRIOR TO OPERATION

[Note: Include here: (1) requirements to submit any documents not complete or ready at time of Permit issuance (e.g., an updated Contingency Plan) and (2) the schedules for such submissions.]

1. The Permittee shall submit the following documents to the Regional Administrator by the dates shown:

<u>Document</u>	<u>Due Date</u>
-----------------	-----------------

2. Prior to operation, the Permittee shall submit as-built

plans of the **[insert units for which plans must be submitted]** _____. At a minimum, these plans shall indicate: _____.

[Note: Insert any items which should be included on the as-built plans. For example, for a container storage area, the as-built plans should include: (1) the dimensions of each storage bay; (2) stacking arrangements for containers; and (3) aisle space in each bay.] [40 CFR 270.32, 270.33]

I.J. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The Permittee shall maintain at the facility, until closure is completed and certified by an independent, registered professional engineer, the following documents and all amendments, revisions and modifications to these documents:

1. Waste Analysis Plan, as required by 40 CFR 264.13 and this Permit.
2. Inspection schedules, as required by 40 CFR 264.15(b) (2) and this Permit.
3. Personnel training documents and records, as required by 40 CFR 264.16(d) and this Permit.
4. Contingency Plan, as required by 40 CFR 264.53(a) and this Permit.
5. Operating record, as required by 40 CFR 264.73 and this Permit.
6. Closure Plan, as required by 40 CFR 264.112(a) and this Permit.

[Note: Under 40 CFR 264.197(c), 264.228(c) and 264.258(c), owners and operators of certain tanks, surface impoundments and waste piles must have Contingent Closure Plans. If the Permit will require the Permittee to have a Contingent Closure Plan, then add the plan to this list.]

7. Post-Closure Plan, as required by 40 CFR 264.118(a) and this Permit.

[Note: Only owners and operators of disposal units are required to have Post-Closure Plans. Under 40 CFR 264.197(c), 264.228(c) and 264.258(c), owners and operators of certain tanks, surface impoundments, waste piles, and miscellaneous units must have Contingent Post-Closure Plans. If the Permit Writer or the Permittee believe that clean closure can not be achieved, than these requirements may also be applicable to open burning/open detonation units. If the Permit will require the Permittee to have a Contingent Post-Closure Plan, then add the plan to this list.]

8. Annually-adjusted cost estimate for facility closure [and post-closure], as required by 40 CFR 264.142(d) [and 264.144(d)] and this Permit.
9. All other documents required by Module I, Permit Condition E.9 [insert as appropriate: and Modules ____, Permit Conditions _____].

MODULE II - GENERAL FACILITY CONDITIONS

[Note: This permit module contains conditions covering the general facility requirements of 40 CFR Part 264, Subparts B - H. This module must be included in all RCRA Permits, except that the following Permit conditions are optional: II.B.1, II.B.2, II.G, II.H, II.I.1, II.I.2, II.I.3, II.I.4, II.K, and II.N.]

[Note: The Permit Writer should refer to the *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

II.A. DESIGN AND OPERATION OF FACILITY

The Permittee shall construct, maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned, sudden or nonsudden release of hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment, as required by 40 CFR 264.31.

II.B. REQUIRED NOTICES

[Note: Permit Condition B.1 should be included in the Permit only if the facility receives waste from a foreign source. Permit Condition B.2 should be included in the Permit only if the facility receives waste from off site. If Permit Condition B.1 is inapplicable, the Permit should specify that the Permittee may not receive hazardous waste from a foreign source. Similarly, if Permit Condition B.2 is inapplicable, the Permit should specify that the Permittee may not receive hazardous waste from off site.]

II.B.1. Hazardous Waste Imports

The Permittee shall notify the Regional Administrator in writing at least four weeks in advance of the date the Permittee expects to receive hazardous waste from a foreign source, as required by 40 CFR 264.12(a). Notice of subsequent shipments of the same waste from the same foreign source in the same calendar year is not required.

II.B.2. Hazardous Waste from Off-Site Sources

When the Permittee is to receive hazardous waste from an off-site source (except where the Permittee is also the generator), he must inform the generator in writing that he has the appropriate Permits, and will accept the waste the generator is shipping. The Permittee must keep a copy of this written notice as part of the operating record. [40 CFR 264.12(b)]

II.C. GENERAL WASTE ANALYSIS

The Permittee shall follow the waste analysis procedures required by 40 CFR 264.13, as described in the attached Waste Analysis Plan, Permit Attachment II-1. The Permittee shall verify the analysis of each waste stream annually as part of its quality assurance program, in accordance with *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, EPA Publication SW-846, or equivalent methods approved by the Regional Administrator. At a minimum, the Permittee shall maintain proper functional instruments, use approved sampling and analytical methods, verify the validity of sampling and analytical procedures, and perform correct calculations. If the Permittee uses a contract laboratory to perform analyses, then the Permittee shall inform the laboratory in writing that it must operate under the waste analysis conditions set forth in this Permit.

[Note: The waste analysis plan included in the Part B Permit Application should be attached to the Permit. As applicable, the plan must cover the requirements of 40 CFR 264.17, 264.177, 264.198, 264.199, 264.229, 264.230, 264.256, 264.257, 264.272, 264.276, 264.281, 264.282, 264.312, 264.313, 264.314, 264.316, and 264.341.]

II.D. SECURITY

The Permittee shall comply with the security provisions of 40 CFR 264.14(b) **[select either (1) or (2) based upon the information in the Part B Permit Application]** and (c) and Permit Attachment II-2.

[Note: Specific security provisions should be included in the Permit, if necessary, to ensure compliance with 40 CFR 264.14(b). In addition, specific security provisions needed to

implement the performance standard in 264.14(a) should be included in the Permit. For example, the following items should be included in the security provisions and equipment for open burning/open detonation units: (a) a 24-hour security system that includes fences or guards, or alarms or locked areas, or location within a larger secured or otherwise inaccessible area or combinations of the above. (b) "DANGER - KEEP OUT" signs posted on all sides of the open burning/open detonation area. (c) controlled entry and number of personnel in the open burning/open detonation area. (d) "NO ENTRY" signs posted during actual operations. If the Permittee successfully demonstrates, in accordance with 40 CFR 264.14(a), that the security requirements in 264.14(b) and (c) are not necessary, a security permit condition is not needed. This demonstration must be documented in the Administrative Record.]

II.E. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedule set out in Permit Attachment II-3. The Permittee shall remedy any deterioration or malfunction discovered by an inspection, as required by 40 CFR 264.15(c). Records of inspection shall be kept, as required by 40 CFR 264.15(d).

[Note: The inspection schedules included in the Part B Permit Application should be attached to the Permit. As applicable, the specific inspection requirements of 40 CFR 264.174, 264.193(i), 264.195, 264.226(b), 264.254(b), 264.273(g), 264.303(b), 264.347(b) and (c) must be covered by the attached schedules.]

II.F. PERSONNEL TRAINING

The Permittee shall conduct personnel training, as required by 40 CFR 264.16. This training program shall follow the attached outline, Permit Attachment II-4. The Permittee shall maintain training documents and records, as required by 40 CFR 264.16(d) and (e).

[Note: The outline of personnel training included in the Part B Permit Application should be attached to the Permit. It must demonstrate how the Permittee will comply with 264.16.]

II.G. SPECIAL PROVISIONS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

[Note: This condition should be included in the Permit only if the facility handles ignitable, reactive, or incompatible wastes.]

The Permittee shall comply with the requirements of 40 CFR 264.17(a). The Permittee shall follow the procedures for handling ignitable, reactive, and incompatible wastes set forth in Permit Attachment II-5.

[Note: Permits must include specific handling procedures tailored to the types of hazardous wastes to be treated, stored, or disposed at the facility and the types of units in which the wastes will be handled. The procedures described by the Permittee in the Part B Permit Application should be attached

to the Permit. In addition, permit conditions specific to the units will be specified in the appropriate module of the Permit. Typically, these precautions are included in existing documents, such as SOP's, utilized by site operators.]

II.H. LOCATION STANDARDS

[Note: EPA is preparing guidance on locating hazardous waste management facilities in sensitive locations, such as karst terrain. If a facility will be located in a sensitive area, the Permit Writer can insert permit conditions deemed necessary to protect human health and the environment. For example, more frequent facility inspections, special operating restrictions, or construction of thicker floors or liners could be required. Such permit conditions are authorized by 40 CFR 270.3, 270.32(a), and 270.32(b)(2).]

[Note: For facilities located in a 100-year floodplain, the Permit must either set forth conditions by which the Permittee will meet the requirements of 40 CFR 264.18(b) or contain a compliance schedule (see 40 CFR 270.14(b)(11)(v) and 270.33). These requirements do not apply to existing surface impoundments, waste piles, land treatment units, landfills, and open burning/open detonation units if the Permittee has demonstrated, in accordance with 40 CFR 264.18(b)(1)(ii), that there will be no adverse effects on human health or the environment from washout. This demonstration must be documented in the Administrative Record. If the facility is not located in a 100-year floodplain, the Permit Writer should delete this provision from the Permit and re-letter subsequent provisions accordingly (i.e., I becomes H).

Example permit conditions are provided below. The first condition should be placed in the Permit only if the Permittee will use flood proofing and/or flood protection measures to prevent washout during a 100-year flood. The second condition should be included in the Permit only if the Permittee will implement procedures to remove the waste from the facility prior to arrival of 100-year flood waters.]

The Permittee shall [**construct,**] operate, and maintain the facility to prevent washout of any hazardous waste by a 100-year flood, as required by 40 CFR 264.18(b)(1) and as specified in the attached plans and specifications, Permit Attachment II-6.

In the event of a 100-year flood, the Permittee shall remove all hazardous waste, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to the flood waters, as required by 40 CFR 264.18(b)(1)(i) and in accordance with the attached 100-year flood response procedures, Permit Attachment II-7.

II.I. PREPAREDNESS AND PREVENTION

[Note: If the Permittee requests a waiver from the preparedness and prevention requirements, a justification for this request must be included in the permit application as specified in 40 CFR 270.14 (b)(6).]

II.I.1. Required Equipment

At a minimum, the Permittee shall maintain at the facility the equipment set forth in the Contingency Plan, Permit Attachment II-8, as required by 40 CFR 264.32.

[Note: The list of equipment required by 264.52 (e) to be in the Contingency Plan must meet the requirements of 264.32. If the Permittee has successfully demonstrated, in accordance with 40 CFR 264.32, that any of the equipment is not required, the decision should be documented in the Administrative Record and Permit Condition II.I.1 should be deleted.]

II.I.2. Testing and Maintenance of Equipment

The Permittee shall test and maintain the equipment specified in Permit Condition II.I.1, as necessary, to assure its proper operation in time of emergency, as required by 40 CFR 264.33.

[Note: Specific testing and maintenance procedures needed to implement this condition should be included in the inspection schedule, Permit Condition II.E.]

II.I.3. Access to Communications or Alarm System

The Permittee shall maintain access to the communications or alarm system, as required by 40 CFR 264.34.

[Note: If the Permittee has successfully demonstrated that such a device is not required under 40 CFR 264.32, the decision should be documented in the Administrative Record and Permit Condition I.3 should be deleted.]

II.I.4. Required Aisle Space

At a minimum, the Permittee shall maintain aisle space, as required by 40 CFR 264.35 and the attached plans and specifications, Permit Attachment II-8A.

[Note: If the Permittee has successfully demonstrated that aisle space is not needed, the decision should be documented in the Administrative Record. The "plans and specifications" to be referenced here generally will be the design plans and specifications for the hazardous waste management units.]

II.I.5. Arrangements with Local Authorities

The Permittee shall maintain arrangements with state and local authorities, as required by 40 CFR 264.37. If state or local officials refuse to enter into preparedness and prevention arrangements with the Permittee, the Permittee must document this refusal in the operating record.

II.J. CONTINGENCY PLAN

[Note: The Permit Writer should assure the following factors of particular importance for open burning/open detonation units are addressed. 1) plans for the emergency coordinator to immediately identify the character, exact source, amount and extent of any fire, explosion or release. 2) the emergency coordinator's assessment of possible hazards to human health or the environment that may result from the explosion, fire or release (the quantity of explosives in the area of a fire will be critical to determining what response activities can be undertaken safely). 3) the emergency coordinator must determine whether the extent of the explosion, fire or release could threaten human health or the environment outside the facility so that local authorities can be notified to take appropriate action.]

II.J.1. Implementation of Plan

The Permittee shall immediately carry out the provisions of the Contingency Plan, Permit Attachment II-8, whenever there is a fire, explosion, or release of hazardous waste or constituents which could threaten human health or the environment.

[Note: The contingency plan included in the Part B Permit Application should be attached to the Permit. As applicable, the plan must cover the requirements of 40 CFR 264.200, and 264.227(c).]

II.J.2. Copies of Plan

The Permittee shall maintain a copy of the Contingency Plan at the facility and shall provide a copy to all police departments, fire departments, hospitals, and

State and local emergency response teams that may be asked to provide emergency assistance, as required by 40 CFR 264.53.

II.J.3. Amendments to Plan

The Permittee shall review and immediately amend, if necessary, the Contingency Plan, as required by 40 CFR 264.54.

II.J.4. Emergency Coordinator

A trained emergency coordinator shall be available at all times in case of an emergency, as required by 40 CFR 264.55.

[Note: For new facilities, add the following sentence to Permit Condition II.J.4.]

The names, addresses, and phone numbers of all persons qualified to act as emergency coordinators shall be supplied to the Regional Administrator at the time of certification. [40 CFR 264.52(d)].

II.K. MANIFEST SYSTEM

The Permittee shall comply with the manifest requirements of 40 CFR 264.71, 264.72, and 264.76.

[Note: This condition should be included in the Permit only if the facility accepts off-site waste.]

II.L. RECORDKEEPING AND REPORTING

In addition to the recordkeeping and reporting requirements specified elsewhere in this Permit, the Permittee shall do the following:

II.L.1. Operating Record

The Permittee shall maintain a written operating record at the facility, in accordance with 40 CFR 264.73.

II.L.2. Biennial Report

The Permittee shall comply with the biennial reporting requirements of 40 CFR 264.75.

II.M. GENERAL CLOSURE REQUIREMENTS

[Note: Owners and operators of certain tank systems, surface impoundments, waste piles, and open burning/open detonation units are required to have contingent closure plans by 40 CFR 264.197(c), 264.228(c), and 264.258(c), respectively. For Permits for these facilities, insert "Contingent Closure Plan" after Closure Plan and append the Contingent Closure Plan as Permit Attachment II-10. Be sure to renumber subsequent attachments.]

II.M.1. Performance Standard

The Permittee shall close the facility, as required by 40 CFR 264.111 and in accordance with the Closure Plan, Permit Attachment II-9.

[Note: The Closure Plan must meet the requirements of 40 CFR 264.112(a) and (b). The specific closure requirements of 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, and 264.351 also must be covered by the attached plan.]

II.M.2. Amendment to Closure Plan

The Permittee shall amend the Closure Plan, in accordance with 40 CFR 264.112(c), whenever necessary.

II.M.3. Notification of Closure

The Permittee shall notify the Regional Administrator in writing at least 60 days prior to the date on which he expects to begin closure of any of the following: **[insert as appropriate: surface impoundment, waste pile, land treatment unit, landfill, or open burning/open detonation unit]** or final closure of the facility, as required by 40 CFR 264.112(d).

[Note: Permit Condition II.M.3 should be used for facilities using surface impoundments, waste piles, land treatment units, landfills, or open burning/open detonation units. For facilities using only tanks, containers, or incinerators, substitute the following condition.]

The Permittee shall notify the Regional Administrator in writing at least 45 days prior to the date on which he expects to begin final closure of the facility, as required by 40 CFR 264.112(d).

II.M.4. Time Allowed For Closure

After receiving the final volume of hazardous waste, the Permittee shall treat, remove from the unit or

facility, or dispose of on site all hazardous waste and shall complete closure activities, in accordance with 40 CFR 264.113 and the schedules specified in the Closure Plan, Permit Attachment II-9.

[Note: If the Permittee is granted a longer time frame for treating, removing, or disposing of waste or for completing closure activities, the basis for granting the extra time must be documented in the Administrative Record.]

II.M.5. Disposal or Decontamination of Equipment, Structures, and Soils

The Permittee shall decontaminate **[and/or]** dispose of all contaminated equipment, structures, and soils, as required by 40 CFR 264.114 and the Closure Plan, Permit Attachment II-9.

II.M.6. Certification of Closure

The Permittee shall certify that the facility has been closed in accordance with the specifications in the Closure Plan, as required by 40 CFR 264.115.

II.M.7. Survey Plat

The Permittee shall submit a survey plat no later than the submission of certification of closure of each hazardous waste disposal unit, in accordance with 40 CFR 264.116.

[Note: This Permit condition should be included only if the facility contains hazardous waste disposal units.]

II.N. GENERAL POST-CLOSURE REQUIREMENTS

[Note: Owners and operators of certain tank systems, surface impoundments, and waste piles are required to have contingent post-closure plans by 40 CFR 264.197(c), 264.228(c), and 264.258(c), respectively. For open burning/open detonation facilities, these requirements may also be applicable if the Permit Writer or the Permittee believe that clean closure can not be achieved. For Permits for these facilities, insert

"Contingent Post-Closure Plan" after Post-Closure Plan and append the Contingent Post-Closure Plan as Permit Attachment II-12. Be sure to renumber subsequent attachments.]

II.N.1. Post-Closure Care Period

The Permittee shall begin post-closure care for each **[insert as appropriate: tank system, surface impoundment, waste pile, land treatment unit, landfill]** after completion of closure of the unit and continue for 30 years after that date. Post-closure care shall be in accordance with 40 CFR 264.117 and the Post-Closure Plan, Permit Attachment II-11.

