

US EPA ARCHIVE DOCUMENT

## 1998 RCRA §3007 Survey of the Inorganic Chemicals Industry Instructions

This RCRA §3007 questionnaire is being used to gather information about solid and hazardous waste management practices in the U.S. inorganic chemicals industry. The Environmental Protection Agency (EPA) requires this information to determine whether certain residual streams should be managed as hazardous under the Resource Conservation and Recovery Act (RCRA), 42 USC 6901 et seq., and should be listed as such in the Code of Federal Regulations. Under §3007 of RCRA, 42 USC 6927, you are required to provide us with this information. However, if you believe that some parts of the information supplied by you are commercially sensitive, you may claim protection for the data. **Please note that this survey should be completed using available information or best engineering judgment and that you are not required to generate any new data.**

Responses may be typed or handwritten neatly. The signature/certification block should be completed by a senior official having authority over plant operations; it may not be completed by a consultant or any other third party.

The questionnaire consists of 7 categories of questions:

- I. Corporate and Facility Information
- II. Process Information and Residual Identification
- III. Residual Characterization
- IV. Residual Generation and Management
- V. Residual Management Unit Characterization
- VI. General Facility Information
- VII. Certification

**Confidentiality:** You may make a confidential business information (CBI) claim for each data element that is sensitive data. You may not withhold information from the Agency because you believe it is confidential. Information so designated will be disclosed by EPA only to the extent set forth in 40 CFR Part 2. If you fail to claim the information as confidential upon submission, it may be made available to the public without further notice to you. For each data point claimed to be CBI, complete the confidentiality claim in Appendix B.

We must notify you if we intend to deny your claim, and you have the right to seek judicial review. Otherwise, we must protect the information from disclosure to anyone other than EPA and its authorized representatives, and we may not release it under the Freedom of Information Act. It may, however, be

disclosed to Congress or the Comptroller General of the United States at their request, or be released by order of a Federal court. The complete regulations regarding confidential business information are given at 40 CFR Part 2 Subpart B.

You may make a CBI claim with respect to all or any part of any information submitted in response to this request. Claims of confidentiality for information such as company name and address, site topography, and other information that is typically available through public sources are unlikely to be supportable. If a claim is made on such information, the Agency requires that you substantiate your claim; in that event, failure to substantiate your claim will result in a waiver of the claim. You are urged to review all potential confidentiality claims before presenting them to EPA and to make claims only on those portions of your response that you feel are business confidential.

Return the completed survey within 60 days from date of receipt to:

Anthony Carrell (5304W)  
Hazardous Waste Identification Division  
Office of Solid Waste  
U.S. Environmental Protection Agency  
401 M St., S.W.  
Washington, D.C. 20460  
Telephone: (703) 308-0458

For technical assistance, call (703) ???-????.

If you wish to claim any portions of the survey as CBI, please send the completed survey to Regina Magbee (5304W) at the address above.

Public reporting burden for this collection of information is estimated to be 38 hours per response. This includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to: Chief, Information Policy Branch, PM-223/U.S. Environmental Protection Agency, 401 M St., SW, Washington, D.C. 20460, and to Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

## I. Corporate and Facility Information

The purpose of this question is to provide general information regarding the name, location, mailing address, and contacts for the facility. In addition, environmental permit numbers are requested to enable the Agency to obtain information otherwise submitted to EPA under different reporting requirements, rather than requiring the facility to report the same information twice.

- A. Parent Corporation \_\_\_\_\_
- B. Name of Company/Affiliate \_\_\_\_\_
- C. Other names by which the corporation may be known  
\_\_\_\_\_
- D. Address of Corporation Headquarters  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_
- E. Name of Facility \_\_\_\_\_
- F. Address of Facility  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_
- G. Mailing Address of Facility (if different from above)  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_
- H. Facility Location  
Latitude: \_\_\_\_\_ deg \_\_\_\_\_ min \_\_\_\_\_ sec Longitude: \_\_\_\_\_ deg \_\_\_\_\_ min \_\_\_\_\_ sec
- I. RCRA Hazardous Waste Generator ID Number: \_\_\_\_\_  
POTW/NPDES Permit Number: \_\_\_\_\_
- J. Name(s) of personnel to be contacted for additional information pertaining to this questionnaire
- | Name  | Title | Telephone |
|-------|-------|-----------|
| _____ | _____ | _____     |
| _____ | _____ | _____     |
| _____ | _____ | _____     |

**For Internal Use Only**

Facility Number: \_\_\_\_\_ Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## II. Process Information and Residual Identification

This question asks for more detailed information about the specific unit operations that are associated with the inorganic chemical processes.

Characterization of these units will provide the Agency with basic information regarding the generation of residuals from the inorganic chemical processes. Please check off all of the pertinent boxes from the list of processes below. If your facility produces more than one product, the survey will have to be completed for each product and/or process. If your company does not produce any of these products check "none of the above" and go to Section VII and sign the certification.

- ☐ G sodium dichromate production
- ☐ G phosphoric acid production via the dry process
- ☐ G phosphorous trichloride production
- ☐ G phosphorous pentasulfide production
- ☐ G sodium chlorate production
- ☐ G antimony oxide production
- ☐ G cadmium pigment production
- ☐ G barium carbonate production
- ☐ G boric acid production
- ☐ G inorganic hydrogen cyanide production
- ☐ G titanium dioxide production
- ☐ G potassium dichromate production
- ☐ G phenyl mercuric acetate production
- ☐ G sodium phosphate production from wet process phosphoric acid
- ☐ G none of the above

Residuals generated from these units are referred to as the residuals of concern (RCs). Residuals may be solids, liquids, sludges, or confined gases. Residuals may be recycled within your process or reclaimed; such residuals must be identified regardless of their disposition. Also, residuals may be generated infrequently (e.g., only during unit turn-arounds).

### II.A. Process Descriptions and Flow Diagrams

Provide a simplified process flow diagram (PFD) and a brief description for each of the processes checked above.

It is not necessary to provide PFDs for your facility's other process units or for the facility's wastewater treatment facility.

Each process flow diagram should (1) illustrate the major process flows and (2) identify all residuals and their point of generation in the process. Some of the inorganic chemical processes require special information. These additional requirements are presented in the "Process-Specific Information" section below. For each process, use as much detail as is necessary to accomplish the applicable requirements. Appendix A provides example process flow diagrams, illustrating the types of information and level of detail that EPA is requiring. If your processes are similar to any of these examples, you have the option of editing the examples to reflect your operations rather than preparing new PFDs. The general information requirements of the PFDs are as follows.

- Provide a brief written description of the process including a discussion of major reaction and/or separation processes. The discussion should focus on the generation of the residuals, including residuals that may be subsequently recycled. All the residuals identified in the PFD should be mentioned in the process description. If applicable, describe any process used to collect/handle residual streams (e.g., off-gas scrubbers, filter press).
- Provide a block for each major unit operation in the production process (e.g., pre-treater, reactor, fractionator, crystallizer).
- Identify process inputs (i.e., feedstocks) by name and the process unit from which the input comes. With arrows, indicate the point at which each input is introduced into the process.
- Identify all products. For intermediate products, identify the typical downstream process units.
- Identify all residuals. Residuals may be solids, liquids, sludges, or confined gases. Residuals may be recycled within your process or reclaimed; such residuals must be identified regardless of their disposition. Also, residuals may be generated infrequently (e.g., only during unit turn-arounds). Some examples of residuals within the scope of this questionnaire are catalysts, waste liquor, leaching residual, still bottoms, scrubber wastewaters, and unsalable off-specification product generated during startup or unit upsets.

Additionally, residuals can be generated during the treatment of other residuals (e.g., filter cake or ash from incineration).

- The following should NOT be identified as residual streams.

Pump gland water	Pipe rust and scale
Boiler water blowdown	Oily rags and gloves
Sanitary wastes	Sample bottles
Storm water	Pump casing sludge
Cooling tower blowdown and sludge	

- Assign each residual a unique Residual Identification Number (RIN). Use a line with an arrow to denote the point in the process from which the residual is generated, and identify the residual by its RIN. RINs should be unique.
- Sometimes two or more residual streams are combined prior to treatment or disposal. Each residual that is generated at a unique location should be assigned a unique RIN. For example, each wastewater stream should be assigned an individual RIN, even if the wastewater streams are combined for management.

#### Process-Specific Information

The following section describes the specific information requirements associated with each inorganic chemical process of concern. The purpose of this section is to focus your responses on the aspects of the processes that are of primary interest to the Agency. However, you should report all residuals generated from your process, as discussed above, even if they are not specifically addressed below.

If residual generation quantities are not reported in Section III for residuals (e.g., scrubber waters, process liquors) which result in process losses, report the make-up quantities or rate as part of the process descriptions.

All Processes:

- Assign a RIN to each of the air pollution control streams, including particulate matter collected from ESP or wet gas scrubbers. Identify all vented gases by name and disposition location but do not assign a RIN.
- Assign a RIN to all wastewaters produced as a result of day-to-day operations. These RINs should include process wastewaters and scrubber solutions. Also assign a RIN to wastewaters produced as a result of scheduled maintenance or cleaning. Please show any specialized waste treatment facility or process used for waste remediation, such as filtration.
- Assign a RIN to any waste streams that are created as a result of scheduled maintenance or cleaning operations. These wastes do not need to appear on the PFD, but should be described elsewhere in the survey including Table III.1.

### Wastewater Treatment Operations

EPA is requiring a limited amount of information for wastewaters generated from inorganic production processes and managed in a centralized wastewater treatment system (i.e., managed with wastewaters from other processes). Specifically:

- A PFD for the wastewater treatment system is not required.
- Specify if discharge is to a surface water or to a POTW.
- If wastewaters are generated, provide wastewater throughput (on an annual and daily basis) for the wastewater treatment plant in the process description.
- Describe any land based units (e.g., surface impoundments) in the wastewater treatment system. This includes settling ponds, biological treatment ponds, polishing ponds, etc.

### Sodium Dichromate Production

Solid waste produced from ore residues, cleaning operations, or other routine operation, should also be assigned a RIN.

The purpose of this study is not to make a hazardous waste determination on wastes that are exempt from hazardous waste regulation pursuant to 40 CFR 261.4(b)(7). With respect to sodium dichromate production, it is not necessary to assign a RIN to "treated residue from roasting/leaching of chrome ore". However, include these wastes in the PFD.

### Phosphoric Acid Production via the Dry Process

Assign a RIN to each of the solid waste streams produced from production of phosphoric acid. This will include remediation and filtering wastes from arsenic sulfide removal as well as any calcium phosphate containing sludges from filtration of scrubber waste. This will also include any sludges or residuals produced as a result of phosphoric acid storage. Assign RINs to all other solid waste streams that are produced on a regular or scheduled basis related to the production of Phosphoric Acid via the Dry Process. These will include: filter aids, filter cartridges, filter cloths, and solid wastes produced as a result of scheduled maintenance.

Wastewaters produced as a result of arsenic filtration or other waste removal system should be assigned a RIN. Any specialized treatment facility should be included in the process flow diagram.

### Phosphorous Pentasulfide Production

Assign a RIN to the wastewater streams including waste generated from the waterseal surrounding the vacuum still and wastewater from scrubbing operations. Please include any other waste streams that are generated during scheduled maintenance of the operations.

Assign a RIN to each of the solid waste streams created during phosphorous pentasulfide production. These should include phosphorous mud residues created from clean out of the water seals as well as still pot residues that contain arsenic pentasulfide.

#### Sodium Chlorate Production

Assign a RIN to each of the liquid waste streams from the production of sodium chlorate. Include wastes from chromium removal process as well as scrubber waste waters. Please include any specialized process equipment in the PFD.

#### Antimony Oxide Production

Assign a RIN to each of the solid waste streams including reactor slags and scrubber blowdown sludge (from the direct method) or furnace slag (from the indirect method).

Assign a RIN to each of the liquid waste streams.

#### Cadmium Pigment Production

Assign a RIN to each of the solid wastes produced during pigment production. These will include filtration devices, filter solids, spent filter cartridges, filter aids, black ash filter media, and wastewater treatment sludges. Please show any specialized waste treatment facility or process used for waste remediation.

#### Barium Carbonate Production

Assign a RIN to each of the liquid waste streams produced from barium carbonate production. These should include all process wastewaters.

Assign a RIN to each of the solid waste streams including unused ore residues and process treatment sludges. Please include any specialized waste treatment systems and wastes on the PFD.

#### Boric Acid Production

Assign a RIN to each of the wastewaters, if any, created during the production of boric acid. These should include waste liquors from centrifuges and dissolvers. Please show any special process equipment designed to treat waste liquors or other liquid waste streams.

Assign a RIN to each of the solid waste streams, if any, created during boric acid production. These should include filtration wastes, if any, and arsenic sulfide wastes, if any.

#### Inorganic Hydrogen Cyanide Production

Assign a RIN to all process wastewater and liquid waste streams. These should include ammonia-acid streams, if present. Please show any specialized equipment used to handle or treat the ammonia-acid mixture, if present, or wastewater streams.

Assign a RIN to solid waste streams generated during production of hydrogen cyanide, if any.

