ATTACHMENT 5
WASTE ANALYSIS PLAN

5. WASTE ANALYSIS PLAN

5.1 Introduction

This Waste Analysis Plan (WAP) is for the World Resources Company (WRC) facility in Tolleson, Arizona. It is intended to comply with the waste analysis requirements found in Code of Federal Regulations (CFR) Title 40, Section 264.13. It includes applicable requirements of the variance granted to WRC in August 2002 by the U.S. Environmental Protection Agency (USEPA) (Part II, Section 2).

The variance exempts recyclable materials having USEPA waste codes F006 and F019 that are partially reclaimed at WRC's facility from the definition of solid waste. To qualify for the variance, each shipment of F006 and F019 metals-bearing sludge must have a metal concentration of no less than 2 percent on a dry weight basis of Cu, Ni, or Sn, or the sum of the equivalent economic value of precious metals Au, Ag, Pt, Pd must exceed the equivalent minimum economic value of one of these metals, Cu, Ni, or Sn. However, the variance does not restrict WRC's ability to accept and treat recyclable materials that do not have the F006 and F019 waste codes, which do not meet this minimum metals content.

5.2 Waste Analysis Parameters

The WRC facility treats wastewater treatment sludges that have been manifested and delivered to the facility in United States Department of Transportation (DOT) compliant packaging. WRC receives wastes classified as USEPA listed hazardous waste numbers F006 and F019; characteristic hazardous waste numbers D004, D005, D006, D007, D008, D009, D010, and D011. Wastes received by WRC are of similar physical and chemical composition to each other. WRC does not accept wastes that may be incompatible with other wastes that were previously accepted.

In order to comply with requirements of 40 CFR § 264.13(a), analyses on incoming recyclable waste material, for characteristic metals, will either be provided by the generator or a sample will be analyzed by a licensed laboratory using certified methods. At a minimum, the analysis will be repeated if WRC is notified by the generator, or believes the process generating the waste has changed based on a comparison to previous loads.

Table 5-1 identifies the recyclable materials managed by WRC, along with their hazardous waste codes and hazardous constituents associated with each waste code identified in Appendix VII of 40 CFR Part 261 for F006 and F019.

Table 5-1. Waste Analysis Parameters and Rationale		
Waste / Generating Process	USEPA Waste Code	Hazardous Constituents
Wastewater treatment sludge / Electroplating operations	F006	Cadmium, hexavalent chromium, nickel, cyanide (complexed)
Wastewater treatment sludge / Chemical conversion coating of aluminum	F019	Hexavalent chromium, cyanide (complexed)
Manufacture of locks	D004	Arsenic
Manufacture of locks	D005	Barium
Precious metals refining	D006	Cadmium
Aluminum coating on carbon steel	D006	Cadmium
Passivation	D007	Chromium
Chemical etching	D007	Chromium
Metal working, grinding, polishing	D007	Chromium
Manufacturing of locks	D007	Chromium
Silversmithing	D007	Chromium
Precious metals refining	D008	Lead
Printed circuit boards	D008	Lead
Included with D007	D008	Lead
Manufacturing of locks	D009	Mercury
Precious metals refining	D010	Selenium
Precious metals refining	D011	Silver
Included with D007	D011	Silver
Powders / Buffing and polishing	N/A	N/A

5.2.1 Test Methods

All EPA test methods are certified and will be conducted by an Arizona Department of Health Services (ADHS) licensed laboratory (i.e., off-site laboratory or WRC laboratory). Attachment 5-A list the parameters and the certified methods used by licensed laboratories when performing compliance testing. Should the referenced EPA methods be superseded, the applicable replacement methods will be used. Any analytical testing completed for compliance purposes (i.e., Toxicity Characteristic Leaching Procedure (TCLP) or totals for characteristic metals of incoming recyclable waste material, treated debris, variance metals concentrations, total cyanide of the outgoing concentrate product, or characterization of wastes), will be conducted by a laboratory certified to perform the EPA standard methodology.

Characterization of removed concrete, replacement cement, material in the soil layer, and the soil below the portions of the lowermost membrane liner where damage was observed during replacement activities will include the analysis of all metals and cyanides that form the basis for demonstrating clean closure. The

samples will be analyzed by an Arizona Department of Health Services certified laboratory for the constituents and methods described below:

- Total aluminum, antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, chromium, lead, manganese, nickel, selenium, silver, thallium, tin, vanadium, and zinc using United States Environmental Protection Agency (USEPA) Test Methods 3050 (sample preparation) and 6010B (sample analysis);
- Total mercury using USEPA Test Methods 3050 (sample preparation) and 7471 or equivalent (sample analysis);
- Total and amenable cyanide using USEPA Methods 9010C or 9012B; and
- Total hexavalent chromium using USEPA Test Methods 3060 (sample preparation) and 7196 (sample analysis) if total (trivalent chromium) exceeds 30 milligrams per kilogram (mg/kg). (Samples will be extracted and held for possible hexavalent chromium analysis, pending the results of total chromium analysis).