[Note: The Post-Closure Plan included in the Part B Permit Application should be attached to the Permit. It must meet the requirements of 40 CFR 264.118 (a) and (b). The specific post-closure requirements of 264.197, 264.228, 264.258, 264.280, and 264.310 also must be covered by the attached plan.]

II.N.2. Post-Closure Security

The Permittee shall maintain security at the facility during the post-closure care period, in accordance with the Post-Closure Plan, Permit Attachment II-11, and 40 CFR 264.117(b).

[Note: This condition should be included in the Permit only if hazardous wastes may remain exposed after completion of closure, or access by the public or domestic livestock may pose a hazard to human health.]

II.N.3. Amendment to Post-Closure Plan

The Permittee shall amend the Post-Closure Plan in accordance with 40 CFR 264.118(d), whenever necessary.

II.N.4. Post-Closure Notices

II.N.4.a. No later than 60 days after certification of closure of each hazardous waste disposal

unit, the Permittee shall submit records of the type, location, and quantity of hazardous waste disposed within each cell or disposal unit, in accordance with 40 CFR 264.119(a).

- II.N.4.b. Within 60 days of certification of closure of the first hazardous waste disposal unit and the last hazardous waste disposal unit, the Permittee shall do the following:
 - i. Record a notation on the deed to the facility property, in accordance with 40 CFR 264.119(b) (1).
 - ii. Submit a certification that a notation, in accordance with 40 CFR 264.119(b) (2), has been recorded.
- II.N.4.c. The Permittee shall request and obtain a Permit modification prior to post-closure removal of hazardous wastes, hazardous waste residues, liners, or contaminated soils, in accordance with 40 CFR 264.119(c).

II.N.5. Certification of Completion of Post-Closure Care

The Permittee shall certify that the post-closure care period was performed in accordance with the specifications in the Post-Closure Plan, as required by 40 CFR 264.120.

II.O. COST ESTIMATE FOR FACILITY CLOSURE [AND POST-CLOSURE]

II.O.1. The Permittee's most recent closure [**insert as applicable "and post-closure"**] cost estimate, prepared in accordance with 40 CFR 264.142 264.144, 264.197(c) (3) and (5), 264.228(c) (2), and 264.258(c) (2), [**is/are**] specified in Permit Attachment II-11.

II.O.2. The Permittee must adjust the closure [**and post-closure**] cost estimate for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s) used to comply with 40 CFR 264.143 [**and 264.145**] and Permit Condition II.P or when using an approved state-required mechanism, upon such date as required by the state. [40 CFR 264.142(b)]

[Note: If the Permittee is using the financial test or corporate guarantee, substitute the following condition.]

The Permittee must adjust the closure cost estimate [**and post-closure cost estimate**] for inflation within 30 days after the close of the firm's fiscal year and before submission of updated information to the Regional Administrator, as specified in 40 CFR 264.142(b) [**and 264.144(b)**].

II.O.3. The Permittee must revise the closure cost estimate [**and post-closure cost estimate**] whenever there is a change in the facility's Closure Plan [**and Post-Closure Plan**], as required by 40 CFR 264.142(c) [**and 264.144(c)**].

II.O.4. The Permittee must keep at the facility the latest closure cost estimate [**and post-closure cost**

estimate] as required by 40 CFR 264.142(d) **[and 264.144(d)]**.

II.P. FINANCIAL ASSURANCE FOR FACILITY CLOSURE [AND POST-CLOSURE]

The Permittee shall demonstrate continuous compliance with 40 CFR **[insert as appropriate 264.143, 264.145, 264.146]** by providing documentation of financial assurance, as required by 40 CFR 264.151 or 264.149, in at least the amount of the cost estimates required by Permit Condition II.O. Changes in financial assurance mechanisms must be approved by the Regional Administrator pursuant to 40 CFR 264.143 **[,264.145]** or 264.149.

[Note: For new facilities, the Permittee shall demonstrate compliance with this permit condition by submitting the required documentation to the Regional Administrator at least 60 days before first receiving hazardous waste for treatment, storage or disposal. [See, for example, 40 CFR 264.143(a)(1).] The Permittee's financial assurance must be effective prior to the Permittee's first receipt of hazardous waste.]

II.Q. LIABILITY REQUIREMENTS

The Permittee shall demonstrate continuous compliance with the requirement of 40 CFR 264.147(a) to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least \$1 million per occurrence, with an annual aggregate of at least \$2 million, exclusive of legal defense costs.

[Note: For facilities containing surface impoundments, landfills, and land treatment units, add the following condition.]

The Permittee also shall demonstrate continuous compliance with the 40 CFR 264.147(b) requirement to have and maintain liability coverage for nonsudden accidental occurrences in the amount of at least \$3 million per occurrence, with an annual aggregate of at least \$6 million, exclusive of legal defense costs.

[Note: The Regional Administrator may grant a variance from the above levels of financial responsibility in accordance with 40 CFR 264.147(c) and (d). For new facilities, the Permittee shall demonstrate its compliance with this permit condition by

submitting the required documentation to the Regional Administrator at least 60 days before first receiving hazardous waste for treatment or storage. The Permittee's liability coverage must be effective before the Permittee's first receipt of hazardous waste.]

II.R. INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

The Permittee shall comply with 40 CFR 264.148, whenever necessary.

PERMIT ATTACHMENTS REFERENCED IN MODULE II -
GENERAL FACILITY CONDITIONS

This list is provided to assist the Permit Writer in checking that all Permit Attachments referenced in this module are attached to the Permit. The purpose of the numbering scheme used here is to facilitate cross-walking with the model permit conditions. The Permit Writer may select other numbering schemes, as appropriate, when preparing actual Permits.

<u>Permit Attachment No.</u>	<u>Plan or Document</u> (from the Part B Permit Application)
II-1	Waste Analysis Plan
II-2	Security Plan
II-3	Inspection Schedule
II-4	Personnel Training Outline
II-5	Procedures for Handling Ignitable, Reactive, or Incompatible Waste
II-6	Flood Proofing/Flood Protection Plans and Specifications
II-7	100-Year Flood Response Procedures
II-8	Contingency Plan
II-8A	Plans and Specifications showing the spacing of aisles
II-9	Closure Plan
II-10	Contingent Closure Plan
II-11	Post-Closure Plan
II-12	Contingent Post-Closure Plan
II-13	Closure Cost Estimate
II-14	Post-Closure Cost Estimate

MODULE III - TREATMENT OF ENERGETIC WASTES

III.A. MODULE HIGHLIGHTS

[The Permit Writer should include a general discussion of the activities covered by this module. The discussion should contain the following information: description of the units, general types and amount of wastes treated, traffic restrictions, any special or unique features associated with the units, and a reference to any special permit conditions.]

III.B. PERMITTED AND PROHIBITED WASTE IDENTIFICATION

III.B.1. The Permittee may _____ [**open burn or open detonate**] the following wastes subject to the terms of this permit and as described below:

Type of Allowed unit of unit	Description of unit	Description of Hazardous Waste	Hazardous Waste No.	Quantity
------------------------------------	------------------------	--------------------------------------	------------------------	----------

[Open Unit consists lbs./event;	Scrap powder	D003	100
------------------------------------	--------------	------	-----

burning of a steel 10' 20,000
lbs./yr.

by 3'pan on a
15'by 15'
concrete pad.]

III.B.2. The Permittee is prohibited from treating hazardous waste that is not identified in Permit Condition III.B.1. **[Note: The Permit Writer may wish to include a specific list of wastes or materials that are prohibited. Open burning of all non-explosive wastes is prohibited. Other prohibited wastes could include: infectious wastes, lethal or incapacitating chemical and biological munitions and their residues, or contaminated packaging wastes containing radioactive materials.]**

III.C. DESIGN, CONSTRUCTION, AND OPERATING REQUIREMENTS

[This Section includes requirements for open burning in containment devices, open burning on a pad, open detonation on the ground, and open detonation in a pond. The Permit Writer should include only applicable sections when drafting the Permit. In addition, design and construction requirements would apply only to proposed units.]

III.C.1 Open Burning in a Containment Device

[Note: this section would cover processing in trays, pans, cages, or other enclosures. Trays and pans are typically elevated and used in conjunction with a cement pad or some other type of liner to protect the surrounding ground surface.]

III.C.1.1 The Permittee shall design and construct an open burning device in accordance with the design plans and specifications contained in Permit Attachment III-2. **[Note: The application should contain detailed discussion of the physical characteristics, materials of construction, dimensions of the unit, engineering drawings of the unit, description of the liner material below the device, minimum safe distances, etc.]**

III.C.1.2 The Permittee shall operate and maintain the open burning device in accordance with the operating procedures contained in Permit Attachment III-1. **[Note: The application should include detailed standard operating procedures (SOP) that specify how the wastes are to be treated. The SOP should discuss loading/unloading procedures, how waste is to be placed in the unit, the amount to be burned per event, how the waste will be ignited,**

duration between burns, number of burns per day, ash/residue management, misfire procedures, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.1.3 The Permittee shall **[design, construct,]** operate and maintain leak detection equipment in accordance with the **[design plans, specifications and]** operating practices contained in Permit Attachment(s) III-[2] 3.
[Note: This condition applies only to facilities with leak detection equipment. The permit application should specify the items/equipment used, their function, types of materials, dimensions and applicable engineering properties, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.1.4 The Permittee shall **[design, construct,]** operate and maintain a precipitation cover in accordance with the **[design plans, specifications and]** operating practices contained in Permit Attachment(s) III-[2] 3. **[Note: If the facility uses a precipitation cover, the application/SOP should address use of the cover during nonoperational periods, its dimensions, materials of construction, or other information that could affect infiltration during non-operational periods or the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.1.5 The Permittee shall manage accumulated precipitation in accordance with Permit Attachment III-3. **[Note: The application should discuss if/how precipitation will be collected, how it will be sampled and analyzed, how it will be managed/treated, or other information that could affect infiltration during nonoperational periods or the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.1.6 The Permittee shall **[design, construct]** operate and maintain the open burning unit in order to minimize air emissions or exposure of people (onsite or offsite) to toxic or

hazardous emissions in accordance with Permit Attachment(s) III-1[2] 5 **[and/or the following permit conditions:]** [Note: The SOP should contain any meteorological restrictions on burning (e.g., wind speed, humidity). Any restrictions imposed by the Permit Writer which are not addressed in the SOP should be specified in this condition.]

III.C.1.7 The Permittee shall **[design, construct]** operate and maintain the open burning unit in order to minimize noise in accordance with Permit Attachment(s) III-[2] 6 **[and/or the following permit conditions:]** [Note: Noise issues usually pertain only to open detonation, but may also apply to open burning of large unit wastes such as rocket motors. If noise is a potential problem at the facility, design and operating procedures to minimize noise (such as wind direction, allowable operating times, sound buffers, etc.) should be addressed in the application. Such provisions should be consistent with any applicable State regulations.]

III.C.1.8 Ash/residues from the open burning unit shall be managed in accordance with Permit Attachment III-4 **[and/or the following permit conditions:]** [Note: The application should

address how ash/residues from the unit will be managed, including how/when they will be collected from the unit and the surrounding area, how they will be sampled and analyzed, how/where they will be stored, methods to control wind dispersal, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.2 Open Burning On A Pad

[This section applies to open burning conducted on a pad on the ground surface. The pads are typically bermed, are constructed of clay, cement, metal, etc., and may or may not have some type of liner surrounding the unit.]

III.C.2.1 The Permittee shall design and construct an open burning pad in accordance with the design plans and specifications contained in Permit Attachment III-2. [Note: The application should contain detailed discussion of the physical characteristics, materials of construction, dimensions of the pad, engineering drawings of the pad, minimum safe distances, etc.]

III.C.2.2 The Permittee shall operate and maintain the open burning pad in accordance with the

operating procedures contained in Permit Attachment III-1. **[Note: The application should include detailed standard operating procedures (SOP) that specify how the wastes are to be treated. The SOP should discuss loading/unloading procedures, how waste is to be placed in the unit, the amount to be burned per event, how the waste will be ignited, duration between burns, number of burns per day, ash/residue management, misfire procedures, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.2.3 The Permittee shall **[design, construct,]** operate and maintain a precipitation cover in accordance with the **[design plans, specifications and]** operating practices contained in Permit Attachment(s) III-1[2]. **[Note: If the facility uses a precipitation cover, the application/SOP should address use of the cover during nonoperational periods, its dimensions, materials of construction, or other information that could affect infiltration during nonoperational periods or the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.2.4 The Permittee shall manage accumulated precipitation in accordance with Permit Attachment III-3. **[Note: The application should discuss if/how precipitation will be collected, how it will be sampled and analyzed, how it will be managed/treated, or other information that could affect infiltration during nonoperational periods or the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.2.5 The Permittee shall **[design, construct]** operate and maintain the open burning pad in order to minimize air emissions or exposure of people (onsite or offsite) to toxic or hazardous emissions in accordance with Permit Attachment III-1[2] 5 **[and/or the following permit conditions:]** **[Note: The SOP should contain any meteorological restrictions on burning (e.g., wind speed, humidity). Any restrictions imposed by the Permit Writer which are not addressed in the SOP should be specified in this condition.]**

III.C.2.6 The Permittee shall **[design, construct]** operate and maintain the open burning pad in order to minimize noise in accordance with Permit Attachment III-[2] 6 **[and/or the following permit conditions:]** **[Note: Noise**

issues usually pertain only to open detonation, but may also apply to open burning of large unit wastes such as rocket motors. If noise is a potential problem at the facility, design and operating procedures to minimize noise (such as wind direction, allowable operating times, sound buffers, etc.) should be addressed in the application. Such provisions should be consistent with any applicable State regulations.]

III.C.2.7 Ash/residues from the open burning pad shall be managed in accordance with Permit Attachment III-4 [and/or the following permit conditions:] [Note: The application should address how ash/residues from the pad will be managed, including how/when they will be collected from the pad and the surrounding area, how they will be sampled and analyzed, how/where they will be stored, methods to control wind dispersal, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.3 Open Detonation On/In The Ground

[This section covers open detonation in or on the ground surface. The open detonation area may be one large area

or may consist of several smaller areas. The detonation areas may or may not be bermed.]

III.C.3.1 The Permittee shall design and construct an open detonation area(s) in accordance with the design plans and specifications contained in Permit Attachment III-2. **[Note: The application should contain detailed discussion of the topography, types of soils, berms (if any), engineering drawings delineating the detonation area(s), minimum safe distances, etc.]**

III.C.3.2 The Permittee shall operate and maintain the open detonation area(s) in accordance with the operating procedures contained in Permit Attachment III-1. **[Note: The application should include detailed standard operating procedures (SOP) that specify how the wastes are to be treated. The SOP should discuss loading/unloading procedures, how waste is to be placed in or on the ground, the amount to be detonated per event and per day, how the waste will be initiated, duration between events, number of events per day, misfire procedures, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.3.3 The Permittee shall **[design, construct]** operate and maintain the open detonation area in order to minimize air emissions or exposure of people (onsite or offsite) to toxic or hazardous emissions in accordance with Permit Attachment(s) III-1[2] 5 **[and/or the following permit conditions:]** **[Note: The SOP should contain any meteorological or other restrictions on detonation (e.g., wind speed, humidity) designed to minimize air pollution releases during firing and wind dispersal of residual ash. Any restrictions imposed by the Permit Writer which are not addressed in the SOP should be specified in this condition.]**

III.C.3.4 The Permittee shall **[design, construct]** operate and maintain the open detonation area in order to minimize noise in accordance with Permit Attachment(s) III-[2] 6 **[and/or the following permit conditions:]** **[Note: If noise is a potential problem at the facility, design and operating procedures to minimize noise (such as wind direction, allowable operating times, sound buffers, covering the waste with soil, limits on the amount of waste per detonation event, etc.) should be addressed in the application. Such**

provisions should be consistent with any applicable State regulations.]

III.C.3.5 Ash/residues from the open detonation area shall be managed in accordance with Permit Attachment III-4 **[and/or the following permit conditions:]** **[Note: The application should address how ash/residues from the detonation area will be managed, including how they will be collected, how often the area will be "policed," how they will be sampled and analyzed, how/where they will be stored, methods to control wind dispersal, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.3.6 The Permittee shall **[design, construct]** operate and maintain a runoff control system in accordance with the design plans, specifications, and operating practices contained in Permit Attachment(s) III-2. **[Note: The application should describe how runoff will be prevented or minimized.]**

III.C.3.7 The Permittee shall **[design, construct]** operate and maintain a runoff control system in accordance with the design plans, specifications, and operating practices contained in Permit Attachment(s) III-2 and 3.

[Note: If the facility does not have measures to prevent runoff, the application should describe how runoff from the area will be minimized and managed, how/if it will be sampled and analyzed, how it will be collected, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.4 Open Detonation In A Pond

[This section applies to detonation of waste underwater. Underwater detonation is typically used because of noise considerations. The deadening effect of the water greatly diminishes air blast and noise associated with the detonation. Thus, underwater detonation can sometimes be used in locations where open detonation in or on the ground cannot.]

III.C.4.1 The Permittee shall design and construct an open detonation pond in accordance with the design plans and specifications contained in Permit Attachment III-1. [Note: The application should contain detailed engineering drawings showing the size of the pond, water depth, any liners, freeboard, equipment for loading and detonating the waste, minimum safe distances, etc.]