#### Titanium Dioxide Production



Assign a RIN to each of the wastewaters produced during titanium dioxide production. These should include all wastewater streams regardless of origin. These wastewater streams shall include both strong and weak acid wastes as well as scrubber waters. Please show any specialized equipment used in the remediation of the waste streams in the PFD.

Assign a RIN to each of the solid/sludge wastes generated in the titanium dioxide process. These should include metal/ore digestion sludges as well as any other sludge/solid waste streams. Please include any waste streams that are subsequently sold as by-product as part of the waste analysis.

The purpose of this study is not to make a hazardous waste on wastes that are exempt from hazardous waste regulations pursuant to 40 CFR 261.4(b)(7). With respect to the titanium dioxide chloride process, it is not necessary to assign a RIN to "waste solids." However, include this waste in the process flow diagram.

#### Potassium Dichromate Production

Assign a RIN to all process wastewater and liquid waste streams. These should include mother liquors, if present, and all wastewater streams.

Assign a RIN to any solid waste streams generated during production of potassium dichromate, if any. These should include solid filter aid waste and sodium chloride salts from mother liquors.

#### Sodium Phosphate Production from Wet Process Phosphoric Acid

Assign a RIN to each of the solid/sludge wastes generated in the production of sodium phosphate from wet process phosphoric acid. These should include filter cake wastes, arsenic sulfide, as well as any other sludge/solid waste streams.

#### Phenyl Mercuric Acetate Production

Assign a RIN to each of the solid/sludge wastes generated in the production of phenyl mercuric acetate.

### III. Residual Characterization

The purpose of this section is to develop detailed information regarding the residuals identified in Section II.A. This information will be central to the Agency's understanding of the characteristics of the RCs, the appropriate scope of the definitions of the RCs, hazard assessments, and, if necessary, land disposal restrictions (LDR) program analyses and regulatory impact analyses.

Copy the blank Table III.1 and complete it for every residual identified in Section II.A.

1. Identify each residual using the Residual Identification Number (RIN) assigned in Section II.A.
2. Indicate the residual's common name within your facility.
3. Classify each residual using the codes presented below.

- |    |   |
|----|---|
| 01 | Solid catalyst                              |
| 02 | Liquid catalyst                             |
| 03 | Neutralization sludge                       |
| 04 | Process sludge                              |
| 05 | Spent filters or sorbents                   |
| 06 | Spent caustics, acids or treating solutions |
| 07 | Process wastewaters                         |
| 08 | Air pollution control scrubber solids       |
| 09 | Other residuals, specify                    |



4. If the residual has been identified as a hazardous waste in the facility's RCRA notification, indicate all applicable waste codes. If the residual is characteristically hazardous, please indicate the Dxxx code(s) that the waste exhibits. If the residual is not regulated as hazardous but is managed as hazardous in a hazardous waste management unit(s), use the "AS" code and indicate by footnote why this waste is managed as hazardous.
5. For each residual, provide the following typical physical characteristics (if applicable). Provide supporting documentation (e.g., lab results) if available. Otherwise these properties should be estimated.
  - pH
  - Reactive Cyanide and Sulfide
  - Vapor Pressure
  - Viscosity
  - Specific Gravity
  - Particle Size Distribution
  - Phase Distribution
  - Total Suspended Solids in WW
  - Naturally Occurring Radioactive Material (NORM)
6. List elements or compounds (inorganic and organic chemicals) that are known by analysis to be present in the residual and specify the concentration of each using weight %, ppm, or mg/L. If you need more space for your response, please continue on a separate sheet of paper. Please submit any available analytical data characterizing the residuals; submit both leachate data (e.g., Toxicity Characteristic Leaching Procedure (TCLP), Synthetic Precipitation Leaching Procedure (SPLP)) and total compositional data where possible. Describe by footnote any difficulties encountered in obtaining these analytical data (e.g., difficulties encountered at the laboratory in analyzing for a particular constituent due to the waste matrix).



## IV. Residual Generation and Management

The purpose of this section is to develop detailed information regarding the residuals identified in the previous question, particularly with respect to how these residuals are managed. This information will be central to the Agency's understanding of the industry wide residual management practices for the RCs, the appropriate scope of the definitions of the RCs, hazard assessments, land disposal restrictions (LDR) program analyses (if necessary), and regulatory impact analysis.

Copy the blank Table IV.1, and complete it for every residual identified in Section II.A. The following numbered items describe the information requirements for the corresponding columns in Table IV.1.

1. Specify the Residual Identification Number (RIN).
2. Indicate the quantity (wet basis, as generated and prior to treatment, metric tons) of residual generated during the calendar year 1997. If the residual was not generated in 1997, report the annual quantity most recently generated and the year of generation.

If a residual was managed by more than one method, complete Table III.I for this RIN to account for the total residual quantity to the different management methods. Each residual quantity should correspond to the management method (or sequence of management methods) listed in column 5.

3. Indicate frequency of residual generation using one of the following codes:

A	Continuous	D	Every 2 to 6 months
B	Every 1 to 7 days (e.g., weekly)	E	Every 6 to 18 months (e.g., annually)
C	Every 8 to 30 days (e.g., monthly)	F	Other, specify

If the residual is generated less frequently than every 18 months, indicate in column 3 the typical number of years between residual generation events.

Indicate if the response to questions 2 or 3 are CBI.

4. Indicate the management step. If a series of management steps are used, designate the first step by "1", the second step by "2," etc., and the final step by "F". Note that the last row should always be designated as "F." If only one management step is used, place an "F" in this column.
5. Specify the residual management method applied to the RIN using one of the codes provided below. Note that the management codes are broken into five categories: storage, treatment, recycle, transfer, and disposal. If a residual is subject to a sequence of methods (e.g., storage in a tank, onsite incineration), list the method codes on separate rows.

If a residual is handled alternatively by more than one method, list each method or sequence of methods on a separate page. For parallel management methods, allocate the residual quantity reported in column 2 to the different management trains.

### Residual Storage Methods

Storage includes any method used to hold the residual onsite temporarily prior to further management.

01-A	Storage in a tank
01-B	Storage in container (e.g., drum)
01-C	Storage in pile with runoff/runoff containment
01-D	Storage in pile without runoff/runoff containment
01-E	Storage in surface impoundment
01-F	Storage in roll-on/roll-off bin
01-G	Other storage, specify

### Residual Treatment Methods

For the purposes of this questionnaire, treatment includes any measure designed to change the character or composition of the residual to make it amenable to disposal or recovery or to reduce its toxicity, hazard, or volume.

02-A	Onsite hazardous waste incineration	05-A	Steam stripping
02-B	Onsite non-hazardous waste incineration	05-B	Washing with solvent
02-C	Onsite flare	05-C	Washing with water
02-D	Onsite boiler	05-D	Other cleaning/extraction, specify
02-E	Onsite industrial furnace		
02-F	Other onsite thermal treatment, specify	06-A	Onsite nonhazardous waste land treatment
		06-B	Offsite nonhazardous waste land treatment
03-A	Offsite hazardous waste incineration	06-C	Onsite hazardous waste land treatment
03-B	Offsite non-hazardous waste incineration	06-D	Offsite hazardous waste land treatment
03-C	Other offsite thermal treatment, specify		
04-A	Sludge thickening	07-A	Onsite stabilization
04-B	Sludge de-watering (centrifuge, filter press)	07-B	Offsite stabilization
04-C	Settling		
04-D	Filtration	08-A	Neutralization
04-E	Emulsion break	08-B	Biotreatment
04-F	Thermal emulsion break	08-C	Physical/Chemical treatment
04-G	Other phase separation, specify		
04-H	Evaporation	09	Other treatment, specify

### Residual Recycle Methods

Recycling/reclamation/reuse measures designed to recover useful constituents or energy, or to beneficially reuse the residual.

10-A	Recovery as pH buffer at wastewater treatment plant
10-B	Other recovery onsite, specify
10-C	Other recycling/reclamation/reuse, specify type and onsite or offsite

### Residual Transfer Methods

Residual transfer includes the transfer of residuals to offsite entities for recycling/reclamation/reuse.

11-A	Transfer of acid or caustic for reclamation, regeneration or recovery
11-B	Transfer for use as an ingredient in products that are placed on the land (e.g., fertilizer)
11-C	Transfer to other offsite entity (specify type of recycling/reclamation/reuse)

### Residual Disposal Methods

Disposal is the permanent disposition of the residual.

12-A	Discharge to onsite wastewater treatment facility (with land based units)	13-A	Disposal onsite Subtitle D landfill
12-B	Discharge to onsite wastewater treatment facility (tank based system)	13-B	Disposal onsite Subtitle C landfill
12-C	Disposal offsite municipal Subtitle D landfill	13-C	Disposal onsite underground injection (specify class)
12-D	Disposal offsite industrial Subtitle D landfill	13-D	Disposal onsite hazardous waste surface impoundment
12-E	Disposal offsite Subtitle C landfill	13-E	Disposal onsite nonhazardous waste surface impoundment
12-F	Disposal offsite underground injection (specify class)	13-F	Other disposal onsite, specify
12-G	Other discharge or disposal offsite, specify		

- Assign a unique residual management unit number (RMUN) to each residual management unit involved in the residual management process described in column 5. Each management code in column 5 should have a corresponding RMUN in column 6. For example, if a residual is disposed of in an onsite, nonhazardous waste landfill (code 13-A in column 5), a unique RMUN should be assigned to the onsite landfill in column 6. This RMUN will be used to reference the

onsite landfill throughout the rest of the questionnaire. If more than one residual is disposed of in this landfill, use the same RMUN for each residual. If another residual is disposed of in a different landfill, the different landfill should be assigned its own unique RMUN.

7. Indicate Yes/No and describe by footnote any planned changes in generation or management of this RIN.

Table IV.1. Residual Generation Rate and Management

1. RIN _____	2. Quantity Generated _____ (MT) Year of Generation (if not 1997) _____		3. Frequency of Generation _____	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes	CBI?*
				Q
				Q
				Q
				Q
				Q

1. RIN _____	2. Quantity Generated _____ (MT) Year of Generation (if not 1997) _____		3. Frequency of Generation _____	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes	CBI?*
				Q
				Q
				Q
				Q
				Q

1. RIN _____	2. Quantity Generated _____ (MT) Year of Generation (if not 1997) _____		3. Frequency of Generation _____	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes	CBI?*
				Q
				Q
				Q
				Q
				Q

\*If CBI is claimed, complete Appendix B.

**IV.B. Offsite Management Facilities**

Copy the blank Table IV.2 and complete it for all the offsite residual management facilities that manage residuals identified in Table IV.1.

**Table IV.2. Offsite Residual Management Facilities**

Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____ City/State/Zip Code: _____ Distance from Facility: _____ CBI? <input type="checkbox"/>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____ City/State/Zip Code: _____ Distance from Facility: _____ CBI? <input type="checkbox"/>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____ City/State/Zip Code: _____ Distance from Facility: _____ CBI? <input type="checkbox"/>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____ City/State/Zip Code: _____ Distance from Facility: _____ CBI? <input type="checkbox"/>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____ City/State/Zip Code: _____ Distance from Facility: _____ CBI? <input type="checkbox"/>

\*If CBI is claimed, complete Appendix B.



#### IV.C. Residual/Residual Management Unit Cross Reference Tables

This section is required for the storage, treatment, and disposal units identified in Table IV.1 (i.e., all RMUNs).

Complete Table IV.3 for all onsite and offsite residual management units. The following numbered items describe the information requirements for the corresponding columns in the table.

Each residual management unit should have been assigned a UNIQUE number in Table IV.1.

1. Indicate the Residual Management Unit Number assigned in Table IV.1.
2. For offsite units, state "OFF." For onsite units, state "ON."
3. Indicate the unit type using the following codes to describe each unit:

Land-Based Residual Management Unit Codes:

- L-1 Land treatment
- L-2 Surface impoundment
- L-3 Landfill
- L-4 Deep well injection
- L-5 Pile
- L-6 Other (specify)

Other Residual Management Unit Codes:

- 1 Tank (including concrete-lined basins)
  - 2 Container
  - 3 Boiler
  - 4 Incineration
  - 5 Other (specify)
4. Indicate the common name used by your facility for this unit.
  5. Indicate the RINs of all the residuals managed in each unit.



**IV.D. Chemical Production and Residual Management Costs**

Please provide product yields for 1997 by completing Table IV.4 below. Complete Table IV.4 for each of the chemicals of concern (see boxes checked in Section II) and the amount generated in 1997.

1. Specify the products generated.
2. Specify the total production for each product for 1997 (MT/yr).

**Table IV.4. Total Production**

1. Product	2. 1997 Total Production (MT/yr)	CBI?*
		Q
		Q
		Q
		Q
		Q

\*If CBI is claimed, complete Appendix B.

This section asks for the total annual management costs for each residual generated, any transportation costs, and payment received, if any.

1. Give the Residual Identification Number (RIN) for each residual generated.
2. Specify the transportation cost (if any) to offsite management facilities. (\$/MT)
3. Specify the total management cost. (\$/MT)
4. Specify any payment received. (\$/MT)

**Table IV.5. Residual Management Cost Table**

1. RIN	2. Transportation Cost (\$/MT)	3. Management Cost (\$/MT)	4. Payment Received (\$/MT)	CBI?*
				Q
				Q
				Q
				Q
				Q
				Q
				Q
				Q
				Q

\*If CBI is claimed, complete Appendix B.