The following table describes analyses that may be required for purposes of characterization of waste for shipment to off-site disposal facilities including evaluation of removed concrete, replacement cement, material in the soil layer, and the soil below the portions of the lowermost membrane liner where damage was observed during replacement activities relative to the closure criteria of Section 11.4 of the Closure Plan. It includes the Toxicity Characteristics (TC) and Universal Treatment Standards (UTS) for the RCRA "Eight" metals and the Underlying Hazardous Constituents (UHC) for the D004 through D011 Waste Codes. It also includes the Treatment Standards for Hazardous Waste (TSHW) criteria for F006 and F019 waste. The criteria are presented in two forms. The first is based on the Toxicity Characteristic Leaching Procedure (TCLP) and the values are presented in milligrams per liter (mg/l). The second form is based on total metals (TM) analysis and the "20 times" rule and the values are presented in milligrams per kilogram (mg/kg). If the TM analyses yield concentrations less than the concentrations presented as mg/kg in the following table, then TCLP analyses will not be required.

Applicable Toxicity Characteristic (TC) Criteria, Treatment Standards for Hazardous Wastes Criteria and Universal Treatment Standards (UTS) Criteria[1]

Metals	*TC Criteria[2]*	*UTS Criteria[3]*	*TSHW Criteria[5]*
RCRA Eight Metals			
D004, Arsenic	*5.0 mg/l, 100 mg/kg*	*5.0 mg/l, 100 mg/kg*	
D005, Barium	*100.0 mg/l, 2,000 mg/kg*	*21 mg/l, 420 mg/kg*	
D006, Cadmium	*1.0 mg/l, 20 mg/kg*	*0.11 mg/l, 2.2 mg/kg*	
D007, Chromium (total)	*5.0 mg/l, 100 mg/kg*	*0.6 mg/l, 12 mg/kg*	
D008, Lead	*5.0 mg/l, 100 mg/kg*	*0.75 mg/l, 15 mg/kg*	
D009, Mercury	*0.2 mg/l,4.0 mg/kg*	*0.025 mg/l, 0.5 mg/kg*	
D010, Selenium	*1.0 mg/l, 20 mg/kg*	*5.7 mg/l, 114 mg/kg[6]*	
D011, Silver	*5.0 mg/l, 100 mg/kg*	*0.14 mg/l, 2.8 mg/kg*	
F006 and F019 Waste			
F006, Cadmium			*0.11 mg/l, 2.2 mg/kg*
F006, Chromium (total)			*0.6 mg/l, 12 mg/kg*
F006, Nickel			*11 mg/l, 220 mg/kg*
F019, Chromium (total)			*0.6 mg/l, 12 mg/kg*
F006 and F019, Total Cyanide			*590 mg/kg[4]*

Applicable Toxicity Characteristic (TC) Criteria, Treatment Standards for Hazardous Wastes Criteria and Universal Treatment Standards (UTS) Criteria[1]			
Metals	*TC Criteria[2]*	*UTS Criteria[3]*	*TSHW Criteria[5]*
F006 and F019, Free Cyanide			*30 mg/kg[4]*
Applicable Underlying Hazardous Constituent Criteria for D004 through D011 Waste Codes			
Antimony		*1.5 mg/l, 30 mg/kg*	
Beryllium		*1.22 mg/l, 24.4 mg/kg*	
Thallium		*0.2 mg/l, 4 mg/kg*	

[1] USEPA Test Methods 1311 (TCLP) followed by Method 6010B (sample analysis for all metals except mercury), and 7471 (for mercury analysis) or, for total metals (Method 3050 (sample preparation) followed by Method 6010B (sample analysis for all metals except mercury), and Method 7471 (for mercury analysis).

[2] Value from R18-8-261.24, Table 1: first value based on TCLP analysis; second value based on TM analysis and 20 times rule.

[3] Value from R18-8-268-48, Universal Treatment Standards Table, Nonwastewater Standard: first value based on TCLP analysis; second value based on TM analysis and 20 times rule.

[4] Both Total Cyanides and Amenable Cyanides are to be analyzed using USEPA Test Method 9010C and Method 9012B, respectively, with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

[5] Treatment Standards for Hazardous Wastes Table, Nonwastewater Standard: first value based on TCLP analysis; second value based on TM analysis and 20 times rule.