III.C.4.2 The Permittee shall operate and maintain the open detonation pond in accordance with the operating procedures contained in Permit Attachment III-1 . **[Note: The application should include detailed standard operating procedures (SOP) that specify how the wastes are to be treated. The SOP should discuss loading/unloading procedures, how waste is to be placed in the pond, the amount to be detonated per event and per day, how the waste will be initiated, duration between events, number of events per day, misfire procedures, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]**

III.C.4.3 The Permittee shall **[design, construct]** operate and maintain the open detonation pond in order to minimize air emissions or exposure of people (onsite or offsite) to toxic or hazardous emissions in accordance with Permit Attachment(s) III-1[2] 5 [and/or the following permit conditions:] **[Note: The SOP should contain any meteorological or other restrictions on detonation (e.g., wind speed, humidity) designed to minimize air pollution releases during firing and wind dispersal of residual ash (if any). Any restrictions**

imposed by the Permit Writer which are not addressed in the SOP should be specified in this condition.]

III.C.4.4 The Permittee shall **[design, construct]** operate and maintain the open detonation pond in order to minimize noise in accordance with Permit Attachment(s) III-[2] 6 [and/or the following permit conditions:] **[Note: If noise is a potential problem at the facility, design and operating procedures to minimize noise (such as wind direction, allowable operating times, sound buffers, limits on the amount of waste per detonation event, etc.) should be addressed in the application. Such provisions should be consistent with any applicable State regulations.]**

III.C.4.5 Ash/residues from the open detonation pond shall be managed in accordance with Permit Attachment III-4 [and/or the following permit conditions:] **[Note: The application should address how ash/residues (if any) from the detonation pond will be managed including: how/will the pond be dredged, how often the pond will be dredged, if/how residues will be collected from the surrounding area, how often the surrounding area will be "policed," how residues will be sampled and analyzed,**

how/where they will be stored, methods to control wind dispersal, and any other relevant information on procedures that could affect the quantity, quality, duration, or frequency of releases to the environment.]

III.C.4.6 The Permittee shall **[design, construct,]** operate and maintain a runoff control system in accordance with the design plans, specifications, and operating practices contained in Permit Attachment (s) III-2 and 3. **[Note: The application should address procedures to prevent overflow of the pond.]**

III.D. HANDLING AND STORAGE REQUIREMENTS

[This section discusses handling and storage requirements for energetic wastes. These requirements will generally be dominated by safety concerns.]

III.D.1 The Permittee shall handle/manage energetic waste in accordance with Permit Attachment II-5 **[Note: The application should contain a detailed description of how wastes are handled at the point of generation; how they are handled in containers, tanks, surface impoundments, waste piles; and how they are prepared for transport and transported, etc. This condition should also address loading and unloading hazards at open burning/open**

detonation facilities. These may include the possibility of spillage or accidental ignition or detonation during loading and unloading of the hazardous wastes. These procedures, because of the nature of the wastes, will be dominated by personnel safety concerns. The Permit Writer should also specify to which waste these requirements apply.]

III.D.2 The Permittee shall store energetic wastes in accordance with Permit Attachment III-3. [Note: This section should include only special storage/accumulation requirements unique to energetic wastes; general requirements for a permitted storage area would be contained in a separate section. The Permit Writer should also specify to which waste these requirements apply.]

III.E. INSPECTION SCHEDULES AND PROCEDURES

[Module II contains General Inspection Requirements for the facility. This section should include only inspection requirements specific to the open burning/open detonation units.]

III.E.1 The Permittee shall inspect the open burning or open detonation unit in accordance with the Inspection Schedule, Permit Attachment II-3, and shall complete the following as part of those

inspections. [Note: The Permit Writer should specify inspection conditions for each unit. These conditions will depend on the peculiarities of the units and will therefore be highly site specific. They should include, however, inspection of the physical integrity of the unit, frequency of inspections, etc.]

III.F. PREVENTION OF UNINTENDED IGNITION OR REACTION OF WASTES

The Permittee shall follow the procedures, contained in Permit Attachment II-5, designed to prevent unintended ignition or reaction of wastes. [Note: Procedures for igniting or detonating waste in the unit should incorporate safety precautions (such as prohibiting smoking and remote ignition of the waste on the burn pad). Typically, these precautions are included in existing documents, such as SOP's, utilized by site operators.]

III.G. MONITORING REQUIREMENTS

[This section discusses monitoring requirements associated with operation of the facility. These requirements will be highly site specific and will depend on the results of assessments conducted by the facility to demonstrate compliance with the Environmental Performance Standards of Subpart X (40 CFR 264.601). Currently, there are no standard, EPA-approved sampling and analytical methods for many of the wastes treated by these facilities. EPA is, however, presently developing a

guidance document for sampling and analysis at OB/OD facilities.]

III.G.1 Ground-Water Monitoring

The Permittee shall conduct ground-water monitoring in accordance with Permit Attachment III-7. **[Note: If the facility should, at the discretion of the Permit Writer, undertake a detection monitoring program, requirements for such a program are shown in section IV of this model permit. If ground-water monitoring is required, the application should specify the types and schedules of monitoring required and the instrumentation required and include a Sampling and Analysis Plan.]**

III.G.2 Air Monitoring

The Permittee shall conduct air monitoring in accordance with Permit Attachment III-8. **[Note: If air monitoring is required, the application should specify the types and schedules of monitoring required and the instrumentation required and should include a Sampling and Analysis Plan.]**

III.G.3 Surface Water Monitoring

The Permittee shall conduct surface water monitoring in accordance with Permit Attachment III-9. **[Note: If surface water monitoring is required, the application**

should specify tthe types and schedules of monitoring required and the instrumentation required and should include a Sampling and Analysis Plan.]

III.G.4 Soil Monitoring

The Permittee shall conduct soil monitoring in accordance with Permit Attachment III-10. [Note: If soil monitoring is required, the application should specify the types and schedules of monitoring required and the instrumentation required and should include a Sampling and Analysis Plan.]

III.H. FACILITY MODIFICATION/EXPANSION

III.H.1 Permit Modification

EPA reserves the right to modify this Permit in accordance with 40 CFR 270.41.

III.H.2 Permit Modification At The Request Of The Permittee

Modifications or expansions of the facility shall be accomplished in accordance with 40 CFR 270.42.

III.I. CLOSURE [AND POST-CLOSURE]

[General closure/post-closure requirements are addressed in Module II. This section should discuss closure/post-closure requirements specific to the OB/OD operations. Post-closure care is required only at facilities that do not anticipate clean closure.]

III.I.1 At final closure of the **[open burning and/or open detonation]** unit(s) the Permittee shall follow the procedures in the Closure Plan, Permit Attachment II-9. **[Note: The Closure Plan should be adequate to ensure, after it has been completed, that EPA receives adequate documentation that post-closure care is not required.]**

III.I.2a If after closure the Permittee finds that not all contaminated soils and debris can be removed or decontaminated in accordance with the Closure Plan, then the Permittee shall close the **[open burning and/or open detonation]** unit(s) and perform post-closure care in accordance with requirements contained in Section VIII of this Permit. **[Note: This condition would apply only to units for which clean closure was anticipated but could not be accomplished. Post-closure care requirements are contained in Module VIII.]**

III.I.2b The Permittee shall perform post-closure care in accordance with the Post-closure Plan, Permit

Attachment II-11. [Note: This condition would apply to units for which clean closure is not proposed.]

III.J RECORDKEEPING

III.J.1 The Permittee shall develop and maintain all records required to comply with 40 CFR 264.73, 40 CFR 264.602, and Permit Attachment III-11. [Note: The facility should maintain sufficient records to demonstrate compliance with the conditions of the Permit, including any restrictions placed on operation of the OB/OD units (e.g., meteorological, daily or event limits, etc.).]

III.K. COMPLIANCE SCHEDULE

[Note: The Permit Writer should include this section if the Permittee is required to complete specific steps within a specific time period, beyond those covered by other conditions of the Permit, as a condition for retaining this operating permit. Compliance schedules are generally used in cases where requirements that are supposed to be met by the Permittee before the permit is issued are deferred for good cause until after permit issuance. Appropriate compliance schedules included in the Part B Permit Application should be attached to, or incorporated in, the Permit. If the application does not include a compliance schedule, the Permit Writer should prepare one and attach it to the Permit. Each compliance schedule

should have at least two columns-one identifying the activity and one identifying the milestone or completion dates. The following is an example of a condition that may apply for an open burning/open detonation unit.]

The Permittee shall provide the following information to the Regional Administrator:

<u>Item</u>	<u>Date Due to the Regional</u>
<u>Administrator</u>	

[Example:

1. Sampling and analysis of soils surrounding open burning unit.]	December 31, 1990
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PERMIT ATTACHMENTS REFERENCED IN MODULE III

This list is provided to assist the Permit Writer in checking that all Permit Attachments referenced in this module are attached to the Permit. The purpose of the numbering scheme used here is to facilitate cross-walking with the model permit conditions. The Permit Writer may select other numbering schemes, as appropriate, when preparing actual permits.

Permit

<u>Attachment No.</u>	<u>Plan or Document</u> (from the Part B Permit Application)
II-3	Facility Inspection Schedule
II-5	Procedures for Handling Ignitable, Reactive, or Incompatible Waste
II-9	Facility Closure Plan
II-11	Facility Post-Closure Plan
III-1	Standard Operating Procedures
III-2	Design Plans and Specifications
III-3	Operation and Maintenance Procedures
III-4	Ash Management Procedures
III-5	Procedures for Limiting Air Emissions
III-6	Procedures for Limiting Noise Emissions
III-7	Sampling and Analysis Plan for Ground-Water Monitoring
III-8	Sampling and Analysis Plan for Air Monitoring

III-9	Sampling and Analysis Plan for Surface Water Monitoring
III-10	Sampling and Analysis Plan for Soil Monitoring
III-11	Recordkeeping Procedures

MODULE IV - GROUND-WATER DETECTION MONITORING

[Note: The goal of detection monitoring is to ensure early and reliable indications of ground-water contamination from the regulated units. Detection monitoring is intended to provide for characterization of releases of hazardous wastes or hazardous constituents from regulated units by requiring analysis for all constituents listed in Appendix IX of 40 CFR 264 to determine if further action is warranted. Detection monitoring entails the following:

1. Development of a list of ground-water indicator parameters and monitoring constituents used in detection monitoring to indicate a release from the regulated unit(s).
2. Establishment of sampling and statistical analysis requirements to determine if a release has occurred.
3. Establishment of additional requirements if a statistically significant release occurs.]

[Note: On July 9, 1987, a federal rule was finalized to require analysis for 40 CFR 264, Appendix IX, rather than 40 CFR 261, Appendix VIII, hazardous constituents pursuant to 40 CFR 264.98 and 264.99, if a statistically significant increase occurs for any detection monitoring parameters or constituents. The Appendix IX list is an abbreviated Appendix VIII list with

several constituents added. This permit module incorporates the new rule.]

[Note: Under 40 CFR 264.91(b) the Regional Administrator may include one or more of the following programs in a permit: (1) detection monitoring (Module IV), (2) compliance monitoring (Module V), and (3) corrective action [Module XII(A)]. If more than one program is included in the Permit, the Permit Writer is to specify the circumstances or conditions under which each program will be required. It is possible that more than one program will be operable at the same time at a facility, or that the programs will be conditional based on a sequence of events. For example, the sequence set up in the Permit could include a detection monitoring program that triggers an Appendix IX analysis that triggers a Permittee option to submit a demonstration to the Regional Administrator that the statistical indication of ground-water contamination is a result of a source other than a regulated unit or that the contamination resulted from error in sampling, analysis, or evaluation. If the Permittee fails to submit a demonstration or if the demonstration fails to show that a source other than a regulated unit or error in sampling, analysis, or evaluation caused the contamination, then compliance monitoring is triggered. The Permit could also set the ground-water protection standard, with a provision for the Permittee to apply for an Alternate Concentration Limit (ACL), and in the absence of an ACL application or denial of an ACL, or exceedence of an ACL or pre-set limit, the triggering of the corrective action program. The corrective action program could include plume assessment, corrective measures study and design, and

implementation of corrective action. Setting up such a sequence in the Permit reduces the number of permit modifications that may be needed and decreases the administrative time needed to get on with subsequent steps in the process and ultimately, the time required to get corrective action under way, if needed.]

[Note: The Permit Writer should refer to the *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

IV.A. MODULE HIGHLIGHTS

[The Permit Writer should include a general discussion of the activities covered by this module. The discussion should contain the following information: description of the waste management units (including type and number that require detection monitoring); number, location and depth of wells; which wells are upgradient and downgradient; the indicator parameters and monitoring constituents specified and their background concentrations; any unique or special features associated with the operation; and a reference to any special permit conditions.]

IV.B. WELL LOCATION, INSTALLATION AND CONSTRUCTION

[Note: For specific Agency guidance on monitoring well design and construction, hydrogeologic site characterization and location of monitoring wells, consult the EPA RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (September

1986). Additionally, updates from site-specific research reports can also be used.]

The Permittee shall install and maintain a ground-water monitoring system as specified below: [40 CFR 264.97]

IV.B.1. The Permittee shall **[install and]** maintain ground-water monitoring wells at the locations specified on the map in Permit Attachment IV-1 and in conformance with the following list:

[Note: The map must show all monitoring well locations and provide unique identifiers for each well. The number and location of monitoring wells utilized for ground-water monitoring is site-specific. The number and location of the wells must meet the requirements of 40 CFR 264.95 (Point of Compliance) and 40 CFR 264.97(a) and (b), if applicable (number, location, and depth of wells). The ground-water monitoring system must: yield samples in upgradient wells that represent the quality of the background ground-water unaffected by leakage from any regulated unit(s), and in downgradient wells yield samples that represent the quality of water passing the point of compliance. The number and location of monitoring wells must be sufficient to identify and define all logical release pathways from the regulated units based on site-specific hydrogeologic characterization. The Permit Writer may require

the Permittee to selectively monitor a hydrologic zone which the Permittee has not described as part of the uppermost aquifer (e.g., perched water table), if based on hydrogeological characteristics, the hydrologic zone is an area of concern for the migration of hazardous constituents from regulated units that can be transported to any exposure point.]

[Note: The information submitted must also meet the requirements of 40 CFR 270.14(c). These requirements include: a summary of ground-water monitoring data obtained during interim status; identification of the uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including ground-water flow direction and rate; a delineation on a topographic map of the waste management area, the property boundary, and the proposed point of compliance; and a description of any plume of contamination that has entered the ground-water from a regulated unit.]

IV.B.2. The Permittee shall [**construct and**] maintain the monitoring wells identified in Permit Condition IV.B.1., in accordance with the detailed plans and specifications presented in Permit Attachment IV-2.

[Note: The plans and specifications must meet the requirements of 40 CFR 264.97(a) and (c) and 40 CFR

270.14(c). They should consist of design drawings and design criteria applicable to all wells, and individual well specifications identifying total well depth and location of screened intervals.]

[Note: If determined to be necessary to protect human health or the environment, the Permit Writer should include Permit Condition IV.B.3., specifications on how monitoring wells are plugged and abandoned. HSWA Section 212 provides EPA with this authority. Several states also have regulations which cover monitoring well decommissioning.]

IV.B.3. All wells deleted from the monitoring program shall be decommissioned in accordance with Permit Attachment IV-3. Well decommissioning methods and certification shall be submitted to the Regional Administrator within **[The Permit Writer should specify the submittal period.]** from the date the wells are removed from the monitoring program.

IV.C. INDICATOR PARAMETERS AND MONITORING CONSTITUENTS

[Note: The Permit Writer may use background data from interim status monitoring to establish background concentrations for detection monitoring, to the extent that the same parameters continue to be used in detection.]

IV.C.1. The Permittee shall monitor **[The Permit Writer should specify the well numbers]**, as described in Permit Condition IV.B., for the following parameters and constituents: [40 CFR 264.98(a)]

<u>Parameter or</u>	<u>Established Background</u>
<u>Constituent</u>	<u>Concentrations</u>

[Note: The Permit Writer should develop a list of detection monitoring parameters and constituents using the following information: waste analysis plan, waste characterization, site hydrogeologic characterization, and proposed monitoring parameters and constituents.]

[Note: Include Permit Condition IV.C.2. when the Permittee has not established background values at the time the Permit is issued in accordance with 40 CFR 264.97(g).]

[Note: Analytical methods and detection limits to be used should be stated for the parameters of interest.]

IV.C.2. For those parameters and constituents in Permit Condition IV.C.1. for which no background values are established at the time the Permit is issued, the Permittee shall establish background values in accordance with the following procedures. **[Note: The Permit Writer should specify that the**

procedures in Permit Conditions IV.C.2. be used to establish the background values.] [40 CFR 264.97(g) (1)]

Background ground-water quality for a monitoring parameter or constituent shall be based on a sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained. **[Note: To determine whether an independent sample is obtained, the Permittee should make reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants.]**
[40 CFR 264.97(g) (1)]

[Note: Under 40 CFR 264.97(g) (2), an alternate sampling procedure proposed by the Permittee may be approved by the Regional Administrator.]

IV.D. SAMPLING AND ANALYSIS PROCEDURES

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the ground-water monitoring wells described in Permit Condition IV.B.: [40 CFR 264.97(d) and (e)]

IV.D.1. Samples shall be collected using the techniques described in Permit Attachment IV-4.

- IV.D.2. Samples shall be preserved [**and shipped (when shipped off site for analysis)**], in accordance with the procedures specified in Permit Attachment IV-4.
- IV.D.3. Samples shall be analyzed in accordance with the procedures specified in Permit Attachment IV-4.
- IV.D.4. Samples shall be tracked and controlled using the chain-of-custody procedures specified in Permit Attachment IV-4.

[Note: The Permittee must submit all of the above information, which is required under 40 CFR 264.97(d) and (e), 264.98(g) and 270.14(c) (7) (vi).]

[Note: The sampling and analytical procedures must be designed to provide a reliable indication of the quality of the ground-water below the facility, pursuant to 40 CFR 264.97(d) and (e).]