## V. Residual Management Unit Characterization

The purpose of this section is to collect more detailed information characterizing the residual management units identified in Question IV. This section should not be completed for offsite facilities that are not owned wholly or in part by either the facility or its parent company (i.e., facilities that are not captive offsite facilities).

## V.A. General Information

1. Specify the Residual Management Unit Number noted in column 1 of Table IV.3.
2. Specify the month and year that the unit was opened.
3. Specify the month and year that the unit is expected to be closed.
4. Estimate the lifetime of the unit (active life).
5. Indicate the RCRA permit status of the unit using one of the following codes.

N	None
IS	Interim status (40 CFR Part 265)
B	Part B (40 CFR Part 264)
S	Solid Waste Management Unit (SWMU) (as defined by 40 CFR §264.90)

6. Has the unit been identified as a source of contamination requiring a RCRA Field Investigation?

**Table V.1. Residual Management Unit Characterization**

[illegible]

\*If CBI is claimed, complete Appendix B.

**V.B. Land-Based Units (other than land treatment): Unit Size and Covers**

Complete Tables V.2 for all onsite and captive offsite land-based management units (except land treatment units) listed in Table IV.3. The following numbered items describe the information requirements for the corresponding columns in the table.

1. Indicate the Residual Management Unit Number (as noted in Table IV.3, column 1).
2. Indicate the surface area of the unit (acres).
3. Indicate the average height of the unit above grade (ft) and the average depth of the unit below grade (ft). For example, if your landfill's finished elevation (excluding final cover) is 5 feet above grade and it extends 10 feet below grade, report "5/10" in this column.
4. Indicate the total capacity of the unit (cubic yards).
5. Indicate the remaining capacity of the unit as of January 1997 (cubic yards).
6. Indicate the percent of the remaining capacity that was used in 1997.
7. Specify the frequency in which a cover is applied (daily, weekly, biweekly, monthly, other).
8. Are dust suppression techniques used? If yes, specify the type in a footnote.

Table V.2. Land-based Units (other than land treatment): Unit Size

1. RMUN	2. Surface Area (Acres )	3. Height (ft)		4. Total Design Capacity (cu. yd.)	5. Remaining capacity as of 1/97 (cu. yd.)	6. % Remaining capacity used in 1997	7. Frequency in Which Cover is Applied	8. Dust Suppression?	CBI*
		above grade	below grade						
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q
								Q	Q

\*If CBI is claimed, complete Appendix B.



### V.C. Land-based Units: Landfills

Complete Tables V.3 for all onsite and captive offsite landfill units listed in Table IV.3. The following numbered items describe the information requirements for the corresponding columns in the table.

1. Specify the Residual Management Unit Number noted in Col. 1 of Table IV.3.
2. Specify the total area of the landfill (acres).
3. Specify the number of cells into which the landfill is divided.
4. Specify the average area of the landfill active at any time (acres).
5. Specify the thickness of the waste distributed over the cell (ft.).
6. Specify the percentage of the area of the total landfill that contains the Residuals of Concern (RC).

**Table V.3. Land-based Units: Landfills**

1. RMUN	2. Total Area (acres)	3. # of Cells	4. Active Area (acres)	5. Thickness of Waste Distributed Over Cell (ft.)	6. % of Total Landfill that Contain RC(s)	CBI?*
						Q
						Q
						Q
						Q
						Q
						Q
						Q

\*If CBI is claimed, complete Appendix B.

# **V.D. Land-Based Units: Design and Construction**

1. Indicate the Residual Management Unit Number (as noted in Table IV.3, column 1).
2. Using the codes below, characterize each layer of the unit's liner in sequence from the uppermost layer to the bottom of the unit. Use a separate line for each layer.
  - 1 Re-compacted clay liner
  - 2 Synthetic liner
  - 3 Natural clay liner
  - 4 Leachate collection layer
  - 5 No liner
  - 6 Other liners (specify)
3. Indicate the thickness of the layer.
4. Indicate the units (inches or millimeters) associated with the thickness measurement in column 3.

**Table V.4. Land-based Units: Liner Construction**

1. RMUN	2. Liner Construction Code	3. Layer Thickness	4. Thickness Units (inches or mm)	CBI?*
				Q
				Q
				Q

\*If CBI is claimed, complete Appendix B.

**V.E. Land-Based Units: Land Treatment Units**

1. Indicate the Residual Management Unit Number (as noted in Table IV.3, column 1).
2. Indicate the surface area of the unit (acres).
3. Indicate the typical surface area over which a Residual of Concern is applied (acres).
4. If the residual is incorporated into the soil, indicate the method used. If the residual is not incorporated into the soil, indicate code 5 in the table.
  - 1 Disking
  - 2 Other surface application (specify type)
  - 3 Subsurface injection
  - 4 Other (specify)
  - 5 Residual NOT incorporated
5. Indicate the depth of incorporation (inches).
6. Specify the frequency of application (daily, weekly, biweekly, monthly, other).
7. Indicate the total annual residual application for 1997 (MT).

**Table V.5. Land Treatment Units**

1. RMUN	2. Surface Area (acres)	3. Surface area residual is applied (acres)	4. Method of Soil Incorporation	5. Depth of Incorporation (inches)	6. Frequency of Application	7. 1997 Total Residual Applied (MT)	CBI*
							G
							G
							G
							G
							G
							G

\*If CBI is claimed, complete Appendix B.

**V.F. Leachate and Run-on/Run-off Control for all Land-Based Units**

1. Indicate the Residual Management Unit Number (as noted in Table IV.3, column 1).
2. If known, specify the annual leachate volume (MT).
3. Is there potential for storm water contact with this unit(s), its contents, or spillages and leaks associated with it? (Yes/No)
4. Will stormwater runoff from the residual management unit(s) in column 1 be managed under a storm water permit? (Yes/No)
5. Indicate the severity of the storm event that the unit's run-on/runoff control system is designed to protect against.
 

10 year 25 year	50 year 100 year	500 year
--------------------	---------------------	----------
6. Indicate if the unit(s) is located in a flood plain. (Yes/No) If yes, indicate the type of flood plain (e.g., 25, 50, 100 year).
7. Indicate the distance from this unit(s) to the nearest downgradient water body (feet).
8. Indicate the type of the run-on/run-off control system in place (indicate all that apply).
  - 1 Berms to prevent water running onto the unit
  - 2 Berms to prevent water running off the unit
  - 3 Berms to prevent flood water from reaching the unit
  - 4 Dikes to prevent water from running onto the unit
  - 5 Dikes to prevent water from running off the unit
  - 6 Dikes to prevent flood water from reaching the unit
  - 7 Diversion ditches to prevent water running onto the unit
  - 8 Diversion ditches to prevent water running off the unit
  - 9 Diversion ditches to prevent flood water from reaching the unit
  - 10 Other (specify)
9. Indicate where the run-off is sent.
  - 1 Onsite wastewater treatment
  - 2 Offsite wastewater treatment
  - 3 Discharged without treatment
  - 4 Other (specify)
10. Provide a brief description of the run-on/run-off control system, including dimensions of barriers (e.g., height, top width, bottom width, run/rise) and materials of construction. Indicate in column 4 whether you have provided this information. (Y/N)

Table V.6. Land-based Units: Leachate and Run-on/Run-off Control

1. RMUN	2. Annual Leachate Volume (MT)	3. Contact with Storm Water Possible? (Yes/No)	4. Runoff Under Storm Water Permit? (Yes/No)	5. Run-on/Run-off Storm Severity	6. Flood Plain Type	7. Distance to Nearest Downgradient Water Body (ft)	8. Run-on/Run-off Control System Type	9. Run-off Destination Code	10. Description Attached (Yes/No)	CBI?*
										Q
										Q
										Q
										Q
										Q
										Q
										Q
										Q
										Q

\*If CBI is claimed, complete Appendix B.

## V.G. Tanks

Complete Table V.7 for all onsite and captive offsite permanent tanks noted in Table IV.3. This section is not required for mobile tanks, such as those brought onsite by contractors providing turnaround services. The following numbered items describe the information requirements for the corresponding columns in the table.

1. Indicate the Residual Management Unit Number (as noted in Table IV.3, column 1).
2. Indicate the tank volume (gallons).
3. Indicate the tank area (ft<sup>2</sup>).
4. Is secondary containment provided? (Yes/No)
5. Does the tank have a roof? (Yes/No)

**Table V.7. Tank Information**

1. RMUN	2. Tank Volume (gal)	3. Tank Area (ft <sup>2</sup> )	4. Secondary Containment? (Yes/No)	5. Covered? (Yes/No)	CBI?*
					Q
					Q
					Q
					Q
					Q
					Q

\*If CBI is claimed, complete Appendix B.

## V.H. Surface Impoundments

Complete Table V.8. for all onsite and captive offsite units listed in Table IV.C, section 3, that are surface impoundments. The following numbered items correspond to the columns in Table V.8.

1. Indicate the Residual Management Unit Number as noted in column 1 of Table IV.3.
2. What is the total wastewater flow through the surface impoundment in Metric Tons?
3. What is the flow of Residuals of Concern in Metric Tons?
4. What is the total surface impoundment area? (M<sup>2</sup>)
5. Is the surface impoundment aerated?
6. Specify the type of liner (e.g., clay, synthetic).
7. Does liner have leak detection system? (Yes/No)
8. Are there plans to close, retrofit, or switch to tanks? (Yes/No) If yes, provide detail in footnote and estimate the quantity of material that would be removed.

**Table V.8. Surface Impoundments**

1. RMUN	2. Total WW Flow through S.I. (MT)	3. Residual Flow (MT)	4. Total S.I. Area (m <sup>2</sup> )	5. Aerated?	6. Liner Type	7. Leak Detection System (Y/N)	8. Closure plans?	CBI?*
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q

\*If CBI is claimed, complete Appendix B.



## V.I. Deep Well Injection

Complete Table V.9. for all onsite and captive offsite deep well injection residual management units previously identified in Table IV.C, section 3.

1. Indicate the residual management unit number.
2. Indicate the injection rate (gal/yr) for the residual and total rate for the well.
3. Indicate the distance from grade to the top of the injection zone (ft).
4. Indicate the regulatory status of the well using the following codes:
  - 1 Class I nonhazardous waste
  - 2 Class I hazardous waste
  - 3 Class I hazardous waste with approved "no migration" petition
  - 4 Other (specify)
5. Attach a construction design of the well showing the date of completion and information on the hydrogeological characteristics of each formation penetrated by the well (e.g., hydraulic conductivity, effective porosity, thickness, fluid elevation, aquifers and pressure). Indicate in column 5 whether you have provided this information (Y/N).

**Table V.9. Injection Well Characteristics**

1. RMUN	2. Injection Rate (gal/yr)	3. Depth from grade to top of injection zone (ft)	4. Regulatory status code	5. Additional information attached? (Yes/No)	CBI?*
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q

\*If CBI is claimed, complete Appendix B.

## V.J. Containers

Containers are any enclosed storage device that is not a tank (see 40 CFR 260.10), landfill, or surface impoundment.

Have identified residuals been stored or treated onsite in containers? Yes/No (Circle one).

If yes, complete Table V.10 for each RIN stored or treated in containers. If the facility has several onsite and captive offsite container storage areas, provide information only on the primary container storage area for each RIN.

The following numbered items describe the information requirements for the corresponding columns in the table.

1. Indicate the Residual Management Unit Number, as noted in column 1 of Table IV.3.
2. Indicate the size and type of container (e.g., 55-gal. drum, 30 cu.yd. roll-off bin).
3. Is the container closed? (Yes/No)

**Table V.10. Containers**

1. RMUN	2. Container type and size	3. Closed? (Yes/No)	CBI?*
			Q
			Q
			Q
			Q
			Q
			Q
			Q
			Q
			Q

\*If CBI is claimed, complete Appendix B.

## V.K. Piles

Have identified residuals been stored or treated in onsite or captive offsite piles at any time since January 1, 1997? Yes/No (Circle one)

If yes, complete Table V.11. for each pile noted in Table IV.1

1. What is the Residual Management Unit Number?
2. Are there dust suppression methods in place? (Yes/No) If yes, specify the type in a footnote.
3. Specify if the pile has:

- 01 concrete pad
- 02 runoff containment
- 03 synthetic liners
- 04 none

4. Specify any Run-on/Run-off Controls used with the following codes:

- 1 Berms to prevent water running onto the unit
- 2 Berms to prevent water running off the unit
- 3 Berms to prevent flood water from reaching the unit
- 4 Dikes to prevent water from running onto the unit
- 5 Dikes to prevent water from running off the unit
- 6 Dikes to prevent flood water from reaching the unit
- 7 Diversion ditches to prevent water running onto the unit
- 8 Diversion ditches to prevent water running off the unit
- 9 Diversion ditches to prevent flood water from reaching the unit
- 10 Other (specify)

5. Indicate the severity of the storm event that the unit's run-on/run-off control system is designed to protect against.