[6] This constituent is not an underlying hazardous constituent as defined at § 268.2(i) of this part because its UTS level is greater than its TC level, thus a treated selenium waste would always be characteristically hazardous, unless treated to below its characteristic level.

mg/l = milligrams per liter

mg/kg = milligrams per kilogram

Precious metals concentration will be determined using fire assay techniques, as there are no EPA standard methods for these metals. Analyses to confirm variance compliance for metal content (copper, nickel, tin, and precious metals) are conducted on each incoming load and total cyanide is performed on each outgoing concentrate product.

5.2.2 Pilot Shipment Analysis

A pilot shipment (a.k.a. initial or trial shipment) is arranged by contract, and analyzed by a licensed laboratory, using certified methods, to ensure the waste can be accepted at the WRC facility (i.e., D004-D011, F006, F019). Numerous pre-acceptance screening procedures are conducted to evaluate whether the material can be safely managed and is compatible with other previously accepted recyclable materials, as well as the components of the hazardous waste management unit (HWMU). Metals analyses (copper, nickel, and tin) are conducted to demonstrate the quality of the recyclable material and compliance with the variance, if required (i.e., F006 or F019 waste). The precious metals analyses use fire assay techniques to determine if the material contains appropriate concentration value of precious metals. If the material meets WRC standards, WRC negotiates to enter into a contractual arrangement with the generator to receive periodic shipments.

5.2.3 Incoming Shipment Analysis

Following approval of the pilot shipment, a generator may proceed to ship periodic shipments of recyclable materials to WRC. Incoming shipments are sampled for metal analyses (copper, nickel, tin, and precious metals), to determine that every load of incoming metal-bearing material meets the applicable variance requirements, if required. Each incoming shipment of recyclable material is subject to pre-acceptance screening procedures to evaluate whether the material can be safely managed and is compatible with other previously accepted recyclable materials as well as the components of the HWMU.

5.2.4 Hazardous Debris Treatment Analysis

Hazardous debris may be commingled with incoming shipments of recyclable materials. Smaller pieces of debris may be processed through the shredder, and then blended with a concentrate, while larger debris that cannot be shredded will be treated at the facility to meet applicable land disposal restrictions (LDR) requirements before being sent for disposal. In addition, hazardous debris may be generated through equipment replacement, maintenance activities, and closure activities. Debris such as equipment, metal, glass, plastic, or rubber will be treated to meet clean debris surface criteria, using the Alternative Treatment Standards for Hazardous Debris as noted at Table 1 of R18-8-268.45, A.1.e. *High Pressure Steam and Water Sprays* or A.2.a *Water Washing and Spraying*. Decontaminated debris that has been inspected and determined to be free of hazardous waste residues will be transported to a municipal landfill for disposal, unless the debris meet the requirements for salvage. Debris may not be sent off-site for salvage unless inspections have first revealed that the debris meets the salvage clearance criteria as described in Attachment 11-A, Section 2.2, to determine if it qualifies for salvage or re-use. If the debris does not qualify for salvage or reuse, it may be decontaminated until it does qualify for salvage or reuse or it may be placed in a non-hazardous landfill for disposal.

Other types of debris will be treated as noted at Table 1 of R18-8-268.45, A.2.a *Water Washing and Spraying*. The debris will be sampled and analyzed by a licensed laboratory for those constituents or wastes for which treatment standards are established under R18-8-268.40 to determine if the treatment standard has been met.

5.2.5 Outgoing Shipments Cyanide Analysis

Outgoing shipments of concentrate product that are to be exempted from the definition of solid waste must have no greater than 590 parts per million (ppm) total cyanide on a wet sample basis. To confirm compliance with the variance, WRC obtains a sample of each concentrate product for licensed laboratory analysis of cyanide content. This analysis need not be conducted for recyclable materials that were previously excluded from coverage under the variance (i.e., waste that is not F006 or F019).

5.2.6 Analysis of Removed Concrete, Replacement Cement and Material in the Soil Layer

Characterization of removed concrete, replacement cement, and material in the soil layer will include the analysis of all metals and cyanides that form the basis for clean closure. The samples will be analyzed by a certified laboratory for the constituents and methods described below:

- Total aluminum, antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, chromium, lead, manganese, nickel, selenium, silver, thallium, tin, vanadium, and zinc using USEPA Test Methods 3050 (sample preparation) and 6010B (sample analysis);.
- Total mercury using USEPA Test Methods 3050 (sample preparation) and 7471 or equivalent (sample analysis).
- Total and amenable cyanide using USEPA Methods 9010C or 9012B.
- Total hexavalent chromium using USEPA Test Methods 3060 (sample preparation) and 7196 (sample analysis) if total (trivalent chromium) exceeds 30 mg/kg. (Samples will be extracted and held for possible hexavalent chromium analysis, pending the results of total chromium analysis).