IV.E. ELEVATION OF THE GROUND-WATER SURFACE

- IV.E.1. The Permittee shall determine the elevation of the ground-water surface at each well each time the ground-water is sampled, in accordance with Permit Condition IV.G.2. [40 CFR 264.97(f)]

[Note: The Permit Writer should include Permit Condition IV.E.2. if new monitoring wells are installed. The surveyed ground surface elevation of all existing monitoring wells is required on the facility map in the Part B Permit Application.]

IV.E.2. The Permittee shall record the surveyed elevation of the monitoring well(s) when installed (with as-built drawings). **[Note: The total depth of the well and the elevations of the following should be recorded: top of casing, ground surface and/or apron elevation, and the protective casing.]**

IV.F. STATISTICAL PROCEDURES

[Note: The Permittee should specify a statistical method to be used in evaluating ground-water monitoring data for each hazardous constituent, which, upon approval by the Regional Administrator, will be specified in the unit permit. [40 CFR 264.97(h)]

IV.F.1. When evaluating the monitoring results in accordance with Permit Condition IV.G., the Permittee shall use one of the following statistical methods:

IV.F.1.a The Permittee shall use a parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of

contamination. The method must include estimation of testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.

[40 CFR 264.97(h) (1)]

IV.F.1.b An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent. [40 CFR 264.97(h) (2)]

IV.F.1.c A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit. [40 CFR 264.97(h) (3)]

IV.F.1.d A control chart approach that gives control limits for each constituent.
[40 CFR 264.97(h) (4)]

IV.F.1.e Another statistical test method submitted by the owner or operator and approved by the

Regional Administrator.

[40 CFR 264.97(h) (5)]

IV.F.2 Any statistical method chosen in IV.F shall comply with the following performance standards:

IV.F.2.a The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the Permittee to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.

[40 CFR 264.97(i) (1)]

IV.F.2.b If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type 1 error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type 1 experiment-wise error rate for each testing period shall be no less than 0.05; however, the Type 1 error of

no less than 0.01 for individual well comparisons must be maintained. This performance level does not apply to tolerance intervals, prediction intervals, or control charts. [40 CFR 264.97(i)(2)]

IV.F.2.c If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the Permittee and approved by the Regional Administrator. [40 CFR 264.97(i)(3)]

IV.F.2.d If a tolerance interval or a prediction interval is used to evaluate ground-water monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the Permittee and approved by the Regional Administrator. These parameters will be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern.
[40 CFR 264.97(i)(4)]

IV.F.2.e The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of

human health and the environment. Any practical quantification limit (PQL) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.

IV.F.2.f If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

IV.G. MONITORING PROGRAM AND DATA EVALUATION

IV.G.1. The Permittee shall collect, preserve, and analyze samples pursuant to Permit Condition IV.D.

IV.G.2. The Permittee shall collect samples and conduct statistical tests **[The Permit Writer should specify the frequency]** to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in Permit Condition IV.C.1. in accordance with 40 CFR 264.97(g). **[Note: The Permit Writer should specify the sampling frequency, but must require a sequence of at least four samples from each well (background and compliance wells) collected at least semi-annually**

during detection monitoring. Some state agencies require quarterly determinations.] [40 CFR 264.98(d)] The Permittee shall express the ground-water quality at each monitoring well in a form necessary for the determination of statistically significant increases (i.e., means and variances). [40 CFR 264.97(h)]

IV.G.3. The Permittee shall determine the ground-water flow rate and direction in the uppermost aquifer at least annually. Methods for flow monitoring shall be proposed by the Permittee and approved by the Regional Administrator. [40 CFR 264.98(e)]

IV.G.4. The Permittee shall determine whether there is a statistically significant increase over the background values for each parameter identified in Permit Condition IV.C.1. each time ground-water quality is determined at the compliance point. In determining whether such an increase has occurred, the Permittee must compare the ground-water quality at each monitoring well specified in Permit Condition IV.B.1. to the background value specified in Permit Condition IV.C.1., in accordance with the statistical procedures specified in Permit Condition IV.F. [40 CFR 264.98(f)]

IV.G.5. The Permittee shall perform the evaluations described in Permit Condition IV.G.4. within **[Note: The Permit Writer should specify the number of days.**

The report time required by the Permit Writer should take into consideration the availability of laboratory services to the Permittee and the type of statistical analysis employed by the Permittee.] after completion of sampling. [40 CFR 264.98(f)(2)]

IV.H. RECORDKEEPING AND REPORTING

IV.H.1. The Permittee shall enter all monitoring, testing, and analytical data obtained in accordance with Permit Condition IV.G. in the operating record. [40 CFR 264.73(b)(6)] The data must include all computations and results associated with the statistical test used in evaluating ground-water monitoring data.

[Note: The Permit Writer should include Permit Condition IV.H.2. if background values were not established prior to permit issuance. The Permit Writer should specify when the year-long quarterly sample analyses and computations for background values must be submitted if they were not included or acceptable in the Part B Permit Application.]

IV.H.2. The established background values and the computations necessary to determine background values must be submitted to the Regional Administrator.

[Note: Ground-water monitoring data collected, including actual levels of constituents, must be maintained in the facility operating record. The Permit Writer should specify in the permit when the data must be submitted for review.]

[40 CFR 264.97(j)]

[Note: The regulations do not require the Permittee to routinely submit all the ground-water sampling analytical results, statistical evaluations or results of the annual determination of the ground-water flow rate and direction. Such information is required to be submitted when there are significant changes in hazardous constituent concentrations or there are changes in the ground-water flow rate or direction which negate or adversely alter monitoring system effectiveness. The Permit Writer may require this "routine" information. Include Permit Condition IV.H.2. if the facility is to submit the information on a regular basis.]

IV.H.3. The Permittee shall submit the analytical results required by Permit Conditions IV.G.2. and IV.G.3. and the results of the initial statistical analyses required by Permit Condition IV.G.4., in accordance with the following schedule: [Note: The Permit Writer should specify the reporting schedule for ground-water sampling, the statistical determination of ground-water sampling, and the

annual ground-water flow rate and direction determination.]

[The following is an example of a Quarterly Reporting Schedule:

<u>Samples to be Collected</u>	<u>Results Due to</u>
<u>During the Preceding</u>	<u>the Regional</u>
<u>Administrator</u>	<u>Months of</u>
	<u>By</u>
January - February	April 15
April - May	July 15
July - August	October 15
October - November	January 15]

IV.H.4. If the Permittee determines, pursuant to Permit Condition IV.G., there is a statistically significant increase above the background values for the indicator parameters specified in Permit Condition IV.C.1., the Permittee shall:

IV.H.4.a. Notify the Agency in writing within seven days. [40 CFR 264.98(g)(1)]

IV.H.4.b. Immediately sample the ground-water in all wells and determine the concentration of all

constituents identified in Appendix IX of 40 CFR 264. [40 CFR 264.98(g)(2)]

IV.H.4.c. Establish the background values for each Appendix IX constituent found in the ground-water. [40 CFR 264.98(g)(3)]

IV.H.4.d. Within 90 days, submit to the Agency an application for a permit modification to establish a compliance monitoring program. [40 CFR 264.98(g)(4)] The application must include the following information:

IV.H.4.d.1 An identification of the concentration of each Appendix IX constituent found in the ground-water at each monitoring well at the compliance point. [40 CFR 264.98(g)(4)(i)]

IV.H.4.d.2 Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of compliance monitoring as described in 40 CFR 264.99. [40 CFR 264.98(g)(4)(ii)]

IV.H.4.d.3 Any proposed changes to the monitoring frequency, sampling and analysis procedures, or methods or

statistical procedures used at the facility necessary to meet the requirements of compliance monitoring as described in 40 CFR 264.99. [40 CFR 264.98(g) (4) (iii)]

IV.H.4.d.4 For each hazardous constituent found at the compliance point, a proposed concentration limit, or a notice of intent to seek an alternate concentration limit for a hazardous constituent . [40 CFR 264.98(g) (4) (iv)]

IV.H.4.e. Submit a corrective action feasibility plan to the Agency within 180 days. [40 CFR 264.98(g) (5)]

IV.H.5. If the Permittee determines, pursuant to Permit Condition IV.G., there is a statistically significant increase above the background values for the parameters specified in Permit Condition IV.C.1., he may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. In such cases, the Permittee shall:

IV.H.5.a. Notify the Regional Administrator in writing within seven (7) days that he intends to make a demonstration. [40 CFR 264.98(g)(6)(i)]

IV.H.5.b. Within 90 days, submit a report to the Regional Administrator which demonstrates that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. [40 CFR 264.98(g)(6)(ii)]

IV.H.5.c. Within 90 days, submit to the Regional Administrator an application for a permit modification to make any appropriate changes to the detection monitoring program at the facility. [40 CFR 264.98(g)(6)(iii)]

IV.H.5.d. Continue to monitor in accordance with the detection monitoring program at the facility. [40 CFR 264.98(g)(6)(iv)]

[Note: The Permittee need not submit a corrective action feasibility plan, in accordance with 40 CFR 264.98(g)(5)(ii), if the concentrations of all hazardous constituents identified under Permit Condition IV.H.5.b. do not exceed the respective values listed in Table 1 of 40 CFR 264.94, or the Permittee has sought an ACL

**variance for every hazardous constituent
identified under Permit Condition IV.H.5.b.]**

IV.I. ASSURANCE OF COMPLIANCE

The Permittee shall assure the Regional Administrator that ground-water monitoring and corrective action measures necessary to achieve compliance with the ground-water protection standard under 40 CFR 264.92 are taken during the term of the Permit. [40 CFR 264.98(k)]

IV.J. SPECIAL REQUIREMENTS IF SIGNIFICANT INCREASES OCCUR IN
VALUES FOR PARAMETERS OR CONSTITUENTS

If the Permittee has determined a statistically significant increase over the background values for any of the parameters and/or constituents identified in Permit Condition IV.C.1., in accordance with statistical procedures specified in Permit Condition IV.F., the Permittee must:

IV.J.1. Notify the Regional Administrator in writing, within seven (7) days. The notification must indicate what parameters or constituents have shown statistically significant increases. [40 CFR 264.98(g) (1)]

IV.J.2. Immediately sample the ground water in all wells and determine the concentration of all constituents identified in Appendix IX of 40 CFR 264. [40 CFR 264.98(g) (2)]

IV.J.3. For any Appendix IX compounds found in the analysis pursuant to Permit Condition X.J.2., the Permittee may resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If the Permittee does not resample for the compounds found pursuant to Permit Condition X.J.2., the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring. [40 CFR 264.98(g)(3)]

IV.J.4. Within 90 days, submit to the Regional Administrator an application for a permit modification to establish a compliance monitoring program. [40 CFR 264.98(g)(4)] The application must include the following:

IV.J.4.a An identification of the concentration of any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point. [40 CFR 264.98(g)(4)(i)]

IV.J.4.b Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of 40 CFR 264.99. [40 CFR 264.98(g)(4)(ii)]

IV.J.4.c Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility to meet the requirements for 40 CFR 264.99. [40 CFR 264.98(g) (4) (iii)]

IV.J.4.d For each hazardous constituent detected at the compliance point, a proposed concentration limit under 40 CFR 264.94(a) (1) or (2) or a notice of intent to seek an alternate concentration limit under 40 CFR 264.94(b). [40 CFR 264.98(g) (4) (iv)]

V.J.5 Within 180 days, all data necessary to justify an alternate concentration limit and an engineering feasibility plan for a corrective action program. [40 CFR 264.98(g) (5) (i-ii)]

[Note: The Permittee need not submit a corrective action feasibility plan, in accordance with 40 CFR 264.98(h) (1) (ii), if the concentrations of all hazardous constituents identified under Permit Condition IV.H.4.b do not exceed the respective values listed in Table 1 of 40 CFR 264.94, or the Permittee has sought an ACL variance for every hazardous constituent identified under Permit Condition IV.H.4.b.]

IV.K. REQUEST FOR PERMIT MODIFICATION

If the Permittee or the Regional Administrator determines the detection monitoring program no longer satisfies the requirements of the regulations, the Permittee must, within 90 days of the determination, submit an application for a permit modification to make any appropriate changes to the program which will satisfy the regulations. [40 CFR 264.98(h)]

PERMIT ATTACHMENTS REFERENCED IN MODULE IV -
GROUND-WATER DETECTION MONITORING

This list is provided to assist the Permit Writer in checking that all Permit Attachments referenced in this module are attached to the Permit. The purpose of the numbering scheme used here is to facilitate cross-walking with the model permit conditions. The Permit Writer may select other numbering schemes, as appropriate, when preparing actual Permits.

<u>Permit Attachment</u> <u>No.</u>	<u>Plan or Document</u> (from the Part B Permit Application)
G.W.1	Maximum Concentration of Constituents for Ground-Water Protection
G.W.2	Statistics for Ground-Water Monitoring Data Analysis
IV-1	Facility map depicting the monitoring well locations and regulated units
IV-2	Plans and specifications for monitoring well construction, installation and maintenance

IV-3	Methodology for Monitoring Well Decommissioning
IV-4	Sampling and Analysis Plan
IV-5	Alternative Statistical Procedures

ATTACHMENT G.W.1

(to Module IV - Ground-Water Detection Monitoring)

Maximum Concentration of Constituents for
Ground-Water Protection

<u>Constituent</u>	<u>Maximum concentration</u> (Milligrams per liter)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro- 1,7-epoxy-1,4, 4a,5,6,7,8,9a- octahydro-1, 4-endo, endo-5,8- dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachloro- cyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2- bis (p-methoxyphenyl) ethane)	0.1
Toxaphene (C ₁₀ H ₁₀ Cl ₆ , Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichloro- phenoxypropionic acid)	0.01

Source: 40 CFR 264.94, Table 1, July 1990.

ATTACHMENT G.W.2

(To Module IV - Ground-Water Detection Monitoring)

The following is a summary of suggested statistical procedures for ground-water data used for compliance monitoring.

The four procedures outlined in 40 CFR 264.97(h) are:

- (1) a parametric analysis of variance (ANOVA);
- (2) a nonparametric ANOVA based on ranks;
- (3) a tolerance or prediction inferral; and
- (4) a control chart approach.

Generally, some methods will be more appropriate than others for each specific site.

[Note: This is not meant to be a comprehensive treatment of statistical methods; Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Interim Final Guidance (U.S. EPA, Office of Solid Waste, Waste Management Division, April 13, 1989), should be consulted for equations and further clarification.]

A. Determining the Statistical Procedures Which are Applicable

One of the most important factors in determining the appropriate statistical procedure to be used is the normality of the data. The normal distribution is the assumed distribution for the parametric analysis of variance, tolerance intervals, and prediction intervals.

The following methods are used to determine the normality of data:

- (1) probability plots of data;
- (2) probability plots of lognormal data;
- (3) coefficient of skewness;
- (4) the Shapiro-Wilk Test of Normality; and
- (5) the Shapiro-Francia Test of Normality.

Another important assumption in some statistical tests (e.g., the parametric ANOVA) is that the different groups (i.e., wells)

have the same variance. The following methods may be used to determine the homogeneity of variance:

- (1) Box plots
- (2) Levene's test
- (3) Bartlett's test

If the test data gives evidence of non-normality or unequal variances, the data may be transformed to make the data set more nearly normal or exhibit equal variance. Tests for normality or equal variance can be applied to transformed data and one can substitute the transformed data for the raw data if the transformed data meet the assumptions of the statistical procedure.

There are many ways to transform data, but the one most commonly used is the log transformation where the natural logs of the raw data are used. Specific statistical tests have been developed for other distributions; however, rather than attempt to detail these or catalog a variety of transformations to consider, a nonparametric approach is recommended if the normal or lognormal approach is not sufficient.

The EPA guidebook for statistical analysis of ground water should be consulted for the methodologies of these tests.

B. Comparison of Compliance Well Data to Background

1. Parametric Analysis of Variance

This approach is used when several downgradient or compliance wells are to be compared to background wells. The errors are assumed to be approximately normal and the data groups defined by wells are assumed to have approximately the same variance (see EPA guidance document, pp. 5-5 to 5-13).

To test these assumptions, first compute the residuals for each well group. For a one-way ANOVA, the residuals can be found by taking the difference between each observation and its group mean. Apply a test for normality such as the Shapiro-Wilk test or a probability plot. If the data are acceptably normal, test the assumption of equal group variances using the residuals.

If, however, the residuals give evidence of non-normality, either apply a log transformation to the original data and then repeat the ANOVA using the log-transformed data, or apply a nonparametric ANOVA to the original data. If the log-transformed data are used, check the equal variance and normality assumptions for the transformed data.

To check the assumption of equal group variances, compare box plots of the residuals and/or use Levene's procedure. If the differences among the sample variances are acceptable, compute the ANOVA table. If not, consider using a nonparametric ANOVA instead.

2. Nonparametric Analysis of Variance

When the assumptions used in a parametric analysis of variance cannot be verified, e.g., when the original or transformed residuals are not approximately normal in distribution or have significantly different group variances, an analysis can be performed using the ranks of the observations rather than the observations themselves. Usually, a nonparametric procedure will be needed when a substantial fraction of the measurements are below detection (more than 15 percent), because the assumptions are then extremely difficult to verify.

Two basic nonparametric procedures are recommended, which depend on the number of well groups being compared. When background wells are compared to two or more compliance groups, the Kruskal-Wallis procedure may be used (see EPA guidance document, pp. 5-14 to 5-20). When only one compliance well group is compared to background wells, the Wilcoxin rank-sum test (also known as the Mann-Whitney test) should be used instead.

a. Kruskal-Wallis Nonparametric ANOVA

The nonparametric analysis of variance can be used in any situation that the parametric analysis of variance can be used. However, because the ranks of the data are being used, the minimum sample sizes for the groups must be a little larger. A useful rule of thumb is to require a minimum of three well

groups with at least four observations per group before using the Kruskal-Wallis procedure.