10 year 25 year 50 year 100 year 500 year

6. Specify the average volume in the pile. (Cu. Yd)

**Table V.11. Piles**

1. RMUN	2. Dust Suppression (Yes/ No)?	3. Concrete Pad/Runoff Containment/ Synthetic Liners?	4. Type Run-on/ Run-off Controls	5. Storm Event Design	6. Average Volume in Pile (cu. yd)	CBI? *
						Q
						Q
						Q
						Q
						Q
						Q

\*If CBI is claimed, complete Appendix B.

## **VI. General Facility Information (Both onsite and facility-owned offsite)**

This section asks for general information on your facility and land use inside and outside the facility. This information will be used in the fate and transport part of EPA's analysis.

Please provide a detailed map of the facility and surrounding area. This map may be a photocopy of one previously sent to a state or federal agency. The map should include items 1 through 4 listed below within 1 mile of the facility boundary, if available.

1. Facility property boundary
2. Location of all residual management units
3. Ground water gradient and direction
4. Prevailing wind direction

## VII. Certification

I certify under penalty of law that I have personally examined and am familiar with the information contained herein and, that based on my inquiry of those responsible for obtaining the information, I believe the above to be true and complete, and I am aware that there are substantial penalties for submitting false information.

Signature \_\_\_\_\_

Date \_\_\_\_\_ Telephone \_\_\_\_\_

Name (print) \_\_\_\_\_

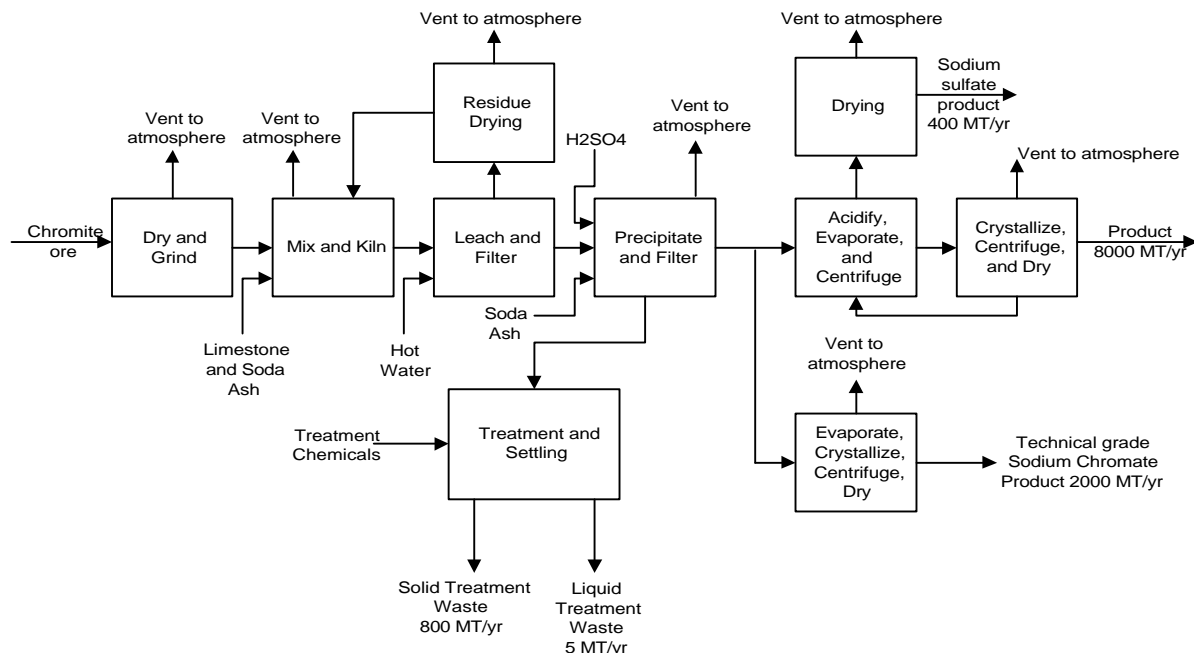
Title \_\_\_\_\_

**Authority for the collection of the above information is contained in the Resource Conservation and Recovery Act, 42 USC 6901 et seq.**

## APPENDIX A

### Examples

## Example PFD for Sodium Dichromate Manufacture



Chromite ore is fed to a drier and grinder to size the chromite ore. The drier is vented to the atmosphere and the exiting air contains fine particulate matter. The chromite ore is then fed to an alkaline roaster where limestone and soda ash are introduced to increase roasting rate. The kiln is vented and the stream is rich with carbon dioxide. After roasting, the mix is leached and filtered allowing the chromium to remain in solution. The filtered residuals are sent to a residue drier and then recycled to the kiln. The residue drier also has a vent that releases small amounts of soda ash and limestone particulates. The chromium solution that remains after leaching is then sent to a precipitation vessel where sulfuric acid and soda ash are added to reduce the pH to 5 to precipitate the remaining ore residues and activate the hexavalent form of chromium. The ore residuals are then sent to treatment and settling which will be described later. The precipitation stage also produces a carbon dioxide rich stream which is vented to the atmosphere.

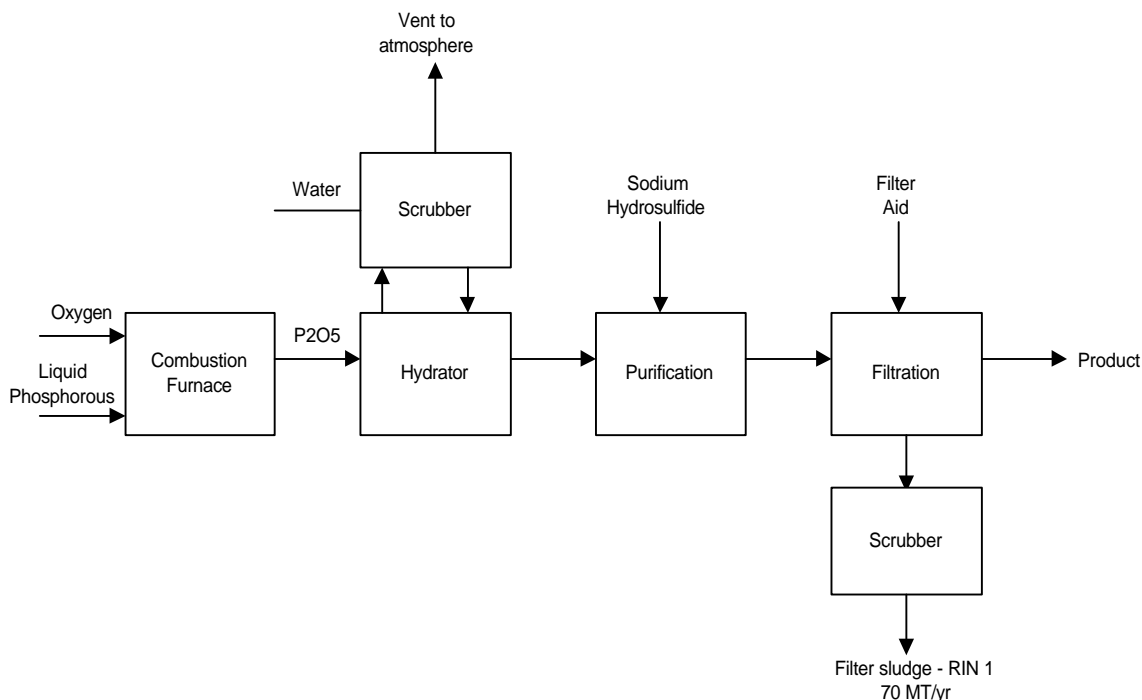
The chromium solution filtrate is split to produce two grades of product. Twenty percent of the chromium stream leaving the precipitation step is immediately evaporated and crystallized to produce technical grade Sodium Chromate ( $\text{Na}_2\text{CrO}_4$ ). The evaporator used to dry the product produces a gaseous waste stream that contains mostly water vapor and small amounts of particulate product.

The remaining 80% of the chromium precipitate stream is diverted to become Sodium dichromate. This solution is further acidified with sulfuric acid to a pH of 4.0 to produce the dichromate form of chromate. This solution is partially evaporated and centrifuged to separate Sodium Sulfate from the dichromate solution. The sodium sulfate is dried and sold as a by-product. After the removal of the sodium sulfate the dichromate solution is centrifuged and crystallized. Any liquid residuals are recycled to the evaporator and sodium sulfate removal stage. The crystallized sodium dichromate is then sent to a final drying step and then packaged as product.

The waste treatment and settling unit receives waste from the ore residue precipitant stage and also handles wastes generated from scheduled clean-outs. The waste treatment unit uses flocculating agents to help precipitate the ore residues. This unit also generates two wastes: a solid waste and a liquid waste (RIN 1 and 2). RIN 1 is sent to an off-site industrial Subtitle D landfill. RIN 2 is drummed and sent to an off-site publicly owned treatment works (POTW). These wastes are treatment residues from the roasting and leaching of chrome ore and are exempt from hazardous waste regulation by the Bevill exemptions.



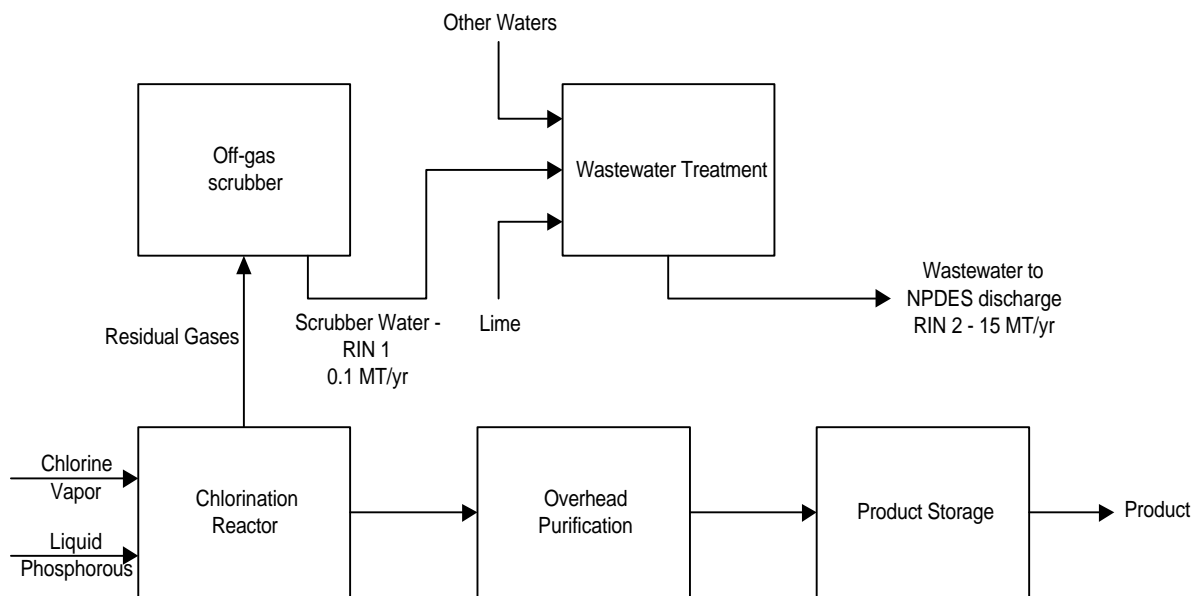
# **Example PFD for Dry Process Phosphoric Acid Manufacture**



Liquid Phosphorous and pure oxygen are fed to a combustion furnace where the phosphorous and oxygen react to form phosphorous pentoxide. This gas is then fed into a condenser where water is sprayed over the gas to create phosphoric acid. Escaping gas is collected in a scrubber with fresh water as the collection agent. The scrubber water, now phosphoric acid, is returned to the condenser. The scrubber is vented and releases an airborne waste stream to the atmosphere which contains trace phosphoric acid. The phosphoric acid from the condenser is sent to purification where sodium hydrosulfide is added to precipitate arsenic sulfide and calcium sulfide. The precipitates from the purification are then filtered with the help of a filter aid. The product is then packaged in drums for sale. Escaping gases from filter waste solids are scrubbed to remove hydrogen sulfide, and the remaining sludge waste is then sent to an offsite Subtitle C landfill (RIN 1).

A solid waste stream is also generated from product storage (RIN 2 not shown on PFD). This waste is mostly inert material which is collected in sludge form and also sent to the offsite Subtitle C landfill.