The analyses described above also apply to replacement soils in the unlikely event that replacement soils are required.

5.3 Pre-Acceptance Screening

Pre-acceptance screening procedures are conducted for all incoming shipments. These screening procedures are conducted to evaluate whether the material can be safely managed and is compatible with other previously accepted recyclable materials as well as the components of the HWMU. The results of these screenings are recorded and maintained as part of the facility operating record.

5.3.1 Parameters and Acceptance Criteria

All incoming recyclable materials are tested for hydrogen cyanide, volatile organic compounds (VOCs), radionuclides, free liquids, moisture, pH, and ignitability using the appropriate EPA methods, per SW 846 or American Society for Testing and Materials (ASTM) standards. Additionally, observations regarding odor, color, texture, appearance, and debris content are made on all incoming recyclable materials. These parameters have been established as those required to provide information regarding the safe management of each incoming waste load.

While the incoming material is still in the pre-acceptance stage, all 12 screenings listed below are performed on each individual bulk container and each generator's set of non-bulk containers (tub, bag, drum, or corrugated box). These criteria provide the primary basis for determining whether the material can be safely managed, are not D001, D002, or D003 wastes, and are compatible with other previously accepted recyclable materials as well as the components of the HWMU.

5.3.1.1 Cyanide

Procedures and Acceptance Criteria. Two levels of cyanide pre-acceptance testing are conducted. The first level is comprised of field-screening procedures that are performed using a portable hydrogen cyanide gas meter and/or cyanide gas detector tubes. The portable hydrogen cyanide gas meter is calibrated on an annual basis by a certified calibration company. The second level of pre-acceptable testing is conducted in WRC's laboratory. The field-screening procedures test for the presence of free cyanide. If no cyanide is detected during field-screening, then the laboratory tests for the presence of complexed cyanide. The field-screening and laboratory test have different threshold criteria for indicating acceptance or rejection. A waste stream must pass both the field-screening and laboratory tests to be accepted. The ambient atmosphere above each waste stream shipment is first tested for the presence of cyanide gas by utilizing a portable hydrogen cyanide meter. Any reading above or equal to 0.1 parts per million by volume (ppmv), the detection level of WRC's meter, will result in rejection of the shipment. A pump with a cyanide detector tube may be used as a backup to the portable meter. A positive indication using the detector tube will result in a second test using a new tube to confirm or discredit the earlier result. If cyanide gas is also detected in this second test, the waste is not accepted for processing. If cyanide gas is not detected on the second test, a third test will be completed to confirm or discredit the results of the previous tests. If cyanide gas is detected in the third test, the waste is not accepted for processing.

If the shipment passes the field-screening procedure using the hydrogen cyanide meter or detector tubes, a sample is acidified with pH 2 solution, and the meter is used to detect the presence of cyanide gas. If less than 1 ppmv cyanide gas is detected, the material is accepted. If greater than 1 ppmv cyanide gas is detected, the shipment is rejected.

Rationale. Because free cyanide gas is highly toxic, WRC's position is that no hydrogen cyanide gas is acceptable in the waste material it receives. Electroplating operations that generate F006 or F019 hazardous waste may either use cyanide electroplating solutions or cyanide reagents in their manufacturing process. The Time-Weighted Average (TWA) value enforced by the Occupational Health and Safety Administration (OSHA) is 10 ppm, which is higher than the threshold values used by WRC.

5.3.1.2 Volatile Organic Compounds

Procedures and Acceptance Criteria. Screening for total concentrations of VOCs is performed using an organic vapor analyzer (OVA) to measure the volatile organic vapors associated with a waste stream shipment. A reading of less than 5 ppm VOCs measured in the ambient atmosphere above the material means that the recyclable material is acceptable. The OVA is calibrated on a weekly basis, in accordance with the manufacturer's specifications, by introduction of a calibration gas and adjustment of the meter readout to correspond to the calibration gas value.

Recyclable materials having an OVA reading exceeding 5 ppm are rejected.

Rationale: Certain organic compounds may be present in plating operations as a result of organic solvents and cleaning agents used. However, generators' treatment processes should remove these organic compounds from the wastewater sludges received by WRC. The OVA used by WRC at the time of waste receipt scans to ensure volatile organic compounds are not present.