Nonparametric procedures typically need a few more observations than parametric procedures for two reasons. On the one hand, nonparametric tests make fewer assumptions concerning the distribution of the data and so more data are often needed to make the same judgment that would be rendered by a parametric test. Also, procedures based on ranks have a discrete distribution (unlike the continuous distributions of parametric tests).

Consequently, a larger sample size is usually needed to produce test statistics that will be significant at a specified alpha level such as 5 percent.

The relative efficiency of two procedures is defined as the ratio of the sample sizes needed by each to achieve a certain level of power against a specified alternative hypothesis. As sample sizes get larger, the efficiency of the Kruskal-Wallis test relative to the parametric analysis of variance test approaches a limit that depends on the underlying distribution of the data, but is always at least 86 percent. The efficiency is 95 percent if the data are really normal, and can be much larger than 100 percent in other cases (e.g., it is 150 percent if the errors follow a distribution called the double exponential).

These results concerning efficiency imply that the Kruskal-Wallis test is reasonably powerful for detecting concentration differences despite the fact that the original data have been replaced by their ranks, and can be used even when the data are normally distributed. When the data are not normal, as is frequently the case with groundwater monitoring, the Kruskal-Wallis procedure tends to be more powerful for detecting differences than the usual parametric approach.

b. Adjusting for Tied Observations

Frequently, the Kruskal-Wallis procedure will be used when the data contain a significant fraction of nondetects (e.g., more than 15 percent of the samples). In these cases, the parametric assumptions necessary for the usual one-way ANOVA are difficult or impossible to verify, making the nonparametric alternative attractive. However, the presence of nondetects prevents a unique ranking of the concentration values, since nondetects are, up to the limit of measurement, all tied at the same value.

To get around this problem, two steps are necessary. First, in the presence of ties (e.g., nondetects), all tied observations should receive the same rank. This rank (sometimes called the midrank (6)) is computed as the average of the ranks that would be given to a group of ties if the tied values actually differed by a tiny amount and could be ranked uniquely. For example, if the first four ordered observations are all nondetects, the midrank given to each of these samples would be equal to $(1+2+3+4)/4=2.5$. If the next highest measurement is a unique detect, its rank would be 5 and so on until all observations are appropriately ranked.

The second step is to compute the Kruskal-Wallis statistic as described in the EPA guidance document, using the midranks computed for the tied values. Then an adjustment to the Kruskal-Wallis statistic must be made to account for the presence of ties. This adjustment is described on page 5-17 of the EPA guidance document and requires computing the formula:

$$H' = \frac{H}{1 - \left[\sum_{i=n}^g \frac{t_i^3 - t_i}{N^3 - N} \right]}$$

where g equals the number of groups of distinct tied observations and t_i is the number of observations in the i th tied group.

c. Wilcoxin Rank-Sum Test for Two Groups

When a single compliance well group is being compared to background data and a nonparametric test is in order, the Kruskal-Wallis procedure should be replaced by the Wilcoxin rank-sum test (also known as the two-sample Mann-Whitney test). For most groundwater applications, the Wilcoxin test should be used whenever the proportion of nondetects in the combined data set exceeds 15 percent. However, to provide valid results, do not use the Wilcoxin test unless the compliance well and background data groups both have at least four samples each.

It is important to note that the EPA guidance document recommends a test of proportions when more than 50 percent of the data are nondetect. However, the Wilcoxin rank-sum test tends to be more powerful than the test of proportions for detecting concentration differences when the fraction of nondetects is less than 60 to 70 percent, and the two tests give extremely similar results when the fraction of nondetects is higher than that. It seems more useful to always recommend the Wilcoxin test as an alternative to the test of proportions.

To run the Wilcoxin rank-sum test, use the following algorithm. Combine the compliance and background data and rank the ordered values from 1 to N . Assume there are n compliance samples and m background samples so that $N=m+n$. Denote the ranks of the compliance samples by C_i and the ranks of the background samples by B_i . Then add up the ranks of the compliance samples and subtract $n(n+1)/2$ to get the Wilcoxin statistic W :

$$W = \sum_{i=1}^n C_i - \frac{1}{2}n(n+1).$$

The idea behind the Wilcoxin test is that if the ranks of the compliance data are too large relative to the background ranks, then the hypothesis that the compliance and background values came from the same population should be rejected. Large values of the statistic W give evidence of contamination at the compliance well site(s).

To find the critical value of W , a normal approximation to its distribution is used. The expected value and standard deviation of W under the null hypothesis of no contamination are given by the formulas below.

$$E(W) = \frac{1}{2}mn; \quad SD(W) = \sqrt{\frac{1}{12}mn(N+1)}$$

An approximate Z-score for the Wilcoxin rank-sum test then follows as:

$$Z \geq \frac{W - E(W) - \frac{1}{2}}{SD(W)}$$

The factor of $1/2$ in the numerator serves as a continuity correction because the discrete distribution of the statistic W is being approximated by the continuous normal distribution.

Once the approximate Z-score has been computed, it may be compared to the upper 0.01 percentile of the standard normal distribution, $z_{.01} = 2.326$, in order to determine the statistical significance of the test. If the observed Z-score is greater than 2.326, the null hypothesis may be rejected at the 1 percent significance level, suggesting there is

significant evidence of contamination at the compliance well site.

3. Intervals

Generally, a tolerance interval contains a proportion of the population, and a prediction interval contains one or more future observations. Each has a probability statement or "confidence coefficient" associated with it.

One should note that both of these intervals generally require assumptions concerning the distribution of sample data used to construct the intervals. There do exist nonparametric versions of the confidence and tolerance intervals, but it is usually assumed that the data follow an approximate normal distribution. If the data are really lognormal instead, then the interval must be constructed using the logarithms of the sample values. In this case, the limits of these intervals should not be compared to the original compliance data or fixed limit. Rather, the comparison should involve the logged compliance data or logged maximum contaminant levels (MCLs) or alternate contaminant levels (ACLs).

a. Tolerance Intervals

A tolerance interval is designed to contain a designated proportion of the population (e.g., 95 percent of all possible sample measurements). Because the interval is constructed from sample data, it is a random interval. Because of sampling fluctuations, a tolerance interval can contain the specified proportion of the population with only a certain confidence level. Two coefficients are associated with any tolerance interval. One is the proportion of the population that the interval is supposed to contain, called the coverage. The second is the degree of confidence with which the interval reaches the specified coverage. This is known as the tolerance coefficient. A tolerance interval with coverage of 95 percent and a tolerance coefficient of 95 percent is construed to contain

(at least) 95 percent of the distribution with probability of 95 percent.

Tolerance intervals are very useful for ground-water data analysis, because, in many situations, one wants to ensure that, at most, a small fraction of the compliance well sample measurements exceed a specific concentration level (chosen to be protective of human health and the environment). Because a tolerance interval is designed to cover all but a small percentage of the population measurements, exceeding the upper tolerance limit should occur very rarely when testing small samples. The upper tolerance limit allows one to gauge whether or not too many extreme concentration measurements are being sampled from compliance point wells.

Tolerance intervals can be used in detection monitoring when comparing compliance data to background values. They also should be used in compliance monitoring when comparing compliance data to certain fixed standards. Specifically, the tolerance interval approach is recommended for comparison with a maximum contaminant level (MCL) or with an alternate contaminant level (ACL) if the ACL is derived from health-based risk data.

In detection monitoring, the compliance data are assumed to come from the same distribution as background values until significant evidence of contamination can be shown. To test this hypothesis, a 95 percent coverage tolerance interval is constructed using only the background data. Then each compliance sample is compared to the upper tolerance limit. If any compliance point sample exceeds the limit, the well from which it was drawn is judged to have significant evidence of contamination.

In compliance monitoring, the tolerance interval is calculated on the compliance point data, so that the upper one-sided tolerance limit may be compared to the fixed standard (MCL or ACL). If the upper

tolerance limit exceeds the fixed standard, there is significant evidence that more than 5 percent of all the compliance well measurements will exceed the limit and consequently that the compliance point wells are in violation of the facility permit.

b. Prediction Intervals

Prediction intervals are constructed to contain the next sample value(s) from a population or distribution with a specified probability. That is, after sampling a background well for some time and measuring the concentration of an analyte, the data are used to construct an interval that will contain the concentration of the next analyte sample with a specified probability (assuming that the distribution has not changed). Thus, a prediction interval will contain a future value with specified probability. Prediction intervals also can be constructed to contain a number of future values, or the average of several future observations.

Prediction intervals are probably most useful for two kinds of situations in detection monitoring. The first would be when comparing compliance point data to background values. In this case the prediction interval would be constructed from the background data and the compliance data would be compared to the upper prediction limits. The second would be when making intrawell comparisons on an uncontaminated well. In this case, the prediction interval is constructed on past data sampled from the well, and used to predict the behavior of future samples from the same well.

When comparing background data to compliance point samples, a prediction interval can be constructed on the background values. The interval should contain all the compliance point samples provided the distribution of background and compliance point data is the same. Evidence of contamination is indicated if one or more of the compliance samples falls above the upper prediction limit.

With intrawell comparisons, a prediction interval can be computed on past data to contain a specified number of future observations from the same well, provided the well has not been contaminated previously. If any one or more of the future samples falls above the upper prediction limit, there is evidence of recent contamination at the well.

4. Control Charts

The previous sections cover various situations where the compliance well data are compared to the background well data or to specified concentration limits (ACL or MCL) to detect possible contamination. This section discusses the case where the level of each constituent within a single uncontaminated well is being monitored over time. In essence, the data for each constituent in each well are plotted on a time scale and inspected for obvious features such as trends or sudden changes in concentration levels. The method suggested here is a combined Shewhart-CUSUM control chart for each well and constituent.

The control chart method is recommended for uncontaminated wells only, when data comprising at least eight independent samples over a 1-year period are available. This requirement is specified under current RCRA regulations and applies to each constituent in each well.

At least four sampling periods at a unit of eight or more wells and at least eight sampling periods at a unit with fewer than four wells is recommended.

The use of control charts can be an effective technique for monitoring the levels of a constituent at a given well over time. It also provides a visual means of detecting deviations from a "state of control." It is clear that plotting of the data is an important part of the analysis

process. Plotting is an easy task, although time-consuming if many data sets need to be plotted. Advantage should be taken of graphics software, because plotting of time series data will be an ongoing process. New data points will be added to the already existing data base each time new data are available. Each data point should be plotted against time using a time scale (e.g., month, quarter). A plot should be generated for each constituent measured in each well. For visual comparison purposes, the scale should be kept identical from well to well for a given constituent. The following few sections will discuss, in general terms, the advantages of plotting time series data; the corrective steps one could take to adjust when seasonality in the data is present; and finally, the detailed procedure for constructing a Shewhart-CUSUM control chart, along with a demonstration of that procedure, is presented.

An important application of the plotting procedure is for detecting possible trends or drifts in the data from a given well. Furthermore, when visually comparing the plots from several wells within a unit, possible contamination of one rather than all downgradient wells could be detected which would then warrant a closer look at that well. In general, graphs can provide highly effective illustrations of the time series, allowing the analyst to obtain a much greater sense of the data. Seasonal fluctuations or sudden changes, for example, may become quite evident, thereby supporting the analyst in his/her decision of which statistical procedure to use. General upward or downward trends, if present, can be detected and the analyst can follow-up with a test for trend, such as the nonparametric Mann-Kendall test (Mann, 1945; Kendall, 1975). If, in addition, seasonality is suspected, the user can perform the seasonal Kendall test for trend developed by Hirsch et al. (1982). The reader is also referred to Chapters 16 "Detecting and Estimating Trends" and 17 "Trends and Seasonality" of Gilbert's "Statistical Methods for Environmental Pollution Monitoring," 1987. In any of the above cases, the help of a professional statistician is recommended.

Another important use of data plots is that of identifying unusual data points (e.g., outliers). These points should then be investigated for possible QC problems, data entry errors, or whether they are truly outliers.

Many software packages are available for computer graphics, developed for mainframes, mini-, or microcomputers. For example, SAS features an easy-to-use plotting procedure, PROC PLOT; where the hardware and software are available, a series of more sophisticated plotting routines can be accessed through SAS GRAPH. On microcomputers, almost everybody has his or her favorite graphics software that they use on a regular basis and no recommendation will be made as to the most appropriate one. The plots shown in this document were generated using LOTUS 1-2-3.

Once the data for each constituent and each well are plotted, the plots should be examined for seasonality and a correction is recommended should seasonality be present. A fairly simple-to-use procedure for deseasonalizing data is presented in the following paragraphs.

a. Correcting for Seasonality

A necessary precaution before constructing a control chart is to take into account seasonal variation of the data to minimize the change of mistaking seasonal effect for evidence of well contamination. This could result from variations in chemical concentrations with recharge rates during different seasons throughout the years. If seasonality is present, then deseasonalizing the data prior to using the combined Shewhart-CUSUM control chart procedure is recommended.

Many approaches to deseasonalize data exist. If the seasonal pattern is regular, it may be modeled with a sine or cosine function. Moving averages can be used, or differences (of order 12 for monthly data for example) can be used. However, time series models may include rather complicated

methods for deseasonalizing the data. Another simpler method exists which should be adequate for the situations described in this document. It has the advantage of being easy to understand and apply, and of providing natural estimates of the monthly or quarterly effects via the monthly or quarterly means. The method proposed here can be applied to any seasonal cycle--typically an annual cycle for monthly or quarterly data.

Note: Corrections for seasonality should be used with great caution as they represent extrapolation into the future. There should be a good scientific explanation for the seasonality as well as good empirical evidence for the seasonality before corrections are made. Larger than average rainfalls for two or three Augusts in a row does not justify the belief that there will never be a drought in August, and this idea extends directly to groundwater quality. In addition, the quality (bias, robustness, and variance) of the estimates of the proper corrections must be considered even in cases where corrections are called for. If seasonality is suspected, the user might want to seek the help of a professional statistician.

When seasonality is known to exist in a time series of concentrations, then the data should be deseasonalized prior to construction control charts in order to take into account seasonal variation rather than mistaking seasonal effects for evidence of contamination.

The following instructions to adjust a time series for seasonality are based on monthly data with a yearly cycle. The procedure can be easily modified to accommodate a yearly cycle of quarterly data.

Assume that N years of monthly data are available. Let x_{ij} denote the unadjusted observation for the i th month during the j th year.

Step 1. Compute the average concentration for month i over the N -year period:

$$\bar{x}_i = (X_{i1} + \dots + X_{iN})/N$$

This is the average of all observations taken in different years but during the same month. That is, calculate the mean concentrations for all Januarys, then the mean for all Februarys and so on for each of the 12 months.

Step 2. Calculate the grand mean, \bar{X} , of all $N \times 12$ observations,

$$\bar{X} = \frac{\sum_{i=1}^{12} \sum_{j=1}^N X_{ij}}{N \times 12} = \sum_{i=1}^{12} \bar{X}_i / 12$$

Step 3. Compute the adjusted concentrations,

$$Z_{ij} = X_{ij} - \bar{X}_i + \bar{X}$$

Computing $X_{ij} - \bar{X}_i$ removes the average effect of month i from the monthly data, and adding \bar{X} , the overall mean, places the adjusted Z_{ij} values about the same mean, \bar{X} . It follows that the overall mean adjusted observation, Z , equals the overall mean unadjusted value, \bar{X} .

b. Combined Shewhart-CUSUM Control Charts for Each Well and Constituent

The standard assumptions in the use of control charts are that the data generated by the process, when it is in control, are independently and normally distributed with a fixed mean μ and constant variance σ^2 . The most important assumption is that of independence; control charts are not robust with respect to departure from independence (e.g., serial correlation). In general, the sampling scheme will be such that the possibility of obtaining serially correlated results is minimized. The assumption of normality

is of somewhat less concern, but should be investigated before plotting the charts. A transformation (e.g., log-transform, square root transform) can be applied to the raw data so as to obtain errors normally distributed about the mean. An additional situation which may decrease the effectiveness of control charts is seasonality in the data. The problem of seasonality can be handled by removing the seasonality effect from the data, provided that sufficient data to cover at least two seasons of the same type are available (e.g., 2 years when monthly or quarterly seasonal effect).

Combined Shewhart-cumulative sum (CUSUM) control charts are constructed for each constituent at each well to provide a visual tool of detecting both trends and abrupt changes in concentration levels.

Assume that data from at least eight independent samples of monitoring are available to provide reliable estimates of the mean, μ , and standard deviation, σ , of the constituent's concentration levels in a given well.

To construct a combined Shewhart-CUSUM chart, three parameters need to be selected prior to plotting:

h - a decision interval value

k - a reference value

SCL - Shewhart control limit

The parameter k of the CUSUM scheme is directly obtained from the value, D, of the displacement that should be quickly detected; $k = D/2$. It is recommended to select $k = 1$, which will allow a displacement of two standard deviations to be detected quickly.

When k is selected to be 1, the parameter h is usually set at values of 4 or 5. The parameter h is the value against which the cumulative sum in the CUSUM scheme will be compared. In the context of groundwater monitoring, a value of $h = 5$ is recommended.

The upper Shewhart limit is set at $SCL = 4.5$ in units of standard deviation. This combination of $k = 1$, $h = 5$, and $SCL = 4.5$ was found most appropriate for the application of combined Shewhart-CUSUM charts for groundwater monitoring (Starks, 1988).

Assume that at time period T_i , n_i concentration measurements $X_1 \dots, X_{n_i}$, are available and compute their average \bar{X}_i .