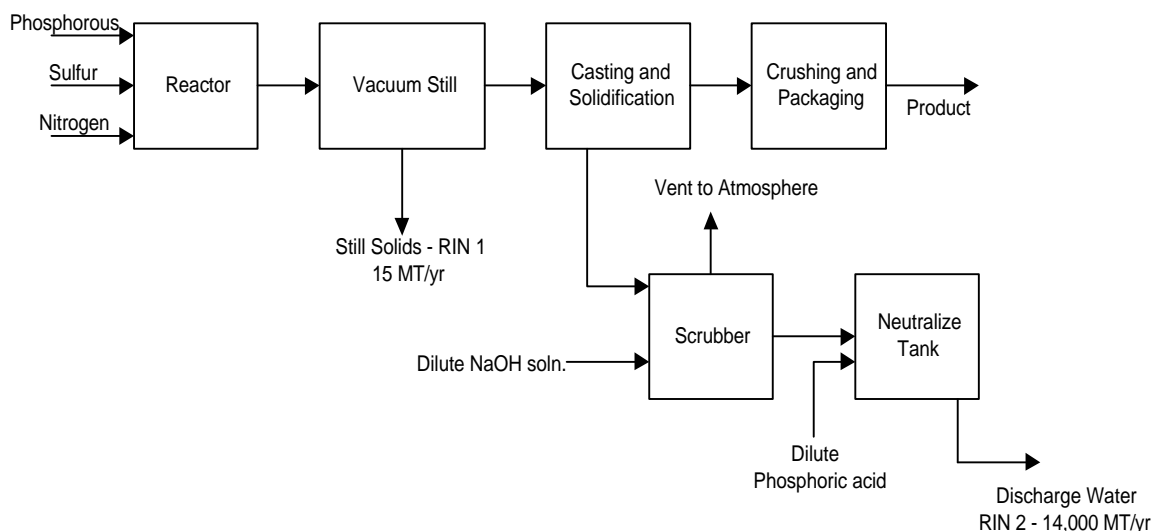
# **Example PFD for Phosphorous Trichloride Manufacture**



The production begins as liquid phosphorous is sprayed into a reactor simultaneously fed with chlorine gas. The ensuing chemical reaction produces phosphorous trichloride and is controlled and slowed by recycling phosphorous trichloride. The reacted phosphorous trichloride is then sent to be purified by distillation. Residual gases from the distillation are scrubbed with water to produce hydrochloric acid and phosphorous acid. These acidic waters (RIN 1 along with some arsenic trichloride) are sent to onsite wastewater treatment. The wastewater treatment plant uses lime to neutralize the acids and this liquid is sent to a Subtitle D surface impoundment prior to NPDES discharge. Total wastewater flow through the WWTP is 15 million MT/yr.

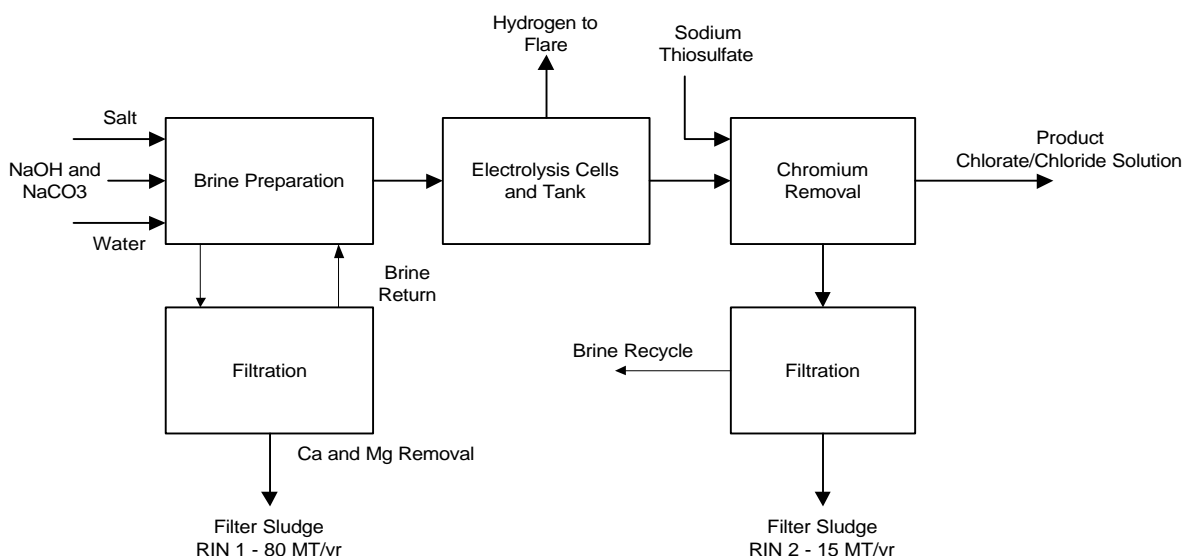
Another residual is produced during regular plant turnaround. Reactor cleaning produces an arsenic bearing sludge (RIN 2 not shown in PFD). Reactor cleaning also uses many solvents which result in arsenic bearing waste streams (RIN 3 not shown in PFD). RIN 2 is drummed and shipped to a Subtitle C landfill; RIN 3 is drummed and shipped to offsite solvent recovery.

# **Example PFD for Phosphorous Pentasulfide Manufacture**

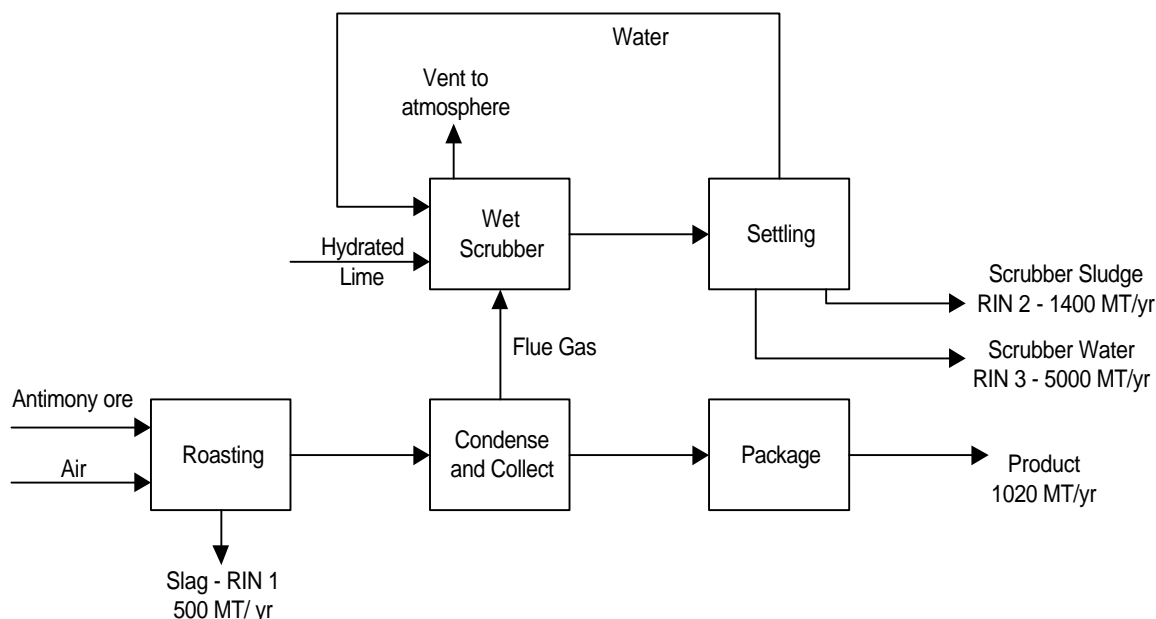


The production of phosphorous pentasulfide begins by feeding liquid phosphorous and liquid sulfur into a cast iron reactor. The reactor temperature starts at 200° Celsius and quickly rises due to the exothermic reaction taking place. The reactor is continually filled with nitrogen gas to prevent oxidation of sulfur. The reactor batches are forced, by nitrogen gas, into an electrically heated vacuum still where the liquid product is distilled leaving a residue in the still consisting of glassy phosphates and carbon and iron sulfur compounds. This still is cleaned out in turn-over operations once every 2 months (RIN 1). The residue is sent to an on-site Subtitle D landfill. The purified product is cast into cones and then crushed and packaged. During casting, the liquid product ignites when it contacts air and emits phosphorous pentasulfide and sulfur dioxide. These contaminants are scrubbed and the wastewater from the scrubber is sent to a neutralization tank prior to discharge (RIN 2). The neutralized wastewater is sent to WWTP which realizes a total flow of 25 million MT/yr. The scrubber vent is nearly clean and is vented to atmosphere.

### Example PFD for Sodium Chlorate Manufacture



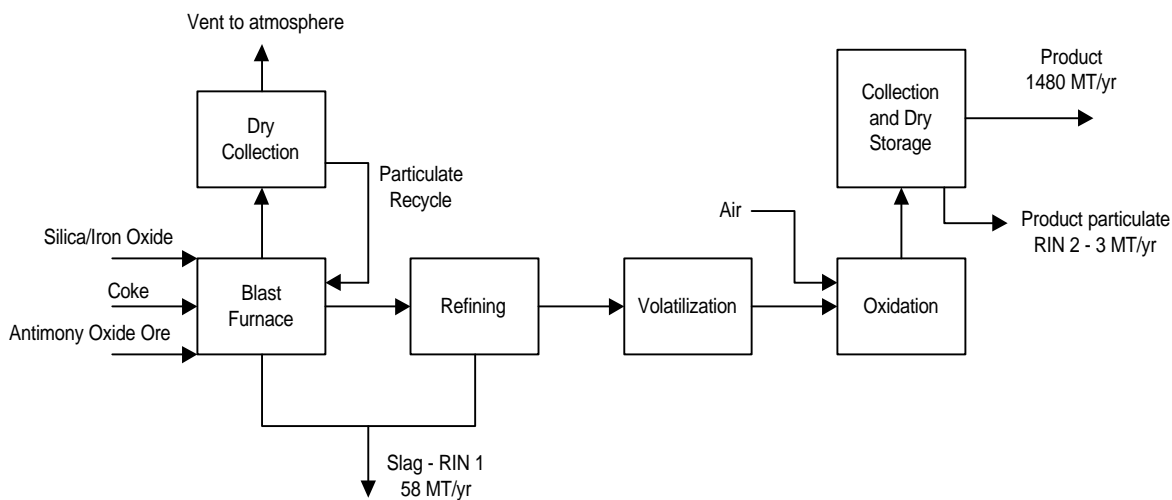
Sodium chlorate is manufactured by first preparing a brine mixture from rock salt. This salt is treated by addition of sodium hydroxide and sodium carbonate to reduce the calcium and magnesium levels. The removed calcium and magnesium are sent through a filtration process and are produced as waste (RIN 1), while the liquid from the filter is returned to the Brine Preparation tank. The brine is then fed to an electrolysis unit where sodium chloride oxidizes with three water molecules to produce the product along with hydrogen gas. The hydrogen gas is very pure and is sent to flare. The sodium chlorate solution is then sent to a chromium removal stage where, with the addition of sodium thiosulfate, the chromium precipitates out in the form of chromium (III) oxide. This precipitant is filtered and the filtrate is returned to the brine preparation tank. The filter solids generated from filtration (RIN 2) are shipped to an offsite Subtitle C landfill. The final product is a chromate/chloride mixture.

**Example PFD for Antimony Oxide by the Direct Method**

The production begins by feeding antimony sulfide ore into a furnace to be burned in air. The resulting reaction creates antimony oxide and sulfur dioxide. The ore creates a slag that must be removed periodically (RIN 1) and contains antimony, arsenic, and some lead. This slag is shipped to an offsite secure Subtitle C landfill. After the product antimony oxide is condensed and collected after roasting, it is packaged as a technical grade product.

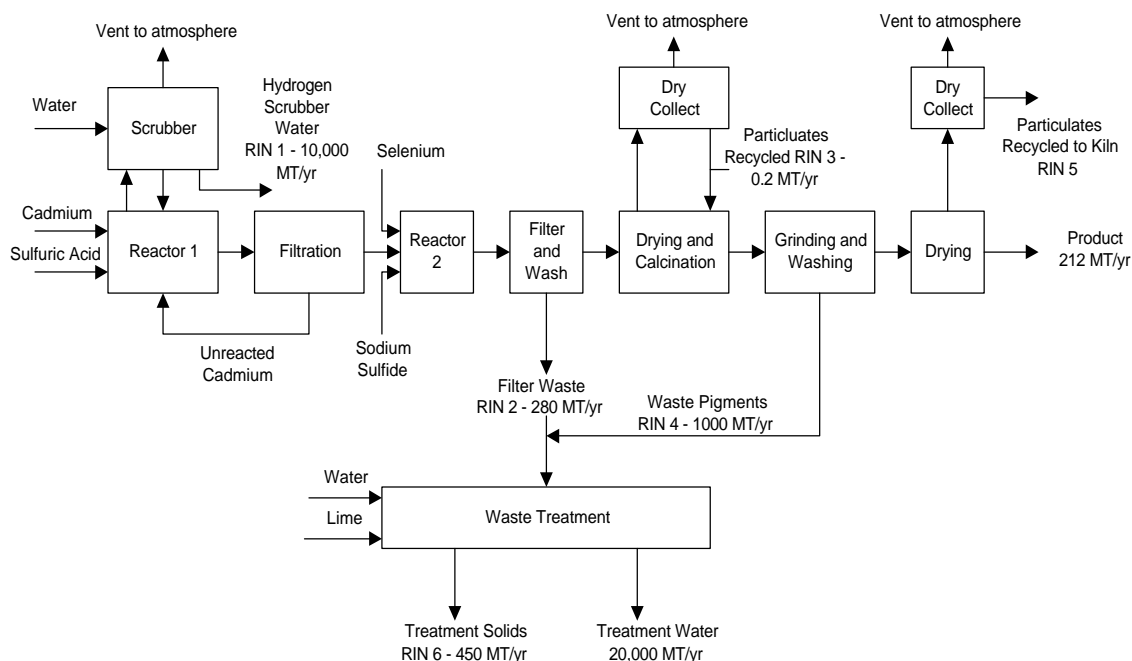
The sulfur dioxide and other gasses produced during condensing and collection are sent to a wet scrubber where hydrated lime is added to remove most of the sulfur dioxide. Escaping gases are vented to the atmosphere with low levels of sulfur dioxide and particulates. The spent scrubbing liquid is sent to a settling tank, allowing the water to be recycled to the scrubber, while the sludge (RIN 2) generated is put in drums and shipped off-site and disposed of in a Subtitle C landfill. Periodically a portion of the scrubber water must be purged. About 5000 MT of scrubber water (RIN 3) is removed each year and sent to WWTP. The total wastewater flow through the WWTP is approximately 20 million MT per year.