5.3.1.3 Radionuclides

Procedures and Acceptance Criteria. Two types of screening are done according to procedures established per ASTM methods. The first requires each truck to pass through monitors upon entering the facility. These radiological monitors will alarm at 5 μCi. In addition, a Geiger counter is held 6 millimeters from the waste for 60 seconds to evaluate if there are any radionuclides present. If a steady reading of 0.05 milli-roentgens per hour (mR/hr) or greater is detected, the waste is rejected. The Geiger counter is calibrated every six months, and the radiological monitors are calibrated daily against a source, with the instrument panel being sent for calibration annually.

Rationale: The characteristic of radioactivity is not associated with the waste material that WRC receives. However, in consideration of health, safety and liability, wastes that arrive at WRC's facility are tested for the presence of radionuclides.

5.3.1.4 Odor

Procedures and Acceptance Criteria. Any abnormal odor is noted and recorded. The generator is consulted to investigate the possible reason for the odor and its nature. By itself, the presence of abnormal odors does not constitute a reason to reject the shipment.

Rationale: Abnormal odors are a possible indication of a change in the generator's waste or an incorrect waste having been delivered.

5.3.1.5 Color

Procedures and Acceptance Criteria. Color is noted and recorded. The generator is consulted to investigate the possible reason for changes in color, compared to previous shipments. By itself, a change in color does not constitute a reason to reject the shipment.

Rationale: Change in color is a possible indication of the presence of foreign matter, a change in the generator's waste, or an incorrect waste having been delivered.

5.3.1.6 Texture

Procedures and Acceptance Criteria. Any unusual or abnormal characteristic is noted and recorded. The generator is consulted to investigate the possible reason for changes in texture compared to previous shipments. By itself, a change in texture does not constitute a reason to reject the shipment.

Rationale: Change in texture is a possible indication of the presence of foreign matter, a change in the generator's waste, or an incorrect waste having been delivered.

5.3.1.7 Appearance

Procedures and Acceptance Criteria. The appearance of the waste is noted and recorded. The generator is consulted to investigate the possible reason for a change in established appearance. By itself, a change in appearance does not constitute a reason to reject the shipment.

Rationale: Change in appearance is a possible indication of a change in the generator's waste or an incorrect waste having been delivered.

5.3.1.8 Debris

Procedures and Acceptance Criteria. Presence of extraneous material is noted and recorded. Recyclable materials are accepted only if they are free of excess extraneous debris.

Rationale: Debris in the waste (e.g., wood, pipes, cans, bricks, etc.) can cause damage to the processing equipment, compromise employee health and safety, and contaminate WRC's concentrates. A load containing debris may be rejected depending on its nature and volume.

5.3.1.9 Free Liquids

Procedures and Acceptance Criteria. During pre-acceptance testing, the technician assesses, by observation, whether there are free liquids. If the technician cannot readily determine from observation that free liquids are present, the technician performs a USEPA paint filter test, in accordance with certified EPA methods. Recyclable materials containing free liquids will be rejected.

Rationale: Material containing free liquids cannot be managed with the material handling equipment used at WRC.

5.3.1.10 Solids/Moisture

Procedures and Acceptance Criteria. The percent solids test is performed on a sample in accordance with the following steps. Recyclable materials are not rejected on the basis of moisture content.

- Tare the dish to zero on the balance.
- Place the representative sample on the dish.
- Weigh the dish and record the weight.
- Place the dish and material in the oven at a temperature >100°C.
    - Allow at least 12 hours for material to dry.
- After drying remove the dish from the oven and allow it to cool for approximately 30 minutes.
- Weigh the dish and material and record the total weight.
- To calculate the percent solids, use the dish and material dry weight minus the dish weight, divide by the wet material weight, and multiply by 100.

Rationale: Evaluation of employee safety requirements. WRC employees handling recyclable materials with incoming moisture contents less than 50 percent are required to use respiratory protection.

5.3.1.11 pH

Procedures and Acceptance Criteria. An initial pH is determined on a sample taken from the incoming shipment using a pH meter. If the pH is less than or equal to 2 or greater than or equal to 12.5, the shipment is rejected. If the shipment is accepted, a secondary pH will be done using certified EPA methods.

Rationale: If the pH of the material is less than or equal to than 2 or greater than or equal to 12.5, the material is a characteristic D002 waste. WRC is not permitted to accept D002 wastes.

5.3.1.12 Ignitability

Procedures and Acceptance Criteria. The procedure for ignitability screening requires the following steps.

- During pre-acceptance of samples, the samples are exposed to air. If the sample shows any signs of spontaneous combustion upon exposure to air, it is considered spontaneously ignitable.
- During the performance of reactivity potential determinations, the samples come in contact with water. Observe the sample for any signs of combustion. If the sample shows any signs of combustion upon exposure to water, it is considered ignitable.
- Using a glass stirring rod, rub approximately 1 gram of sample against fine sandpaper. If the sample shows any signs of combustion, it is considered ignitable by friction.