Calculate the standardized mean using the formula:

$$Z_i = (\bar{X}_i - \mu) \sqrt{n_i/\sigma}$$

where μ and σ are the mean and standard deviation obtained from prior monitoring at the same well (at least four sampling periods in a year).

At each time period, T_i , compute the cumulative sum, S_i , as:

$$S_i = \max 0, (Z_i - k) + S_{i-1}$$

where $\max \{A, B\}$ is the maximum of A and B, starting with $S_0 = 0$.

Plot the values of S_i versus T_i on a time chart for this combined Shewhart-CUSUM scheme. Declare an "out-of-control" situation at sampling period T_i if for the first time, $S_i \geq h$ or $Z_i \geq SCL$. This will indicate probable contamination at the well and further investigations will be necessary.

c. Update of a Control Chart

The control chart is based on preselected performance parameters as well as on estimates of μ and σ , the parameters of the distribution of the measurements in question. As monitoring continues and the process is found to be in control, these parameters need periodic updating so as to incorporate this new information into the control

charts. In general, adjustments in sample means and standard deviations be made after sampling periods 4, 8, 12, 20, and 32, following the initial monitoring period recommended to be at least eight sampling periods. Also, the performance parameters h , k , and SCL would need to be updated. It is suggested that $h = 5$, $k = 1$, and $SCL = 4.5$ be kept at those values for the first 12 sampling periods following the initial monitoring plan, and that k be reduced to 0.75 and SCL to 4.0 for all subsequent sampling periods. These values and sampling period numbers are not mandatory. In the event of an out-of-control state or a trend, the control chart should not be updated.

d. Nondetects in a Control Chart

Regulations require that four independent water samples be taken at each well at a given sampling period. The mean of the four concentration measurements of a particular constituent is used in the construction of a control chart. Situations will arise when the concentration of a constituent is below detection limit for one or more samples. The following approach is suggested for treating nondetects when plotting control charts.

If only one of the four measurements is a nondetect, then replace it with one half of the detection limit ($MDL/2$) or with one half of the practical quantitation limit ($PQL/2$) and proceed as described earlier.

If either two or three of the measurements are nondetects, use only the quantitated values (two or one, respectively) for the control chart and proceed as discussed earlier.

If all four measurements are nondetects, then use one half of the detection limit or practical quantitation limit as the value for the construction of the control chart. This is an obvious situation of no contamination of the well.

In the event that a control chart requires updating and a certain proportion of the measurements is below detection limit, then adjust the mean and standard deviation necessary for the control chart by using Cohen's method (see EPA Guidance Manual). In that case, the proportion of nondetects applies to the pool of data available at the time of the updating and would include all nondetects up to that time, not just the four measurements taken at the last sampling period.

CAUTIONARY NOTE: Control charts are a useful supplement to other statistical techniques because they are graphical and simple to use. However, it is inappropriate to construct a control chart on wells that have shown evidence of contamination or an increasing trend (see §264.97(a)(1)(i)). Further, contamination may not be present in a well in the form of a steadily increasing concentration profile--it may be present intermittently or may increase in a step function. Therefore, the absence of an increasing trend does not necessarily prove that a release has not occurred.

5. Handling Values Below Detection Level

To make appropriate adjustments for nondetect measurements in statistical procedures for ground-water monitoring data, the overall percentage of nondetects must first be determined. Generally, if the percentage is no greater than 15 percent, one of two basic approaches can be taken. Either perform a simple substitution (e.g., replace each nondetect by half the detection limit) or compute nondetect concentrations via a more complex estimation scheme that requires parametric assumptions about the data (e.g., Cohen's adjustment procedure, which assumes that the data are really normal or lognormal in distribution). When the proportion of nondetects is less than 15 percent, simple substitution methods will not significantly decrease the power of the statistical procedures. Therefore, its use is recommended for ease of computation.

If the percentage of nondetects is greater than 15 percent, it is probably wiser to use a nonparametric statistical method than to impute values for nondetects. Simple substitution methods tend to perform poorly in statistical procedures when the nondetect percentage is substantial (8). Likewise, when the percentage of nondetects is high, it is very difficult to verify the assumption of normality or lognormality needed to perform Cohen's adjustment. Furthermore, the mean and variance estimates resulting from Cohen's adjustment tend to be unstable for small samples of the sizes frequently encountered in ground-water monitoring data analysis.

For these reasons, a nonparametric method is recommended when the percent of nondetects exceeds 15 percent. As such, when ranking data containing nondetects, all values below detection should be given the same rank, presumably representing the lowest concentrations present within the data set.

MODULE V - GROUND-WATER COMPLIANCE MONITORING

[Note: This module presents permit conditions addressing the regulatory requirements for ground-water compliance monitoring programs (40 CFR 264.91, 264.98, and 264.99). A compliance monitoring program must be established at the facility if the Permittee or the Regional Administrator determines there is a statistically significant increase in the concentration of hazardous constituents in the ground water at the point of compliance. This determination is the result of either an interim status assessment ground-water monitoring program [40 CFR 265.91] or a detection ground-water monitoring program [40 CFR 264.98]. Federal regulations 40 CFR 264.98(g)(4) and 270.14(c)(5) and (c)(7) require the applicant to submit detailed plans and engineering reports describing the proposed compliance monitoring program.]

[Note: The goal of compliance monitoring is to determine whether and when leakage of hazardous constituents into the ground water exceeds specified concentration limits. Compliance monitoring entails the following:

1. Development of a list of all 40 CFR 264, Appendix IX hazardous constituents present in the ground-water which could have reasonably been derived from the facility;
2. Specification of a concentration limit for each hazardous constituent listed in the Permit;
3. Establishment of a ground-water protection standard at the compliance point; and
4. Establishment of the duration of the compliance period.]

[Note: On July 9, 1987, a federal rule was finalized to require analysis for 40 CFR 264, Appendix IX, rather than 40 CFR 261, Appendix VIII, hazardous constituents pursuant to 40 CFR 264.98 and 264.99, (1) if a statistically significant increase occurs for any detection monitoring parameters or constituents, and (2) annually under compliance monitoring. The Appendix IX list is an abbreviated Appendix VIII list, with several constituents added. This permit module incorporates the new rule.]

[Note: Under 40 CFR 264.91(b) the Regional Administrator may include one or more of the following programs in a permit: (1) detection monitoring (Module IV), (2) compliance monitoring (Module V), and (3) corrective action (Module VII). If more than one program is included in the Permit, the Permit Writer is to specify the circumstances or conditions under which each program will be required. It is possible that more than one program will be operable at the same time at a facility, or that the programs will be conditional based on a sequence of events. For example, the sequence set up in the Permit could include a detection monitoring program that triggers an Appendix IX analysis that triggers a Permittee option to apply for a variance (e.g., other contamination source or sampling error) and if the Permittee fails to seek or fails to obtain a variance, then compliance monitoring is triggered. The Permit could also set the ground water protection standard, with a provision for the Permittee to apply for an Alternate Concentration Limit (ACL), and in the absence of an ACL application or denial of an ACL, or exceedence of an ACL or pre-set limit, the triggering of the corrective action program. The corrective action program could include plume assessment, corrective measures study and design, and implementation of corrective action. Setting up such a sequence in the Permit reduces the number of permit modifications that may be needed and decreases the administrative time needed to get on with subsequent steps in the process and ultimately, the time required to get corrective action under way, if needed.]

[Note: The Permit Writer should refer to the Model *RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

V.A. MODULE HIGHLIGHTS

[The Permit Writer should include a general discussion of the activities covered by this module. The discussion should include the following information: description of the waste management units for which compliance monitoring is being conducted; number, location, and depth of wells; which wells are upgradient and downgradient; hazardous constituents and concentration limits; compliance period for each hazardous

waste management unit; special features associated with the operation; and a reference to any special permit conditions.]

V.B. WELL LOCATION, INSTALLATION AND CONSTRUCTION

[Note: For specific Agency guidance on monitoring well design and construction, hydrogeologic site characterization, and location of monitoring wells, the Permit Writer should consult the EPA RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (September 1986).]

The Permittee shall **[install and]** maintain a ground-water monitoring system, as specified below: [40 CFR 264.99(b)]

V.B.1. The Permittee shall **[install and]** maintain ground-water monitoring wells at the locations specified on the map presented in Permit Attachment V-1, and in conformance with the following list:

[Note: The map must show all monitoring well locations and provide identifiers for each well. The number and location of monitoring wells utilized for ground-water monitoring is site specific. The number and location of the wells must meet the requirements of 40 CFR 264.95 (Point of Compliance) and 40 CFR 264.97(a) or (b) (number, location, and depth of wells). The ground-water monitoring system must: yield samples in upgradient wells that represent the quality of the background water unaffected by leakage from any regulated unit(s); and, in downgradient wells, yield samples that represent the quality of water passing the point of compliance. The number and location of monitoring wells must be sufficient to identify and define all potential release pathways from the regulated units based on site-specific hydrogeologic characterization. The Permit Writer may require the Permittee to selectively monitor a hydrologic zone that the Permittee has not described as part of the uppermost aquifer (e.g., perched water table); if based on hydrogeological characteristics, the hydrogeologic zone is an area of concern for the migration of hazardous constituents from regulated units that can be transported to any exposure point.]

V.B.2. The Permittee shall **[construct and]** maintain the monitoring wells identified in Permit Condition V.B.1., in accordance with the plans and specifications presented in Permit Attachment V-2.

[Note: The plans and specifications in the Part B Permit Application must meet the requirements of 40 CFR 264.97(a) and (c). They should consist of design drawings and design criteria applicable to all wells and individual well specifications identifying depth and screened intervals.]

[Note: If determined to be necessary to protect human health or the environment, the Permit Writer may include Permit Condition V.B.3., specifications on how monitoring wells are plugged and abandoned. HSWA Section 212 provides EPA with this authority. Several states have regulations which cover monitoring well decommissioning.]

V.B.3. All wells deleted from the monitoring program shall be decommissioned in accordance with Permit Attachment V-3. Well decommissioning methods and certification shall be submitted to the Regional Administrator within **[The Permit Writer should specify the submittal period.]** from the date the wells are removed from the monitoring program.

V.C. GROUND-WATER PROTECTION STANDARD

[Note: The Permit Writer must establish concentration limits for the constituents listed in this condition, pursuant to 40 CFR 264.94(a) to implement the ground-water protection standard. Concentration limits for hazardous constituents are established at each waste management area to determine the ground-water protection standard (GWPS) at the facility. There are four ways to determine the concentration limits in establishing the GWPS: (1) use of pooled background levels of the hazardous constituents determined from facility ground-water monitoring; (2) use of maximum constituent concentrations listed in Table 1, 40 CFR 264.94(a) - Permit Attachment G.W.1 to this module; (3) use of alternate concentration limits (ACLs) proposed by the Permittee; or (4) the concentration limits may be established at upgradient wells

each time the ground-water is sampled at the compliance point, if there is a high temporal correlation. The GWPS may be a combination of these four methods. For detailed information on ACLs, consult the EPA Alternate Concentration Limit Guidance (July 1987). The Permit Writer may incorporate the background concentrations of hazardous constituents from Table 1, 40 CFR 264.94(a), if background concentrations for these constituents have not been established at the facility.]

V.C.1. The Permittee shall monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under 40 CFR 264.92. The following hazardous constituents and their concentration limits comprise the ground-water protection standard: [40 CFR 264.93 and 94]

<u>Limits</u>	<u>Hazardous Constituents</u>	<u>Concentration</u>
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[Note: The Permit Writer should develop a list of hazardous constituents to establish initial compliance monitoring requirements using the following information submitted by the Permittee in the Part B Permit Application: waste analysis plan, waste characterization, site hydrogeologic characterization, Appendix IX ground-water sample analyses, and proposed monitoring constituents. In addition to the hazardous constituents, the Permit Writer may require the Permittee to monitor for ground-water quality indicator parameters.]

[Note: The concentration limits should be determined from the mean of pooled background data available for the concentrations of hazardous constituents at the time of permitting, from Table 1 in 40 CFR 264.94(a) or approved ACLs. The Permittee should include Permit Condition V.C.2. if the Permittee has demonstrated a high temporal correlation between upgradient and compliance point hazardous constituents.] [40 CFR 264.99(c)(1)]

V.C.2. The Permittee may establish the concentration limit by sampling the upgradient well(s) each time ground-water is sampled at the compliance point. The concentration limit for the hazardous constituent(s) must be determined according to the following procedure:

[Note: the Permit Writer must specify the procedures used for determining the concentration limit in Permit Condition V.C.2. The concentration limits may be determined by Permit Condition V.C.2. only if the Permittee can demonstrate a high temporal correlation between upgradient and compliance point concentrations for hazardous constituents.]

V.C.3. The Permittee shall monitor **[The Permit Writer should specify the well numbers to be monitored.]** at the point of compliance, as described in Permit Condition V.B., and as designated in Permit Attachment V-1. [40 CFR 264.95]

V.C.4. The compliance period, during which the ground-water protection standard applies, is equal to _____ months (or years) **[The Permit Writer should specify the applicable time period. The compliance period shall begin at the time the Permittee begins the compliance monitoring program.]** [40 CFR 264.96(b)] If the Permittee is conducting corrective action at the end of the compliance period specified, then the compliance period shall be extended until the Permittee demonstrates that the ground-water protection standard has not been exceeded for three consecutive years. [40 CFR 264.96(c)]

V.D. SAMPLING AND ANALYSIS PROCEDURES

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the ground-water monitoring wells described in Permit Condition V.B.: [40 CFR 264.97(d) and (e)]

V.D.1. Samples shall be collected using the techniques described in Permit Attachment V-4.

V.D.2. Samples shall be preserved [**and shipped (when shipped off site for analysis)**], in accordance with the procedures specified in Permit Attachment V-4.

V.D.3. Samples shall be analyzed in accordance with the procedures specified in Permit Attachment V-4.

V.D.4. Samples shall be tracked and controlled using the chain-of-custody procedures specified in Permit Attachment V-4.

[Note: The sampling and analysis procedures described in the Part B Permit Application must be designed to provide a reliable indication of ground-water quality below the waste management area and be compatible with the statistical analysis method.]

V.D.5 The Permittee must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to 40 CFR 264.99(a) at a frequency specified under 40 CFR 264.99(f). The concentration of hazardous constituents in the ground water at the compliance point must be determined by collecting a sequence of at least four samples from each well (background and compliance wells) at least semi-annually during the compliance period which was specified in Permit Condition V.C.3. [40 CFR 264.99(d)]

[Note: The Permit Writer can require more frequent collection of samples, if necessary.]

V.D.6 The Permittee must analyze samples from all monitoring wells, at the compliance point, for all constituents listed in Appendix IX of Part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer, and, if so, at what concentration, pursuant to procedures in 40 CFR 264.98(f). If the Permittee finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the

Permittee may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the Permittee must report the concentration of these additional constituents to the Regional Administrator within seven days after the completion of the second analysis and add them to the monitoring list. If the Permittee chooses not to resample, then he or she must report the concentrations of these additional constituents to the Regional Administrator within seven days after completion of the initial analysis and add them to the monitoring list. [40 CFR 264.99(g)]

[Note: The Permit Writer can require more frequent collection of Appendix IX samples, if necessary.]

V.E. ELEVATION OF THE GROUND-WATER SURFACE

V.E.1. The Permittee shall determine the ground-water surface elevation at each monitoring well each time ground water is sampled in accordance with Permit Condition V.G. [40 CFR 264.97(f)]

[Note: The Permit Writer should include Permit Condition V.E.2. if new monitoring wells are installed. The surveyed ground surface elevation of all existing monitoring wells is required on the facility map from the Part B Permit Application.]

V.E.2. The Permittee shall report the surveyed elevation of the monitoring well(s) when installed (with as-built drawings). **[Note: The total depth of wells and the elevation of the following should be recorded: top of casing, ground surface and/or apron elevation, and the protective casing.]**

V.F. STATISTICAL PROCEDURES

When evaluating the monitoring results in accordance with Permit Condition V.G., the Permittee shall use the following procedures:

[Note: The Permittee must use a statistical procedure outlined under 40 CFR 264.97(h). Use of the statistical method must be

protective of human health and the environment and must comply with the performance standards outlined under 40 CFR 264.94 (i) .]

V.G. MONITORING PROGRAM AND DATA EVALUATION

The Permittee shall determine ground-water quality as follows:

V.G.1. The Permittee shall collect, preserve, and analyze ground-water samples pursuant to Permit Condition V.D.

V.G.2. The Permittee shall determine the concentration of hazardous constituents (as specified in Permit Condition V.C) in ground-water at each monitoring well (required under Permit Condition V.B.), at the compliance point, during the compliance period. These determinations shall be made **[The Permit Writer should specify the frequency. A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.]** [40 CFR 264.99(f)]

V.G.3. The Permittee shall determine the ground-water flow rate and direction in the uppermost aquifer at least annually. [40 CFR 264.99(e)]

V.G.4. The Permittee shall analyze samples from all monitoring wells, at the compliance point, for all constituents contained in Appendix IX of Part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration pursuant to procedures in 40 CFR 264.98(f). If the Permittee finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the Permittee may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the Permittee must report the concentration of these additional constituents to the Regional Administrator within seven days after the

completion of the second analysis and add them to the monitoring list. If the Permittee chooses not to resample, then he or she must report the concentrations of these additional constituents to the Regional Administrator within seven days after the completion of the initial analysis and add them to the monitoring list. [40 CFR 264.99(g)]

V.G.5. For each hazardous constituent identified in Permit Condition V.C, the Permittee shall determine whether statistically significant evidence of increased contamination exists. In determining whether such an increase has occurred, the Permittee shall use the method(s) specified in the permit under 40 CFR 264.97(h). The method(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with 40 CFR 264.94. The Regional Administrator will determine within what time period the Permittee must make this determination. [40 CFR 264.99(d) (1) and (d) (2)]

V.G.6. The Permittee shall perform the statistical evaluation required by Permit Condition V.G.5. within **[Note: The Permit Writer should specify the time period, considering the complexity of the statistical test and the availability of laboratory facilities to perform the ground-water sample analysis.]** days from completion of the sampling analysis. [40 CFR 264.99(d) (2)]

V.H. REPORTING AND RECORDKEEPING

V.H.1. The Permittee shall enter all monitoring, testing, and analytical data obtained pursuant to Permit Condition V.G. in the operating record. The data must include all computations, calculated means, variances, and results of statistical tests. [40 CFR 264.73(b)]

[Note: The regulations do not require the Permittee to routinely submit all the ground-water sampling analytical results, statistical evaluations, or results of the annual determination

of the ground-water flow rate and direction. Such information is required to be submitted when there are significant changes in hazardous constituent concentrations or there are changes in the ground-water flow rate or direction which negate or adversely alter monitoring system effectiveness. However, the Permit Writer may require this "routine" information. Include Permit Condition V.H.2. if the facility is to submit the information on a regular basis.]