### Example PFD for Antimony Oxide by the Indirect Method



Antimony oxide is manufactured by first feeding a combination of coke, antimony oxide ore, iron oxide, and silica to a blast furnace. These constituents react to release elemental antimony in liquid form. Blast furnace off-gasses, mostly carbon dioxide, are vented into a baghouse, where ore particulates are recovered and off-gasses are vented to the atmosphere. The off-gas particulates are recycled to the blast furnace. The extracted liquid antimony is then refined before oxidation. After being refined the liquid antimony is volatilized and then sent to the oxidation process where air is forced through liquid antimony. The oxidized product is then allowed to cool and condense in the collection and dry storage facility before being drummed for shipping. The waste produced in this process is a slag which contains arsenic, lead, and antimony from the refining process, the blast furnace, and off-gas from product collection. The slag (RIN 1) is sold to an offsite lead recovery operation.

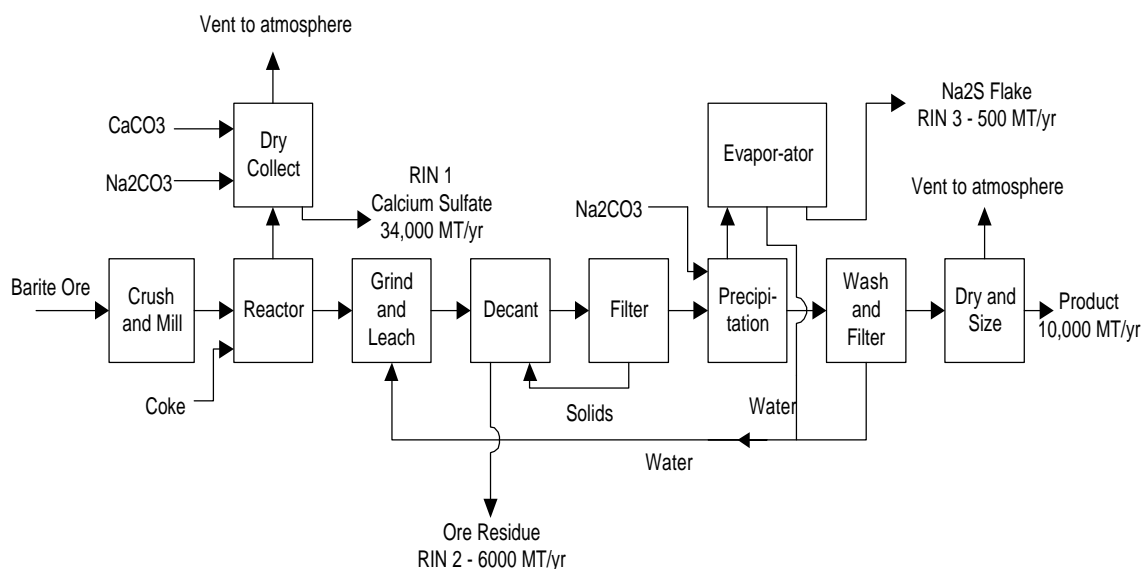
## Example PFD for Cadmium Pigments Manufacture



This facility produces one cadmium pigment, Cadmium Red. Production of Cadmium Red begins by reacting cadmium metal with sulfuric acid. The off-gasses, which contain hydrogen, water vapor, cadmium sulfide, and some sulfuric acid, are water scrubbed. Off gas vapors are vented to the atmosphere, while the spent scrubber liquid (RIN 1) is sent to waste treatment. The reaction products are sent to filtration, where unreacted cadmium is separated and returned to the reaction vessel. The cadmium sulfide is then sent to a second reactor, where selenium is added to provide the red coloration and sodium sulfide is added to precipitate out sodium sulfate. The reaction products are once again filtered; filter sludges (RIN 2) are washed and then sent to waste treatment (discussed below) while the liquid product is sent to be dried. The drying and calcination kiln has a vent that leads to a dry collection store. The store collects particulate product (RIN 3) and returns it to the kiln; off-gasses from the store are vented to the atmosphere. After the product is dried, it is ground to the proper size and washed with water. The wash waters (RIN 4) are sent to waste treatment while the product is again dried and then packaged. The drier vent is sent to a baghouse; particulates (RIN 5) are collected and sent to the kiln, while off-gas is vented to atmosphere.

The waste treatment facility described above accepts wastes RIN 2 and RIN 4. These wastes are acidic, and as such, are treated with lime to adjust the pH to precipitate cadmium and zinc salts. The water is then filtered and sent to the WWTP. Total wastewater flow of the WWTP is 25 million MT/yr. The treatment solids (RIN 6) are sold to an off-site firm to recover the cadmium metal.

### Example PFD for Barium Carbonate Manufacture



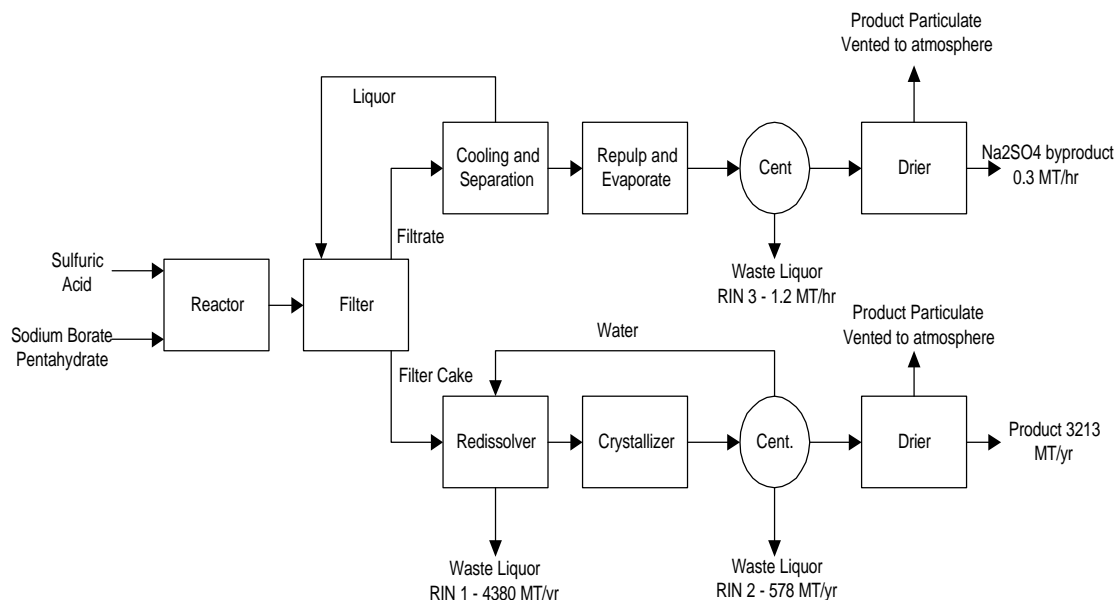
The first step of barium carbonate manufacture is the crushing and milling of barite ore to 100 mesh. The ore is then fed to a baking kiln along with coke in a ratio of 5:4. This mixture is baked at high temperature for about ten minutes where the reactions release sulfur dioxide, carbon monoxide, carbon dioxide, as well as other prolific constituents. The airborne wastes are scrubbed with calcium carbonate and sodium carbonate to precipitate calcium sulfate and sodium sulfate. The calcium/sodium sulfate residue (RIN 1) is collected and sent to a Subtitle D landfill. The remaining airborne wastes are vented to the atmosphere.

The solid remaining in the kiln is ground and leached with hot water. The barium sulfide solution is then decanted and clarified using three serial clarifiers. The ore residue is removed during the decantation process, dried, and then sent to an onsite Subtitle D landfill (RIN 2).

The clarified barium sulfide is then sent to a precipitation tank where soda ash is added to produce barium carbonate. As a byproduct of this reaction sodium sulfide and sodium hydrogen sulfide are produced. These byproducts are sent to an evaporation tank where the solids are collected and sent to an offsite Subtitle C landfill (RIN 3). Water from the evaporator is recycled to the leaching process. The barium carbonate precipitate is then washed and filtered in preparation for drying. The filter water is recycled to the leaching process, while the barium carbonate solid is sent to drying. The drier is vented and allows small amounts of product particulates to escape. The dry product is then sized and packaged.



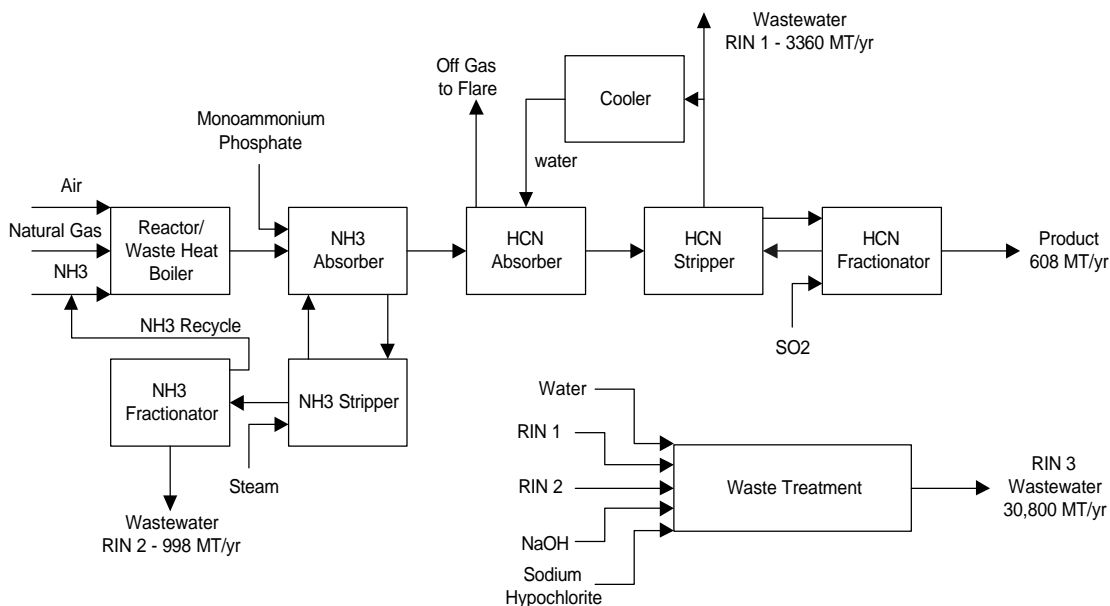
### Example PFD for Boric Acid Manufacture



Orthoboric acid production begins by reacting sodium borate pentahydrate with sulfuric acid. The resulting reaction creates orthoboric acid with sodium sulfate and water. The boric acid, which is a solid after reaction, is then filtered. The filter cake, which is primarily boric acid is cleaned and crystallized. Excess liquor is cleaned from the acid by means of recycled wash water from a later cleaning step. The liquor water (RIN 1) is sent to be stabilized, and is then sent to an offsite Subtitle C landfill. The boric acid then is crystallized and centrifuged to remove the final traces of mother liquor from the product (RIN 2). The waste liquor from this step is transferred to an on-site WWTP with an on-site surface impoundment. The total flow in the surface impoundment is 1 million MT/yr. The dilute mother liquor is recycled to the redissolver step. The final product is then dried and packaged.

The filtrate from the reactor is sent to be cooled to remove the byproduct of sodium sulfate. The sodium sulfate drops out of solution upon cooling and is sent to the next stage, while the remaining liquor is recycled to the filter. The sodium sulfate is then returned to a slurry via waterwash and is evaporated before being sent to centrifuge for drying and separation. The liquid that is produced from the centrifuge is drummed (RIN 3) and sent off site for incineration. The sodium sulfate crystals are then dried further and packaged.