Rationale: Ignitable wastes could pose employee safety concerns, and may not be compatible with WRC's thermal concentrating unit or meet WRC's product quality requirements.

5.3.2 Shipment Rejection Procedures

A pre-shipment review of manifested waste is conducted prior to authorizing the generator to ship waste to WRC, to ensure waste can be accepted by the WRC facility (i.e., only approved EPA Waste Codes). Incoming waste shipments are inspected and screened by trained and qualified laboratory personnel for acceptability prior to unloading in the HWMU by comparison to established parameters for the waste.

Any waste that contains hydrogen cyanide gas, that has volatile organic compounds in excess of 5 ppm, that is corrosive, that fails the paint filter test for free liquids, that is determined to be ignitable, or that exceeds 0.05 mR/hr for radioactivity is rejected. Wastes that exceed the established guidelines for debris are also rejected. Wastes are not normally rejected on the basis of color, odor, texture, or percent of solids. However, if color, odor, texture, or percent of solids appears to be sufficiently inconsistent with the established parameters, then the generator is consulted as to the possible cause.

For waste that fails the variance criteria (i.e., after an initial sequence of non-conforming loads), WRC will analyze a new sample of the generator's sludge to verify compliance with the variance, before resuming shipments of the generator's waste stream. The next four loads of that waste stream from that generator will be placed on the HWMU, as a set-aside with appropriate labeling and segregation, until analysis is completed (typically 5-10 days) that demonstrates the waste stream passes the variance criteria. If all four loads pass the variance criteria, future loads from the generator will no longer be set aside on the HWMU, but will be managed as was the case prior to the initial non-conforming load. If, however, any one of the four loads fails the variance criteria, WRC will, first, determine within five days either (a) to send the load as a hazardous waste to a smelter for recycling or (b) to reject the load under the procedures set forth below and, second, suspend further shipments of that waste stream.

All or part of a shipment may be rejected based on the assessment of the Laboratory Manager or other competent authority (i.e., Assistant Laboratory Manager, Staff Chemist, EH&S Manager, Operations Manager, or General Manager). If technical questions arise concerning the acceptability of a waste, the generator is contacted prior to an acceptance-or-rejection decision. Records of rejections are maintained on

manifests and in the generator file. If the waste cannot be accepted and must be returned to the generator's custody, rejection procedures are as follows:

- Contact the WRC Laboratory Manager or other competent authority for consultation.
- Consult with the transporter to assess if the nonconformity appears to have been transporter related.
- Consult with the generator on the observed changes in the waste stream.
- Do not unload the questionable shipment on to the HWMU (except for waste that failed the variance criteria as outlined above).
- Confirmation in writing of the nonconformity will be provided to the generator by the Laboratory Manager or designee within five working days after the day of rejection. This confirmation will include the number of containers rejected and the screening criteria for which the waste failed. A copy is kept in the generator's file.
- Accept the conforming portion of the shipment, if any.
- Complete the Material Received Evaluation, Form FM-M02.
- In consultation with the generator, determine if the waste will be returned to the generator or sent to an alternate facility.
- Follow applicable manifest regulations in order to complete the manifest.
- Provide the transporter's copy of the manifest to the driver as the shipping document for the return trip to the generator. For full rejections, the whole manifest is given to the transporter. For partial rejections, a new manifest is prepared.
- Submit a copy of the signed manifest to Arizona Department of Environmental Quality (ADEQ) after the end of each month.
- Comply with other applicable requirements of 40 CFR §§ 264.71 and 264.72, including reporting of significant discrepancies in weight (greater than 10 percent) or type of waste to ADEQ within 15 days of receipt of the waste, unless the discrepancies are resolved with the generator or transporter prior to then. Significant discrepancies will be noted on copies of the manifest provided to transporter, retained by the facility, and returned to the generator. Rejected waste does not necessarily indicate the occurrence of a manifest discrepancy.
- Rejected waste will not be stored at WRC (except for waste that failed the variance criteria as outlined above), but will be returned to the generator or sent to an alternate facility the same day as received/rejected at the WRC facility. The truck with the rejected load will be parked in the truck receiving lot until direction is received from the generator as to where the rejected load is to be sent. This process typically takes less than four hours to complete, at which point the rejected waste leaves the WRC facility.