V.H.2. The Permittee shall submit the analytical results required by Permit Conditions V.E., V.G.2., V.G.3., and V.G.5., in accordance with the following schedule:

[Note: The following is an example of a quarterly ground-water report schedule:

<u>Samples to be Collected</u> <u>During the Preceding</u> <u>Months of _____</u>	<u>Results Due to the</u> <u>Regional</u> <u>Administrator By</u>
January - February	April 15
April - May	July 15
July - August	October 15
October - November	January 15]

V.H.3. If the Permittee determines, pursuant to Permit Condition V.G., there is a statistically significant increase above the concentration limits for the constituents specified in Permit Condition V.C. (indicating that the ground-water protection standard is being exceeded), the Permittee shall notify the Regional Administrator in writing within seven (7) days. (40 CFR 264.99(h) (1)]

V.H.4. The Permittee must analyze samples from all monitoring wells, at the compliance point, for all constituents listed in Appendix IX of Part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration pursuant

to procedures in 40 CFR 264.98(f). If the Permittee finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the Permittee may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the Permittee must report the concentration of these additional constituents to the Regional Administrator within seven days after the completion of the second analysis and add them to the monitoring list. If the Permittee chooses not to resample, then he or she must report the concentrations of these additional constituents to the Regional Administrator within seven days after completion of the initial analysis and add them to the monitoring list. [40 CFR 264.99(g)]

V.I. ASSURANCE OF COMPLIANCE

The Permittee shall assure that monitoring and corrective action measures necessary to achieve compliance with the ground-water protection standard are taken during the term of the Permit.

V.J. SPECIAL REQUIREMENT IF THE GROUND-WATER PROTECTION STANDARD IS EXCEEDED

V.J.1. The Permittee must notify the Regional Administrator in writing within seven (7) days if the ground-water protection standard has been exceeded at any monitoring well. The notification must indicate which concentration limits have been exceeded. [40 CFR 264.99(h) (1)]

V.J.2. The Permittee must submit to the Regional Administrator a permit modification to establish a corrective action program meeting 40 CFR 264.100 requirements within 180 days, or within 90 days if the Permittee has previously submitted an engineering feasibility study. [40 CFR 264.99(h) (2)] **[Note: The information requirements for the permit modification are outlined in 40 CFR 264.99(h) (2) (i) and (h) (2) (ii).]**

V.J.3. The Permittee may make a demonstration that the ground-water protection standard was exceeded due to sources other than a regulated unit or errors in sampling, analysis or evaluation. [40 CFR 264.99(i)]

V.J.3.a. The Permittee must notify the Regional Administrator in writing, within seven (7) days, that a demonstration will be made. [40 CFR 264.99(i)(1)]

V.J.3.b. The Permittee must submit a report to the Regional Administrator, within 90 days, that demonstrates that a source other than a regulated unit caused the ground-water protection standard to be exceeded or that the apparent non-compliance was a result of an error in sampling, analysis or evaluation. [40 CFR 264.99(i)(2)]

V.J.3.c. The Permittee must submit to the Regional Administrator within 90 days an application for a permit modification to make any appropriate changes in the compliance monitoring program at the facility. [40 CFR 264.99(i)(3)]

V.J.3.d. The Permittee must continue the compliance monitoring program in accordance with 40 CFR 264.99.

V.J.4. If the Permittee or the Regional Administrator determines that the compliance monitoring program no longer satisfies the requirements of 40 CFR 264.99, the Permittee must submit a permit modification application within 90 days of the determination detailing appropriate changes to the compliance monitoring program. [40 CFR 264.99(j)]

V.K. REQUEST FOR PERMIT MODIFICATION

V.K.1. If the Permittee or the Regional Administrator determines the ground-water protection standard is

being exceeded, the Permittee shall submit to the Regional Administrator an application for a permit modification to establish a corrective action program. [40 CFR 264.99(h)(2)]

[Note: Submittal is required within 90 days if an engineering feasibility study has been previously submitted to the Regional Administrator; within 180 days otherwise. The application content is described in 40 CFR 264.99(h)(2).]

V.K.2. If the Permittee or the Regional Administrator determines the compliance monitoring program no longer satisfies the requirements of 40 CFR 264.99, then, within 90 days, the Permittee must submit an application for a permit modification to make any appropriate changes to the program. [40 CFR 264.99(j)]

PERMIT ATTACHMENT REFERENCED IN MODULE V -
GROUND-WATER COMPLIANCE MONITORING

This list is provided to assist the Permit Writer in checking that all Permit Attachments referenced in this module are attached to the Permit. The purpose of the numbering scheme used here is to facilitate cross-walking with the model permit conditions. The Permit Writer may select other number schemes, as appropriate, when preparing actual Permits.

<u>Permit Attachment No.</u>	<u>Plan or Document</u> (from the Part B Permit Application)
G.W.1	Maximum Concentration of Constituents for Ground-Water Protection
V-1	Facility map depicting ground-water monitoring wells and regulated units
V-2	Plans and specifications for monitoring well construction, installation and maintenance
V-3	Methodology for monitoring well decommissioning
V-4	Sampling and Analysis Plan
V-5	Statistical Procedures

ATTACHMENT G.W.1
 (to Module V - Ground-Water Compliance Monitoring)
 Maximum Concentration of Constituents for
 Ground-Water Protection

<u>Constituent</u> <u>concentration</u>	<u>Maximum</u>
Milligrams per liter)	
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro- 1,7-epoxy-1,4, 4a,5,6,7,8,9a- octahydro-1,4-endo, endo-5,8- dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachloro- cyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1- Trichloro-2,2-bis (p- methoxypheny) lethane)	0.1
Toxaphene (C ₁₀ H ₁₀ Cl ₆ , Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichloro- phenoxypropionic acid)	0.01

Source: 40 CFR 264.94, Table 1, July 1990.

MODULE VI - ADDITIONAL PERMIT CONDITIONS

[Note: this Module should include, at the discretion of the Permit Writer, any additional miscellaneous conditions necessary to comply with the Environmental Performance Standards contained in 40 CFR 264.601]

VI.A The Permittee shall adhere to the following additional permit conditions to demonstrate compliance with 40 CFR 264.601. **[Note: in this condition the Permit writer should list additional requirements not included elsewhere. These conditions will be highly site specific.]**

MODULE VII - CORRECTIVE ACTION FOR REGULATED UNITS

[Note: This module provides permit conditions for waste management units which have exceeded the ground-water protection standard at any monitoring well at the point of compliance. If the ground-water protection standard is exceeded at any monitoring well at the point of compliance, a corrective action program must be implemented to bring the unit back into compliance with the standard. A corrective action program may be permitted separately after receipt of an application for a permit modification or it may be specified as part of the Permit for the compliance monitoring program.]

[Note: On July 9, 1987, a federal rule was finalized to require analysis for 40 CFR 264, Appendix IX, rather than 40 CFR 261, Appendix VIII, hazardous constituents pursuant to 40 CFR 264.98 and 264.99, (1) if a statistically significant increase occurs for any detection monitoring parameters or constituents and (2) annually under compliance monitoring. The Appendix IX list is an abbreviated Appendix VIII list, with some additional constituents. This permit module incorporates this new rule.]

[Note: Under 40 CFR 264.91(b) the Regional Administrator may include one or more of the following programs in a permit: (1) detection monitoring (Module IV), (2) compliance monitoring (Module V), and (3) corrective action [Module VII]. If more than one program is included in the Permit, the Permit Writer is to specify the circumstances or conditions under which each program will be required. It is possible that more than one program will be operable at the same time at a facility, or that the programs will be conditional based on a sequence of events. For example, the sequence set up in the Permit could include a detection monitoring program that triggers an Appendix IX analysis that triggers a Permittee option to apply for a variance (e.g., other contamination source or sampling error) and if the Permittee fails to seek or fails to obtain a variance, then compliance monitoring is triggered. The Permit could also set the ground water protection standard, with a provision for the Permittee to apply for an Alternate Concentration Limit (ACL), and in the absence of an ACL application or denial of an ACL, or exceedence of an ACL or pre-set limit, the triggering

of the corrective action program. The corrective action program could include plume assessment, corrective measures study and design, and implementation of corrective action. Setting up such a sequence in the Permit reduces the number of permit modifications that may be needed and decreases the administrative time needed to get on with subsequent steps in the process and ultimately, the time required to get corrective action under way, if needed.]

[Note: The Permit Writer should refer to the *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

VII.A. MODULE HIGHLIGHTS

[The Permit Writer should include a general discussion of the activities covered by this module. The discussion should contain the following information: description of the waste management unit(s) for which corrective action is required; number, location, and depth of monitoring wells; which wells are upgradient and downgradient; hazardous constituents and concentration limits; compliance period for each waste management unit; any special features associated with the operation; and a reference to any special permit conditions.]

VII.B. WELL LOCATION, INSTALLATION AND CONSTRUCTION

[Note: For specific Agency guidance on monitoring well design and construction, hydrogeologic site characterization and location of monitoring wells, the Permit Writer should consult the EPA RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (September 1986).]

The Permittee shall [install and] maintain a ground-water monitoring system to comply with the requirements specified below: [40 CFR 264.100(d)]

VII.B.1. The Permittee shall [install and] maintain ground-water monitoring wells at the locations specified on the map in Permit

**Attachment VII-1 and in conformance with the following list:
[40 CFR 264.100(a)(3) and (d)]**

[Note: The Permit Writer should specify the number and locations of upgradient and downgradient wells. A brief description of the locations of the wells, relative to the regulated units and geological formations, should also be provided. The description should identify the spacing of wells and screened depths (intervals).]

[Note: The map must show all monitoring well locations and provide unique identifiers for each well. The number and location of the wells must meet the requirements of 40 CFR 264.95 (Point of Compliance) and 40 CFR 264.97(a) or (b) (number, location, and depth of wells). The number and location of monitoring wells must be sufficient to identify and define all potential release pathways from the regulated units based on site-specific hydrogeologic characterization. The map should make a distinction among point-of-compliance wells, withdrawal wells (for pump and treat systems), and observation wells or piezometers. This may include the area between the point of compliance and the facility boundary.]

[Note: The information submitted must also meet the requirements of 40 CFR 270.14(c). These requirements include: a summary of the ground-water monitoring data obtained during interim status; identification of the uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including ground-water flow direction and rate; a delineation on a topographic map of the waste management area, the property boundary, and the proposed point of compliance; and a description of any plume of contamination that has entered the ground-water from a regulated unit.]

VII.B.2. The Permittee shall [construct and] maintain the monitoring wells identified in Permit Condition VII.B.1., in

accordance with the plans and specifications presented in Permit Attachment VII-2. [40 CFR 264.100(d)]

[Note: The plans and specifications contained in the Part B Permit Application must meet the requirements of 40 CFR 264.97(c) and 40 CFR 270.14(c). They should consist of design drawings and design criteria applicable to all wells, as well as individual well specifications identifying depth, and location of screened intervals.]

[Note: If determined to be necessary to protect human health or the environment, the Permit Writer should include Permit Condition VII.B.3., specifications on how monitoring wells are decommissioned. HSWA Section 212 provides EPA with this authority. Several states also have regulations which cover monitoring well decommissioning.]

VII.B.3. All wells deleted from the monitoring program shall be decommissioned in accordance with Permit Attachment VII-3. Well decommissioning methods and certification shall be submitted to the Regional Administrator within [The Permit Writer should specify the submittal period.] from the date the wells are removed from the monitoring program.

VII.C. GROUND-WATER PROTECTION STANDARD

[Note: The Permit Writer must establish concentration limits for the constituents listed in this section, pursuant to 40 CFR 264.94(a), to implement the ground-water protection standard. (The concentration limits may have been established in the Compliance Monitoring Module.) Concentration limits for hazardous constituents are established for each waste management area to determine the ground-water protection standard (GWPS) at the facility. There are four ways concentration limits can be established to set the GWPS: (1) pooled background levels of the hazardous constituents determined from facility ground-water monitoring; (2) maximum constituent concentrations listed in Table I, 40 CFR 264.94(a) - which is Permit Attachment G.W.1 to this module; (3) alternate concentration limits (ACLs) proposed by the Permittee; or

(4) the concentration limits may be established through sampling at upgradient wells each time the ground water is sampled at the compliance point, if there is a high temporal correlation. The GWPS may be a combination of these four methods. For detailed information on ACLs, consult the EPA Alternate Concentration Limit Guidance (July 1987).

VII.C.1. The Permittee shall implement a corrective action program to ensure that regulated units are in compliance with the ground-water protection standard. [40 CFR 264.100(d)] The following hazardous constituents and their concentration limits comprise the ground-water protection standard: [40 CFR 264.93 and 264.94]

<u>Hazardous</u> <u>Constituents</u>	<u>Limits</u>	<u>Concentration</u>
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VII.C.2. The Permittee shall monitor [The Permit Writer should specify the identification number(s) of the well(s) to be monitored.] at the point of compliance, and those wells between the point of compliance and the facility boundary, as described in Permit Condition VII.B., and as designated in Permit Attachment VII-2. [40 CFR 264.95 and 264.100(d)]

VII.C.3. The Permittee shall monitor for the following hazardous constituents during the compliance period. [The Permit Writer should specify the compliance period.] [40 CFR 264.93]

[Note: The Permit Writer should develop a list of monitoring constituents to establish initial monitoring requirements using the following information submitted by the Permittee; waste analysis plan, waste characterization, site hydrogeologic characterization, Appendix IX ground-water sample analyses determined from compliance monitoring, proposed monitoring constituents, corrective action program, and engineering feasibility study.]

VII.D. CORRECTIVE ACTION PROGRAM

VII.D.1. The Permittee shall begin corrective action within [The Permit Writer should specify the time period.] from the time the ground-water protection standard was exceeded. [40 CFR 264.100(c)]

VII.D.2. The Permittee shall implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits (as required under Permit Condition VII.D.1.) at the compliance point by removing the hazardous waste constituents or by treating them in place. [40 CFR 264.100(b)]

VII.D.3. The Permittee shall conduct a corrective action program to remove or treat in place any hazardous constituents that exceed concentration limits in ground-water between the compliance point and the downgradient facility property boundary, in accordance with the procedures specified in Permit Attachment VII-4. [40 CFR 264.100(e)]

[Note: The Permit Writer must specify the corrective action measures to be taken and the schedule in which these measures are to be taken. The corrective action program and engineering feasibility study submitted by the Permittee should contain all appropriate measures to ensure that ground-water quality will achieve compliance in a reasonable time period. The Permit Writer may want to utilize the corrective action program (and the engineering feasibility study) as an Attachment(s). The corrective action measures must be initiated and completed within a reasonable period of time and may be terminated once the concentrations of hazardous constituents are reduced to levels below their respective concentration limits, as specified in Permit Condition VII.C.] [40 CFR 264.100(f)]

VII.D.4. If the ground-water protection standard is met during the compliance period, the Permittee shall continue corrective action to the extent necessary to ensure that the ground-water protection standard is not exceeded. If corrective action is required beyond the compliance period, it must continue until

the ground-water protection standard has not been exceeded for three consecutive years. [40 CFR 264.100(f)]

VII.E. SAMPLING AND ANALYSIS PROCEDURES

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the ground-water monitoring wells described in Permit Condition VII.B.: [40 CFR 264.97(d) and (e)]

VII.E.1. Samples shall be collected by the techniques described in Permit Attachment VII-5.

VII.E.2. Samples shall be preserved [and shipped (when shipped off site for analysis)], in accordance with the procedures specified in Permit Attachment VII-5.

VII.E.3. Samples shall be analyzed according to the procedures specified in Permit Attachment VII-5.

VII.E.4. Samples shall be tracked and controlled using the chain-of-custody procedures specified in Permit Attachment VII-5.

[Note: The sampling and analytical procedures described in the Part B Permit Application must be designed to provide a reliable indication of the quality of the ground-water below the facility, as required by 40 CFR 264.97(d) and (e), and be compatible with the statistical analysis method.]

VII.F. GROUND-WATER SURFACE ELEVATION

VII.F.1. The Permittee shall determine the ground-water surface elevation at each well each time ground water is sampled, in accordance with Permit Condition VII.H. [40 CFR 264.97(f)]

[Note: The Permit Writer should include Permit Condition VII.F.2. if new monitoring wells are installed. The surveyed ground surface elevation of all existing monitoring wells is required on the facility map in the Part B Permit Application.]

VII.F.2. The Permittee shall report the surveyed elevation of the monitoring well(s) when the well(s) is (are) installed.