## Example PFD for Hydrogen Cyanide Manufacture



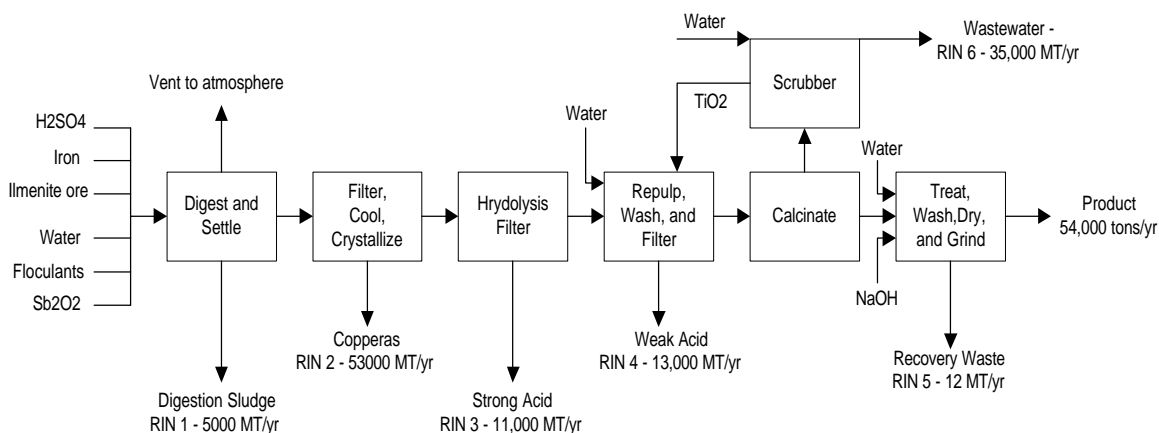
### Andrussow Process with ammonia recycle

Ammonia, natural gas, and air are fed into the primary reactor and heated over platinum and rhodium catalyst to 1100° Celsius. The products are moved through the reactor and quenched immediately to 350° Celsius via a waste heat boiler. The products and unreacted reactants then move to an ammonia absorber where a monoammonium phosphate solution is added. This converts the ammonia to diammonium phosphate and the liquid is removed and taken to the ammonia recovery system, which will be described later. The product off-gas is sent from the ammonia absorber to the hydrogen cyanide absorber where cold water is added to entrain the hydrogen cyanide. The excess unreacted gasses are sent to flare. The hydrogen cyanide-water mixture is then sent to a cyanide stripper where excess water is removed from the liquid. Wastewater is partially recycled to the cyanide absorber and the remainder is sent to waste water treatment (RIN 1). After being stripped to near purity, the hydrogen cyanide- water mixture has sulfur dioxide added in a fractionator to act as an inhibitor. This mixture is the final product.

The ammonia recovery system accepts diammonium phosphate from the ammonia absorber. The system consists of a steam stripper and a fractionator. From the stripper, the overhead containing water and ammonia is condensed and sent to a fractionator where the water is removed and sent to wastewater treatment (RIN 2). The stripper bottoms are recycled to the ammonia absorber. The ammonia gas is then mixed with fresh ammonia for recycle into the primary reactor. Spent Pt/Rd catalyst (RIN 4) is removed from the reactor every 2 years and sent offsite for metals reclamation.

The wastewater treatment facility accepts wastewaters RIN 1 and RIN 2 from the process. The total wastewater flow for the WWTP is 30,800 MT/yr. The wastewater is fed into a retention pond where the pH is adjusted to 10. Next, sodium hypochlorite is added to chlorinate the waste for cyanide destruction. After settling for 9 hours the liquid is discharged to an offsite POTW (RIN 3).

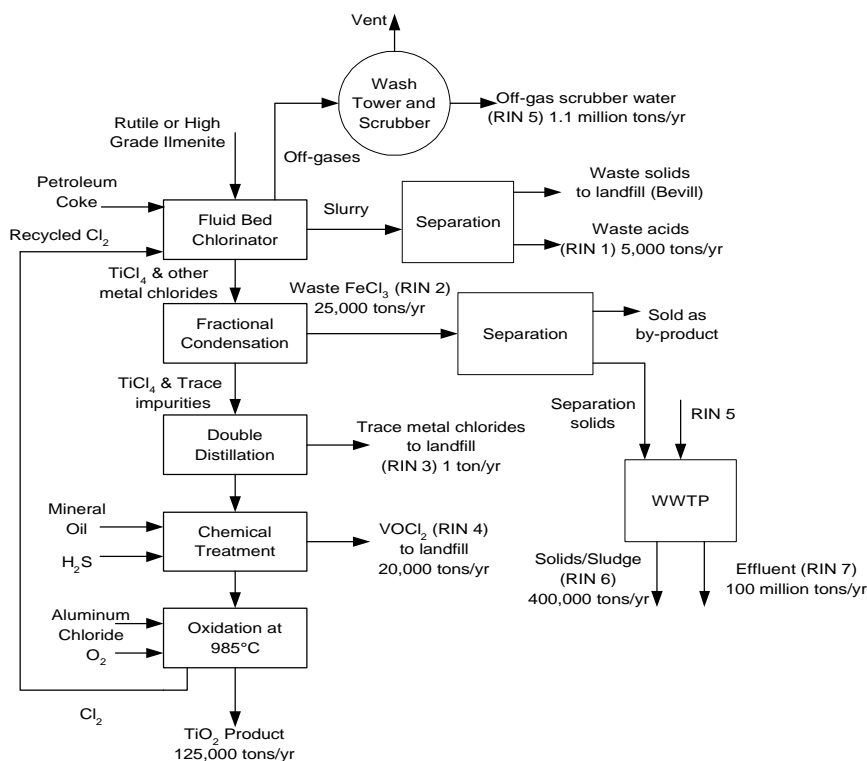
## Example PFD for Titanium Dioxide Manufacture



The sulfate process begins by feeding dried ilmenite ore into a batch reaction still with concentrated sulfuric acid. The acid digests the ore over the period of an hour resulting in a green, thick, titanyl sulfate sludge. The reactor is then flooded with warm water and steam creating a slurry of titanyl sulfate which is pumped into settling tanks. Scrap iron is then added to the mixture to reduce the ferric ions in the slurry to the ferrous state. Sodium hydrosulfide is then added to precipitate all of the heavy metal sulfides, flocculating agents are added to precipitate all of the suspended solids, and antimony oxide is added to control the quality of the final product. The solution is then filtered to remove the precipitants and vacuum crystallized to cool the purified liquid. The titanium liquor is then hydrolyzed to titanium dioxide hydrate by boiling and seeding with the hydrate product. The hydrate then precipitates from the acid solution and the pulp is removed via a rotary filter. The solid product is then leached to remove the final traces of the acid solution and then sent to be calcinated. Calcination takes place in a rotary kiln at 850° Celsius to dehydrate the titanium dioxide. The final product is then sent to treatment, where surface treatments are added to improve dispersability. The product is again dried, then sized and packaged.

This process creates a number of residuals. Ore digestion creates two RCs: vented gases and a digestion ore sludge. The vented gases are released to the atmosphere. Digestion sludge is removed after flocculation and primary filtration of the titanyl sulfate (RIN 1). This digestion sludge is rich in heavy metals, chromium, and alumina, and is drummed and sent to an offsite Subtitle C landfill. The centrifugation of the titanyl sulfate solution also produces an acidic waste (RIN 2), which is commercially sold as copperas. The filtering of the titanium dioxide hydrate solution produces a large quantity of strongly acid waste (RIN 3). This waste is sent to a neutralization tank along with the weak acid produced from the cleaning of the hydrate (RIN 4). Waste water from the neutralization tank is released upon neutralization to the WWTP, while the solids (RIN 7) are filtered and sent to an offsite Subtitle D landfill. Scrubber water is also produced which contains particulate product from the calcinator (RIN 6) which is sent to an onsite WWTP. The final treatment step in the titanium dioxide process produces a small amount of wastewater containing product and some additives (RIN 5). This waste is sent to an onsite Subtitle D surface impoundment for storage and then to WWT. Total wastewater flow for the facility is approximately 20 million MT/yr.

## Example PFD for Titanium Dioxide Manufacture using the Chloride Process

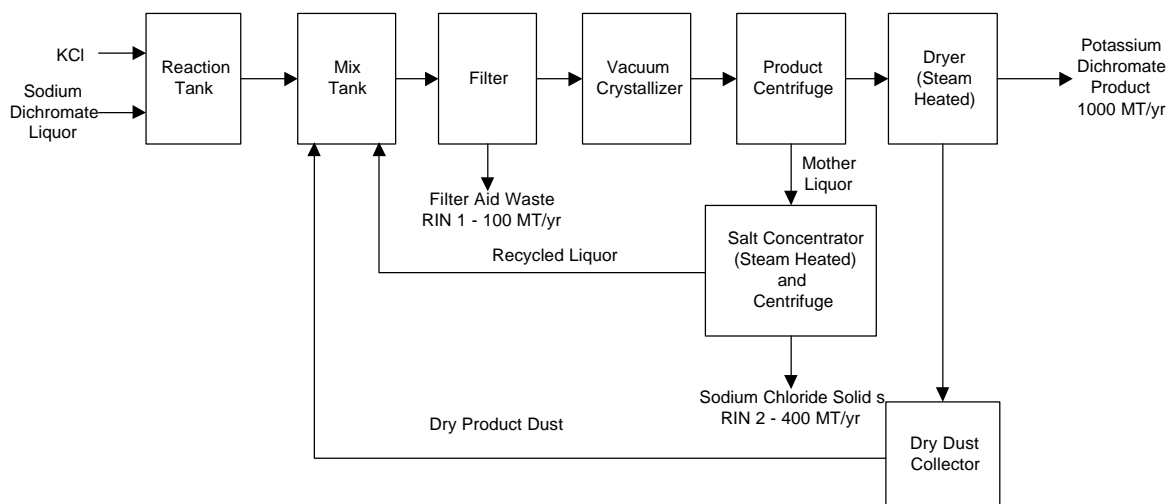


The chloride process begins with the conversion of rutile or high-grade ilmenite into titanium tetrachloride (TiCl<sub>4</sub>). This step occurs in a fluidized bed chlorinator in the presence of chlorine gas at a temperature of approximately 900°C. Petroleum coke is also added as a reductant. The generated volatile metal chlorides (TiCl<sub>4</sub>) are collected while the produced waste undergoes further processing. This waste stream is generated as a combined acids/solids slurry. The two waste forms (solids and liquids) are separated with the chloride process waste solids landfilled while the acids (RIN 1) are deep-well injected.

After chlorination, the gaseous product stream is purified in order to separate the titanium tetrachloride from the other metal chlorides. The separation is carried-out in three separate steps which are: fractional condensation, double distillation, and chemical treatment. Waste ferric chloride (FeCl<sub>3</sub>) (RIN 2) is produced as an acidic waste stream during fractional condensation. This waste stream is treated with lime and either landfilled or sold as a by-product. Several additional trace metal chlorides (RIN 3) are removed as a result of double distillation and subsequently landfilled. During chemical treatment, vanadium oxychloride (VOCl<sub>3</sub>) is removed as a low-volume non-special waste through complexing with mineral oil and reducing with hydrogen sulfide (H<sub>2</sub>S) to VOCl<sub>2</sub> (RIN 4) and subsequently landfilled. In the final step, the titanium tetrachloride is oxidized to TiO<sub>2</sub> product. The chlorine gas driven-off from this oxidation step is recycled to the fluidized bed chlorinator.

Finally, the off-gases from the chlorinator are sent through a water tower and scrubber system in which off-gas scrubber water (RIN 5) is produced and subsequently managed in the WWTP. After processing, the gas stream is vented to the atmosphere. Wastewater treatment effluent (RIN 7) and sludge/solids (RIN 6) are sent to separate on-site impoundments before the effluent is discharged through an NPDES outfall.

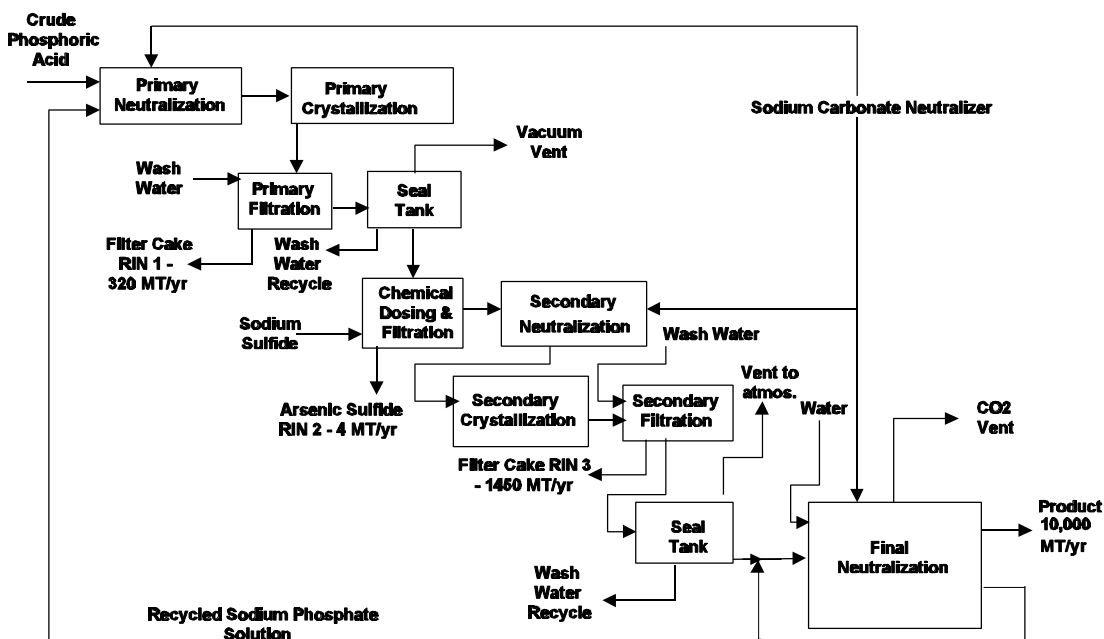
# **Example PFD for Potassium Dichromate**



Potassium dichromate is made by the reaction of potassium chloride and sodium dichromate liquor in solution. The solution is then pH adjusted, saturated and filtered. Filtering produces solid filter aid waste (RIN 1) which is drummed and shipped to a Subtitle C landfill. The material is then vacuum cooled to precipitate crystalline potassium dichromate which is recovered by centrifuging. The resulting potassium dichromate solution is then evaporated to recover the product. Next, the material is dried, sized and packaged. The dust produced during the drying and packaging is sent to a dust collection area where it is settled and returned to the reaction tank via conveyor.