5.4 Sampling Procedures

All of the procedures and equipment used for sampling purposes will conform to ASTM and/or EPA protocol ("Test Methods for Evaluation of Solid Waste", SW-846) to ensure the collection of reliable and representative samples. The sampling procedure selection process is addressed in Step 3, as well as, Step 7 of the DQO process (Section 5.5.1). In Step 3, sampling protocols and equipment capable of meeting the data requirements have been identified and document in this section. In Step 7, the sampling strategy is optimized after the outputs of the first six steps of the DQO process are completed. The following policies and procedures apply.

- All sampling will be conducted by sampling technicians, or other laboratory personnel who have been properly trained.
- Sampling procedures as identified in this section will be strictly adhered to by all sampling technicians.

- Sampling devices, such as triers, will be decontaminated with a water rinse after sampling of each load of recyclable material received from each generator when appropriate, maintained in good operating condition, and kept in their designated areas by the sampling technicians.

Samples of recyclable materials and concentrate product are collected in lined sampling buckets, using the procedures that are detailed in the following sections. An identification tag (internal chain of custody) listing the sample date, company number (indicating source or destination of the material), and the initials of the sampler is attached to the bucket handle. In the laboratory, secondary samples are collected from a bucket and placed into a sample dish having a unique dish number. A log is maintained in the laboratory to cross-reference the sample date, company number, and dish number. Samples are eventually transferred to sample bags that are labeled with the company number, sample date, dish number, and a unique laboratory assay number that follows the sample throughout all sample digestion and analytical work.

Samples of recyclable materials, debris, or other wastes that are collected for analysis by an outside laboratory, are collected in lined sampling buckets, using the procedures that are detailed in the following sections. In the laboratory, secondary samples are collected from this bucket and placed into an appropriate sample container with a standard chain-of-custody attached, in order to track that sample from the point of collection through sample analysis and reporting of the analytical results.

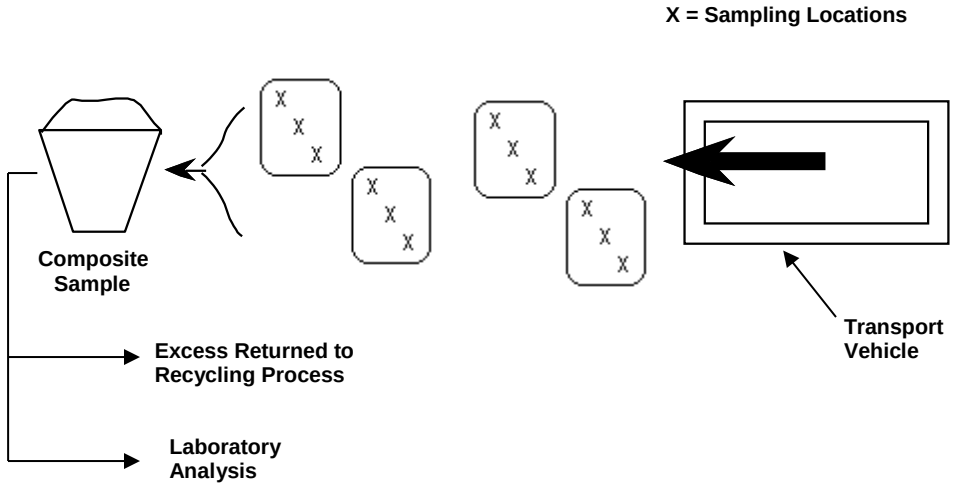
5.4.1 Incoming Waste Sampling

Upon successful completion of pre-acceptance screening, the shipment is staged in the HWMU for sampling. (During and subsequent to the unloading, visual inspection of the waste continues for appearance (layering), texture, color, debris or any other unusual characteristics.) Every container is sampled and the samples for each generator's waste material are composited to form a representative sample for the safety parameters and metals analysis.

Sampling of recyclable materials that have been unloaded on the HWMU, following completion of pre-acceptance screening, is based on a systematic random sampling approach. As described in Chapter 9 of SW-846, a systematic random sampling approach is appropriate when the material being sampled is randomly distributed or contains, at most, a modest stratification.

Sampling procedures for incoming recyclable materials are outlined in the following figures.