[Note: The total depth of wells and the elevation of the following should be reported: top of casing, ground surface and/or apron elevation, and the protective casing.]

VII.G. STATISTICAL PROCEDURES

When evaluating the monitoring results to determine the effects of corrective action measures, in accordance with Permit Condition VII.H., the Permittee shall use the following procedures:

[Note: The Permittee must use a statistical procedure outlined under 40 CFR 264.97(h). Use of the statistical method must be protective of human health and the environment and must comply with the performance standards outlined under 40 CFR 264.94(i).]

The Permittee shall conduct the statistical procedures as presented in Permit Attachment VII-6.

VII.H. MONITORING PROGRAM AND DATA EVALUATION

The Permittee shall establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Ground-water monitoring shall be conducted and shall be as effective as the program for compliance monitoring under 40 CFR 264.97 and 40 CFR 264.99. The Permittee shall determine ground-water quality as follows:

VII.H.1. The Permittee shall collect, preserve and analyze samples in accordance with Permit Condition VII.E.

VII.H.2. The Permittee shall determine the concentrations of the hazardous constituents specified in Permit Condition VII.C., throughout the compliance period and any extensions due to corrective action implementation, to demonstrate conformance with the ground-water protection standard. [40 CFR 264.92]

The Permittee shall determine the concentration of hazardous constituents in ground water at each monitoring well at the compliance point using a sequence of at least four samples, collected at least semi-annually. [40 CFR 264.100(d)]

[Note: The Permit Writer may specify more frequent monitoring, if necessary.]

VII.H.3. The Permittee shall analyze samples from all monitoring wells at the compliance point for all constituents contained in 40 CFR 264, Appendix IX [Note: The frequency to be specified must be at least annually.], to determine if additional hazardous constituents are present in the uppermost aquifer. If the Permittee finds additional hazardous constituents present (i.e., not listed in Permit Condition VII.C.), their concentrations shall be reported to the Regional Administrator in writing within seven days from completion of the analysis.

VII.H.4. The Permittee shall determine the ground-water flow rate and direction in the uppermost aquifer at least annually. [40 CFR 264.98(e)]

VII.H.5. The Permittee shall statistically compare the measured concentration of each monitored hazardous constituent with its concentration limit in the ground-water protection standard each time ground-water quality is determined, in accordance with Permit Condition VII.H.2. The Permittee must compare the ground-water quality measured at each point of the compliance monitoring well and any other specified wells, as stated in Permit Condition VII.C. and in accordance with the procedures specified in Permit Condition VII.G.

VII.I. RECORDKEEPING AND REPORTING

VII.I.1. The Permittee shall enter all monitoring, testing and analytical data obtained, according to Permit Condition VII.H.2., in the operating record. The data must include all computations, calculated means, variances, and results of the statistical test(s)

that the Regional Administrator has specified. [40 CFR 264.73(b)(6)]

VII.I.2. The Permittee shall report, in writing, semi-annually to the Regional Administrator on the effectiveness of the corrective action program. These reports shall be submitted on [April 1 and October 1, for example] of each year until the corrective action program has been completed. [40 CFR 264.100(g)]

[Note: The regulations do not require the Permittee to routinely submit all the ground-water sampling analytical results, statistical evaluations or results of the annual determination of the ground-water flow rate and direction. Such information is required to be submitted when there are significant changes in hazardous constituent concentrations or there are significant changes in the ground-water flow rate or direction which negate or adversely alter the monitoring system effectiveness. The Permit Writer may require this "routine" information. Include Permit Condition VII.I.3. if the facility is to submit the information on a regular basis.]

VII.I.3. The Permittee shall submit the analytical results required by Permit Conditions VII.F., VII.H.2., VII.H.3., VII.H.4., and VII.H.5., in accordance with the following schedule:

[Note: The Permit Writer should specify the report schedule for ground-water sampling, the statistical evaluation of ground-water sampling results, and the determination of the ground-water flow rate and direction.]

Example of a Quarterly Ground-Water Report Schedule:

<u>Samples to be Collected During the Preceding Months of</u>	<u>Results Due to the Regional Administrator By</u>
January - February	April 15
April - May	July 15
July - August	October 15
October - November	January 15]

VII.J. REQUEST FOR PERMIT MODIFICATION

If the Permittee or the Regional Administrator determines that the corrective action program established by this Permit no longer satisfies the regulatory requirements, then the Permittee must submit an application for a permit modification within 90 days to make any appropriate changes to the program. [40 CFR 264.100(h)]

PERMIT ATTACHMENTS REFERENCED IN MODULE
VII - CORRECTIVE ACTION
FOR REGUL

MODULE VIII - POST-CLOSURE CARE

[Note: Include this permit module in all permits for landfills, surface impoundments, and land treatment units used for the disposal of hazardous waste. In addition, this module should be used for contingent post-closure care of surface impoundments, waste piles, tank systems, and open burning/open detonation units used for storing or treating hazardous waste, that will be closed as landfills because clean-closure could not be accomplished.]

[Note: This module should also be used for Post-Closure Permits. Post-Closure Permits are required under 40 CFR 270.1(c) for "any unit which closes after January 26, 1983," i.e., for closing interim status facilities. Relevant conditions from the other modules also need to be included in the permit (see discussion in the Model Permit introduction).]

[Note: The Permit Writer should refer to the *Model RCRA Permit for Hazardous Waste Management Facilities (Draft)* for additional guidance in developing or reviewing permit conditions.]

VIII.A. MODULE HIGHLIGHTS

[The Permit Writer should include a general discussion of the activities covered by this module. The discussion should contain the following information for each unit or group of units: types of wastes disposed in the unit; anticipated date of closure and the length of post-closure care for each unit; planned monitoring and maintenance activities; any special features associated with the post-closure care operation; and a reference to any special permit conditions.]

VIII.B. UNIT IDENTIFICATION

The Permittee shall provide post-closure care for the following hazardous waste management units, subject to the terms and conditions of this permit, and as described as follows:

Type of Waste Unit	Unit No. or Other Designation	Maximum Waste Inventory	Description of Wastes Contained	Hazardous Waste No.
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[Note: If the number of hazardous wastes in the unit(s) subject to post-closure care is large, the Permit Writer should use a separate attachment (Permit Attachment VIII-1) to list the wastes, in lieu of listing them all directly in Permit Condition VIII.B.]

VIII.C. POST-CLOSURE PROCEDURES AND USE OF PROPERTY

VIII.C.1. The Permittee shall conduct post-closure care for each hazardous waste management unit listed in Permit Condition VIII.B. above, to begin after completion of closure of the unit and continue for 30 years after that date, except that the 30-year post-closure care period may be shortened upon application and demonstration approved by EPA that the facility is secure, or may be extended by EPA if the Regional Administrator finds this is necessary to protect human health and the environment. [40 CFR 264.117(a)]

[Note: The Regional Administrator may shorten the post-closure care period if he finds that human health and the environment will be protected sufficiently. This could be determined through, for example, leachate or ground-water monitoring results, inherent characteristics of the hazardous wastes, application of treatment or other control technology that indicate that the hazardous waste management unit or facility is secure.] [40 CFR 264.117(a)(2)(i)]

[Note: The Regional Administrator may extend the post-closure care period if he finds that this is necessary to protect human health or the environment. A basis for this determination could be leachate or groundwater monitoring results that indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment.] [40 CFR 264.117(a)(2)(ii)]

[Note: The length of the post-closure care period may be set in the original permit, in which case it should be justified in the Administrative Record; or may be shortened or extended upon a permit modification.]

VIII.C.2. The Permittee shall maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of 40 CFR Part

264 Subpart F during the post-closure period.
[40 CFR 264.117(a)(1)] **[The Permit Writer should refer to and use, as appropriate, Modules IV, V, and VII in developing conditions to satisfy the Subpart F requirements.]**

[Note: The Permit Writer should include Permit Conditions VIII.C.3., VIII.C.4., and/or VIII.C.5., depending on the type of disposal units covered by the permit. Permit Condition VIII.C.5. should be used for surface impoundments, waste piles, tank systems, and open burning/open detonation units used for storing or treating hazardous waste that cannot be clean-closed and must be closed as landfills.]

VIII.C.3. The Permittee shall comply with the requirements for surface impoundments as follows: [40 CFR 264.228(b)(1) and (3)]

VIII.C.3.a. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap, as necessary, to correct the effects of settling, subsidence, erosion, and other events; and

VIII.C.3.b. Prevent run-on and run-off from eroding or otherwise damaging the final cover.

VIII.C.4. The Permittee shall comply with the requirements for land treatment units as follows: [40 CFR 264.280(c)]

VIII.C.4.a. Continue all operations (including pH control) necessary to enhance degradation and transformation and sustain immobilization of hazardous constituents in the treatment zone to the extent that such measures are consistent with other post-closure care activities;

VIII.C.4.b. Maintain a vegetative cover over closed portions of the facility;

VIII.C.4.c. Maintain the run-on control system required under 40 CFR 264.273(c); and

VIII.C.4.d. Maintain the run-off management system required under 40 CFR 264.273(d).

[Note: The Permit Writer should also include Permit Conditions VIII.C.4.e., VIII.C.4.f., and/or VIII.C.4.g., if applicable.]

VIII.C.4.e. Control wind dispersal of hazardous waste as required under 40 CFR 264.273(f).

VIII.C.4.f. Continue to comply with any prohibitions or conditions concerning growth of food-chain crops required under 40 CFR 264.276.

VIII.C.4.g. Continue unsaturated zone monitoring required under 40 CFR 264.278.

[Note: The Permittee may terminate soil-pore liquid monitoring 90 days after the last application of waste to the treatment zone.] [40 CFR 264.280(c)(7)]

VIII.C.5. The Permittee shall comply with the requirements for landfills, as follows: [40 CFR 264.310(b)]

VIII.C.5.a. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap, as necessary, to correct the effects of settling, subsidence, erosion, or other events;

VIII.C.5.b. Continue to operate the leachate collection and removal system until leachate is no longer detected;

VIII.C.5.c. Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of 40 CFR Subpart F;

VIII.C.5.d. Prevent run-on and run-off from eroding or otherwise damaging the final cover; and

VIII.C.5.e. Protect and maintain surveyed benchmarks used in complying with the surveying and recordkeeping requirements of 40 CFR 264.309.

[Note: The Permit Writer should include Permit Condition VIII.C.6. if he determines that the Permittee must continue to comply with any of the security requirements of 40 CFR 264.14 during part or all of the post-closure period. The condition should be included when hazardous waste may remain exposed after completion of partial or final closure; or access by the public or domestic livestock may pose a hazard to human health.]

VIII.C.6. The Permittee shall comply with all security requirements, as specified in Permit Attachment VIII-2. [40 CFR 264.117(b)]

VIII.C.7. The Permittee shall not allow any use of the units designated in Permit Condition VIII.B. which will disturb the integrity of the final cover, liners, any components of the containment system, or the function of the facility's monitoring systems during the post-closure care period. [40 CFR 264.117(c)]

[Note: The Regional Administrator may allow a variance to this condition if a disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment, or is necessary to reduce a threat to human health and or the environment.] [40 CFR 264.117(c) (1) and (2)]

VIII.C.8. The Permittee shall implement the Post-Closure Plan, Permit Attachment II-11. All post-closure care activities must be conducted in accordance with the provisions of the Post-Closure Plan. [40 CFR 264.117(d) and 264.118(b)]

VIII.D. INSPECTIONS

The Permittee shall inspect the components, structures, and equipment at the site in accordance with the Inspection Schedule, Permit Attachment II-3. [40 CFR 264.117(a)(1)(ii)]

VIII.E. NOTICES AND CERTIFICATION

VIII.E.1. No later than 60 days after certification of closure of each permitted hazardous waste disposal unit, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Regional Administrator a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the Permittee shall identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records he has kept. [40 CFR 264.119(a)]

VIII.E.2. Within 60 days of certification of closure of the first and the last hazardous waste disposal unit, the Permittee shall:

VIII.E.2.a. Record, in accordance with _____ **[Permit Writer should insert state name]** law, a notation on the deed to the facility property -- or on some other instrument that is normally examined during the title search -- that will in perpetuity notify any potential purchaser of the property that:

- (i) The land has been used to manage hazardous wastes;
- (ii) Its use is restricted under 40 CFR Part 264 Subpart G regulations; and
- (iii) The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other

hazardous waste disposal unit of the facility have been filed with the Regional Administrator and _____ **[Permit Writer should insert name of local zoning authority or the authority with jurisdiction over local land use]**.

VIII.E.2.b. Submit a certification to the Regional Administrator, signed by the Permittee, that he has recorded the notation specified in Permit Condition VIII.E.2.a., including a copy of the document in which the notation has been placed. [40 CFR 264.119(b)]

VIII.E.3. If the Permittee or any subsequent owner or operator of the land upon which the hazardous waste disposal unit is located, wishes to remove hazardous wastes and hazardous waste residues, the liner, if any; or contaminated soils, then he shall request a modification to this post closure permit in accordance with the applicable requirements in 40 CFR Parts 124 and 270. The Permittee or any subsequent owner or operator of the land shall demonstrate that the removal of hazardous wastes will satisfy the criteria of 40 CFR 264.117(c). [40 CFR 264.119(c)]

[Note: By removing hazardous waste, the Permittee may become a generator of hazardous waste and must manage it in accordance with all applicable RCRA requirements. If he is granted a permit modification or otherwise granted approval to conduct such removal activities, the Permittee may request that the Regional Administrator approve either:

- a. **The removal of the notation on the deed to the facility property or other instrument normally examined during title search or**
- b. **The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.]**

VIII.E.4. No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the Permittee shall submit to the Regional Administrator, by registered mail, a certification that the post-closure care for the hazardous waste disposal unit was performed in accordance with the specifications in the approved Post-Closure Plan. The certification must be signed by the Permittee and an independent, registered professional engineer. Documentation supporting the independent, registered professional engineer's certification must be furnished to the Regional Administrator upon request until the Regional Administrator releases the Permittee from the financial assurance requirements for post-closure care under 40 CFR 264.145(1). [40 CFR 264.120]

VIII.F. FINANCIAL ASSURANCE

VIII.F.1. The Permittee shall maintain financial assurance during the post-closure period and comply with all applicable requirements of 40 CFR Part 264 Subpart H. [40 CFR 264.145]

[Note: The Permit Writer should include conditions that cover the procedures the Permittee must follow to be released from financial assurance or to be reimbursed for post-closure care. The procedures will vary according to the type of financial assurance mechanism used. Permit Conditions VIII.F.2. and VIII.F.3. are sample conditions for cases where a post-closure trust fund is used.]

VIII.F.2. The Permittee shall demonstrate to the Regional Administrator that the value of the financial assurance mechanism exceeds the remaining cost of post-closure care, in order for the Regional Administrator to approve a release of funds. [40 CFR 264.145(a)(10)]

VIII.F.3. The Permittee **[or any other person authorized to conduct post-closure care]** shall submit itemized

bills to the Regional Administrator when requesting reimbursement for post-closure care. [40 CFR 264.145(a)(11)]

VIII.G. POST-CLOSURE PERMIT MODIFICATIONS

The Permittee must request a permit modification to authorize a change in the approved Post-Closure Plan. This request must be in accordance with applicable requirements of 40 CFR Parts 124 and 270, and must include a copy of the proposed amended Post-Closure Plan for approval by the Regional Administrator. The Permittee shall request a permit modification whenever changes in operating plans or facility design affect the approved Post-Closure Plan, there is a change in the expected year of final closure, or other events occur during the active life of the facility that affect the approved Post-Closure Plan. The Permittee must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the Post-Closure Plan. [40 CFR 264.118(d)]

[Note: The wording of this Permit Condition should be altered for post-closure permits (i.e., the references to expected year of final closure and events during the active life), and checked against the forthcoming rule amendments regarding permit modifications.]

**PERMIT ATTACHMENTS REFERENCED IN MODULE VIII -
POST-CLOSURE CARE**

This list is provided to assist the Permit Writer in checking that all Permit Attachments referenced in this module are attached to the Permit. The purpose of the numbering scheme used here is to facilitate cross-walking with the model permit conditions. The Permit Writer may select other numbering schemes, as appropriate, when preparing actual permits.

Permit Attachment No.	Plan or Document (from the Part B Permit Application)
II-3	Facility Inspection Schedule
II-11	Post-Closure Plan
VIII-1	List of Wastes Contained in the Units Under Post-ClosureCare
VIII-2	Security Procedures During the Post-Closure Period

MODULE IX - CORRECTIVE ACTION FOR SOLID WASTE
MANAGEMENT UNITS

[Note: 40 CFR 264.101 requires final hazardous waste permits to include corrective action requirements for all releases of hazardous wastes or constituents from any solid waste unit at the facility regardless of when waste was placed in the unit. This Module covers corrective actions at non-regulated solid waste management units, corrective actions at regulated units are covered by Module VII.]

IX.A. MODULE HIGHLIGHTS

[Corrective actions at non-regulated solid waste managements will be highly site specific, and should be based on the findings of the facility's RCRA Facility Assessment (RFA) and/or RCRA Facility Investigation (RFI). Based on the findings of the RFA/RFI, the Permit Writer should include a general discussion of the activities covered by this module. The discussion may contain the following information: description of the solid waste management unit(s) for which corrective action is required; number, location, and depth of monitoring wells; which wells are up gradient and down gradient; hazardous constituents and concentration limits; compliance period for each waste management unit; any special features associated with the operation; and a reference to any special permit conditions.]

IX.B. CORRECTIVE ACTION REQUIREMENTS

The Permittee shall conduct the following corrective actions.

[Note: the corrective action requirements will be site specific, and based on the findings of the RFA/RFI. The specific corrective action conditions should be similar to those contained in Module VII for regulated units.]