The mother liquor from the product centrifuge is then concentrated to precipitate sodium chloride which is removed as a solid waste (RIN 2) from a salt concentrator and centrifuge. The waste solid sodium chloride is contaminated with chromate salts and is considered hazardous and is subsequently transported to an offsite Subtitle C landfill.

## Example PFD for Wastes from the Production of Sodium Phosphate from Wet Process Phosphoric Acid



Sodium phosphate from the wet feedstock method is produced by a series of precipitation reactions followed by a final neutralization step to release the product. Wet phosphoric acid is fed into the system with sodium carbonate until a pH of approximately 2.0 is reached. This step precipitates sodium fluorosilicate. Primary filtration results in a filter cake (RIN 1) which is shipped to a Subtitle C landfill. The precipitant is removed by centrifugation and the remaining solution is sent to a secondary precipitation train. Arsenic salts are removed by treatment with sodium sulfide (arsenic precipitant). The arsenic sulfide (RIN 2) is containerized and shipped to a Subtitle C landfill. This step also removes any remaining fluorides that escaped the previous precipitation step. The solution is then neutralized to a pH of 5 with sodium carbonate to remove iron and aluminum phosphates. The solution is sent to the secondary crystallizer, then filtered to remove the precipitants (RIN 3). The precipitants are then managed in an on-site Subtitle D landfill. The remaining acid is then sent to final neutralization with sodium carbonate. The pH is neutralized to approximately 8.5 if the desired product is trisodium phosphate. The final neutralization also produces some monosodium dihydrogen phosphate and some monosodium monohydrogen phosphate.

**Table III.1. Example Response to Section III.A  
Residual Characterization**

<b>1. RIN</b> _1_____		<b>3. Residual Code</b> _04_____		<b>CBI?</b> <b>Q</b>	
<b>2. Common Name</b> _Digestion sludge_____		<b>4. RCRA Code(s):</b> D007_____			
<b>5. Properties of Residual</b>		<b>Particle Size Distribution</b>		<b>Phase Distribution &amp; Other Properties</b>	
pH	3.5	> 60 mm	10%	Aqueous Liquid	65%
Reactive CN	NA ppm	1-60 mm	65%	Organic Liquid	%
Reactive S	NA ppm	100 $\mu$ m-1 mm	20%	Solid	35%
Vapor Pressure	NA mm Hg	10 $\mu$ m-100 $\mu$ m	5%	Other (specify)	%
Viscosity	NA cP	< 10 $\mu$ m	%	TSS in WW	
Specific Gravity	1.0			NORM	
<b>6. Residual Characterization</b>					
Element or Compounds	Total Concentration (mg/kg)	TCLP Concentration (mg/L)	Other Leaching Procedure Concentration (mg/L), Specify Method		
Arsenic	250	0.1			
Barium	200	10			
Cadmium	ND	ND			
Chromium	200	25	20/SPLP		
Lead	10	0.5			
Iron	32000	NA			
Magnesium	640	NA			
Silver	ND	ND			
Titanium	24000	NA			
Zinc	1300	NA			
Sodium	250000	NA			

\*If CBI is claimed, complete Appendix B.

NA - data not available

ND - not detected

Table IV.1. Example Response to Section IV.A  
Residual Generation Rate and Management

1. RIN ____1____	2. Quantity Generated ____5,000____ (MT) Year of Generation (if not 1997) _____		3. Frequency of Generation ____B____	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes (Y/N)	CBI?
1	01-B	10	N	Q
F	13-B	20	N	Q
				Q
				Q

1. RIN 2	2. Quantity Generated 5,000 (MT) Year of Generation (if not 1997)		3. Frequency of Generation B	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes (Y/N)	CBI?
F	10-C (Offsite metals reclamation)	30	N	Q
				Q

1. RIN ____3____	2. Quantity Generated ____53,000____ (MT) Year of Generation (if not 1997) _____		3. Frequency of Generation ____A____	CBI? Q
4. Management Step	5. Management Code	6. RMUN	7. Planned Changes (Y/N)	CBI?
1	08-A	40	N	Q
F	12-A	50	N	Q



**Table IV.2. Example Response to Section IV.B.  
Offsite Management Facilities**

Residual Management Unit Number (RMUN): <u>30</u> Name of Facility: <u>Thoroughburn, Inc.</u> Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): <u>Route 6</u>  City/State/Zip Code: <u>Warm Springs, Nevada 08012</u> Distance from Facility: <u>150 miles</u> CBI? <u>Q</u>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____  City/State/Zip Code: _____ Distance from Facility: _____ CBI? <u>Q</u>
Residual Management Unit Number (RMUN): _____ Name of Facility: _____ Hazardous Waste Facility ID Number (if any): _____ Facility Location (Street, Route Number, or Other Specific Identifier): _____  City/State/Zip Code: _____ Distance from Facility: _____ CBI? <u>Q</u>

**Table IV.3. Example Response to Section IV.C.  
Onsite and Offsite Residual Management Unit Identification**

1. RMUN	2. Location	3. Unit Type	4. Unit Common Name	5. RINs Managed in Unit	CBI?
10	On	2	Container (Drum)	1	Q
20	On	L-3	Subtitle C Landfill	1	Q
30	Off	5 (HTMR)	Thoroughburn Metal reclamation	2	Q
40	On	1	Neutralization tank	3	Q
50	On	L-6	WWTP	3	Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q

**Table IV.4. Example Response to Section IV.D.  
Total Production**

1. Product	2. 1997 Total Production (MT/yr)	CBI?
Titanium dioxide	54,000	Q
Copperas	53,000	Q
		Q

**Table IV.5. Example Response to Section IV.E  
Residual Management Cost Table**

1. RIN	2. Transportation Cost (\$/MT)	3. Management Cost (\$/MT)	4. Payment Received (\$/MT)	CBI?
2	50	200		Q
				Q
				Q

**Table V.1. Example Response to Section V.A.  
Residual Management Unit Characterization**

1. RMUN	2. Date Opened (month/year)	3. Closure Date (month/year)	4. Active life (years)	5. Permit Status	6. RFI (Y/N)?	CBI?
10	1/1990	1/2020	30	B	N	Q
20	6/1985	6/2010	25	S	N	Q
40	2/1985	2/2000	15	N	N	Q
50	10/1987	10/2017	30	N	N	Q
70	4/1979	4/1999	20	S	N	Q
80	1/1982	1/2007	25	S	N	Q
						Q
						Q
						Q
						Q

Table V.2. Example Response to Section V.B.  
Land-Based Units (other than land treatment): Unit Size

1. RMUN	2. Surface Area (Acres )	3. Height (ft)		4. Total Design Capacity (cu. yd.)	5. Remaining capacity as of 1/97 (cu. yd.)	6. % Remaining capacity used in 1997	7. Frequency in Which Cover is Applied	8. Dust Suppression? (Y/N)	9. Water Monitoring/ Hydrology	CBI?
		above grade	below grade							
20	12	10	15	484,000	100,000	10	Daily	Y <sup>1</sup>	no	Q
70	6	3	32	338,800	50,000	15		Y <sup>1</sup>	no	Q
80	24	10	15	968,000	250,000	1	Daily	Y <sup>1</sup>	no	Q
										Q
										Q
										Q
										Q
										Q
										Q
										Q

\*If CBI is claimed, complete Appendix B.

1. Daily Cover Applied, and grass cover for completed cells

**Table V.3. Example Response to Section V.C.**  
**Land-based Units: Landfills**

1. RMUN	2. Total Area (acres)	3. # of Cells	4. Active Area (acres)	5. Thickness of Waste Distributed Over Cell (ft.)	6. % of Total Landfill that Contain RC(s)	CBI?
20	40	4	12	4	45	Q
80	65	6	24	8	20	Q
						Q
						Q
						Q

**Table V.4. Example Response to Section V.D.**  
**Land-Based Units: Design and Construction**

1. RMUN	2. Liner Construction Code	3. Layer Thickness	4. Thickness Units (inches or mm)	CBI?
20	2	10	mm	Q
	4			
	3	60	inches	
70	5	500	mm	Q
80	3	400	inches	Q

**Table V.5. Example Response to Section V.E.**  
**Land Treatment Units**

1. RMUN	2. Surface Area (acres)	3. Surface area residual is applied (acres)	4. Method of Soil Incorporation	5. Depth of Incorporation (inches)	6. Frequency of Application	7. 1997 Total Residual Applied (MT)	CBI?
140	80	10	1	12	Monthly	2100	Q
							Q
							Q
							Q

Table V.6. Example Response to Section V.F.  
Leachate and Run-on/Run-off Control

1. RMUN	2. Annual Leachate Volume (MT)	3. Contact with Storm Water Possible? (Yes/No)	4. Runoff Managed Under a Storm Water Permit? (Yes/No)	5. Run-on/Run-off Storm Severity	6. Flood Plain Type	7. Distance to Nearest Downgradient Water Body (ft)	8. Run-on/Run-off Control System Type	9. Run-off Destination Code	10. Description Attached (Yes/No)	CBI?
20	10	Yes	Yes	50	100	50	1	1	Y	Q
70	NA	Yes	Yes	N	50	10	3	1	Y	Q
80	NA	Yes	Yes	N	50	25	1	3	Y	Q
										Q
										Q
										Q
										Q
										Q

NA - leachate not collected

Table V.7. Example Response to Section V.G.  
Tanks

1. RMUN	2. Tank Volume (gal)	3. Tank Area (ft <sup>2</sup> )	4. Secondary Containment? (Yes/No)	5. Covered? (Yes/No)	CBI?
40	5000	40	No	Yes	Q
					Q
					Q
					Q
					Q
					Q

Table V.8. Example Response to Section V.H.  
Surface Impoundments

1. RMUN	2. Total WW Flow through S.I. (MT)	3. Residual Flow (MT)	4. Total S.I. Area (m <sup>2</sup> )	5. Aerated?	6. Liner Type	7. Leak Detection System (Y/N)	8. Closure plans?	CBI?
70	200,000	35,000	97,000	Yes	None	No	No	Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q
								Q



Table V.9. Example Response to Section V.I.  
Deep Well Injection

1. RMUN	2. Injection Rate (gal/yr)	3. Depth from grade to top of injection zone (ft)	4. Regulatory status code	5. Additional information attached? (Yes/No)	CBI?
110	75 million*	100	1	Yes	Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q
					Q

Table V.10. Example Response to Section V.J.  
Containers

1. RMUN	2. Container type and size	3. Closed? (Yes/No)	CBI?
10	Drum, 500 cu. yd	Yes	Q
			Q
			Q
			Q
			Q
			Q

Table V.11. Example Response to Section V.K.  
Piles

1. RMUN	2. Dust Suppression (Yes/ No)?	3. Concrete Pad/Runoff Containment/ Synthetic Liners?	4. Type Runon/ runoff controls	5. Storm Event Design	6. Average Volume in Pile (cu. yd)	CBI?
150	No	Pad w/ synthetic liner	5	50 year*	10,000	Q
						Q
						Q
						Q
						Q
						Q
						Q

## APPENDIX B

### Claim of Confidentiality

### Substantiating the Claim of Confidentiality

You may make a confidential business information (CBI) claim for each data element that is sensitive data. The following series of questions needs to be filled out for each data point that is claimed to be CBI. Attach additional pages as needed.

1. For what period of time do you request that the information be maintained as confidential? If the occurrence of a specific event will eliminate the need for confidentiality, please specify that event.

---

---

---

---

---

2. Information submitted to EPA becomes stale over time. Why should the information you claim as confidential be protected for the period of time specified in your answer to question #1?

---

---

---

---

---

3. What measures have you taken to protect the information claims as confidential? Have you disclosed the information to anyone other than a governmental body or someone who is bound by an agreement not to disclose the information further? If so, why should the information still be considered confidential?

---

---

---

---

---

4. Has any governmental body made a determination as to the confidentiality of the information? If so, please attach a copy of the determination.

---

---

---

---

---

5. Is the information contained in any publicly available material such as promotional publications, annual reports, articles, permits, etc.? Is there any means by which a member of the public could obtain access to the information?

---

---

---

---

---

6. For each section of information claimed as confidential, discuss with specificity why release of the information is likely to cause substantial harm to your competitive position. Explain

the nature of these harmful effects, why they should be viewed as substantial, and the causal relationship between disclosure and such harmful effects. How could your competitors make use of this information to your detriment?

---

---

---

---

---

7. Please discuss any other information you deem relevant.

---

---

---

---