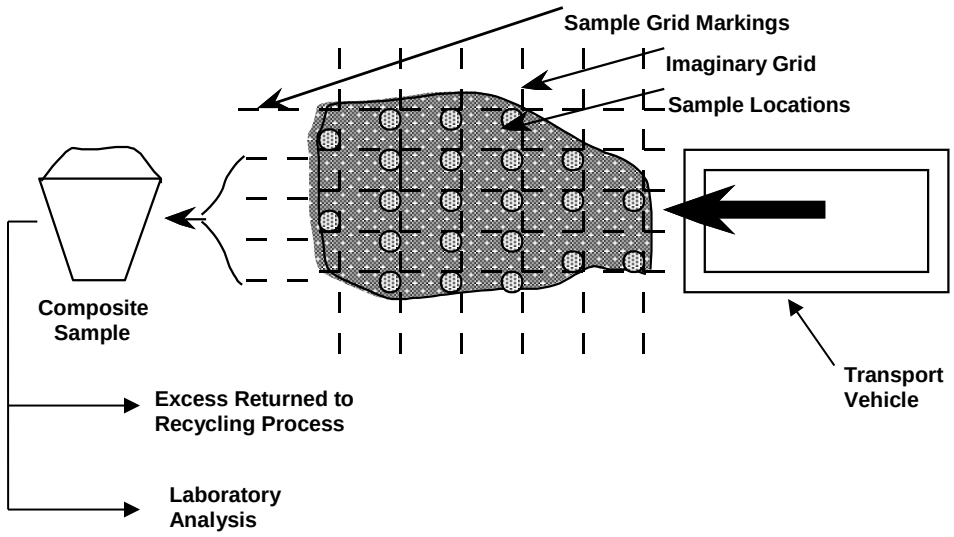
Figure 5-1: Sampling of Incoming Recyclable Material in Containers



After the transport vehicle of recyclable material has been unloaded into the HWMU, the bulk bags, tubs, corrugated boxes or drums are opened for sampling using the proper sampling tools and equipment. (**Note:** This sampling procedure is to be used if sampling is done before emptying bulk bags, tubs, corrugated boxes or drums.)

1. Take three core samples from each container. One core sampling should be from the center of the container while the other two are taken from opposite corners. Each core sample should be taken from the top to the bottom of the container.
2. Discharge the material from the trier into the lined sample bucket.
3. Twist liner closed.
4. Attach the filled-out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

Figure 5-2: Sampling of Incoming Recyclable Material in Bulk



After the transport vehicle of recyclable material has been unloaded into the HWMU, sample the recyclable material using the proper sampling tools and equipment.

1. Sample the material utilizing an imaginary 4 foot grid pattern. The locations where the markings intersect denote the places where core samples need to be taken using a trier.
2. Discharge the material from the trier into the lined sample bucket. (Do not stab the trier into the bottom of the bucket.)
3. Twist liner closed.
4. Attach the filled-out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

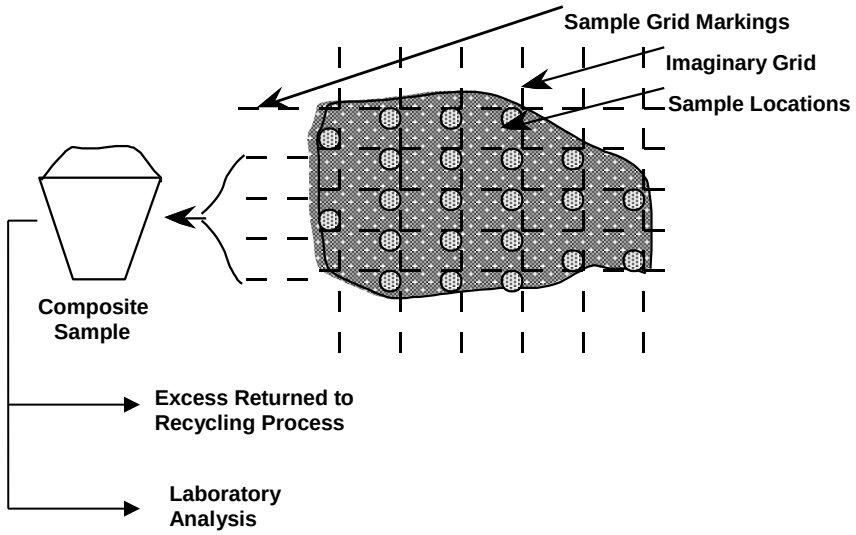
5.4.2 Hazardous Debris Treatment Sampling

A composite sample of treated hazardous debris is prepared by first visually examining the types of debris that are present in a given lot of treated debris. Individual pieces of debris are selected by hand and placed into a sampling container with the intention of producing a composite sample that is representative of the total population. The container is closed following collection of the sample. If debris is intended for salvage, it must meet the salvage clearance criteria found in Attachment 11-A, Section 2.2.

5.4.3 Outgoing Sampling

Every outgoing concentrate is sampled and composited to form a representative sample for cyanide analysis. Sampling of bulk materials is based on a systematic random sampling approach. As described in Chapter 9 of SW-846, a systematic random sampling approach is appropriate when the material being sampled is randomly distributed, or contains, at most, a modest stratification. Sampling procedures for outgoing recyclable materials are outlined in the following figures.

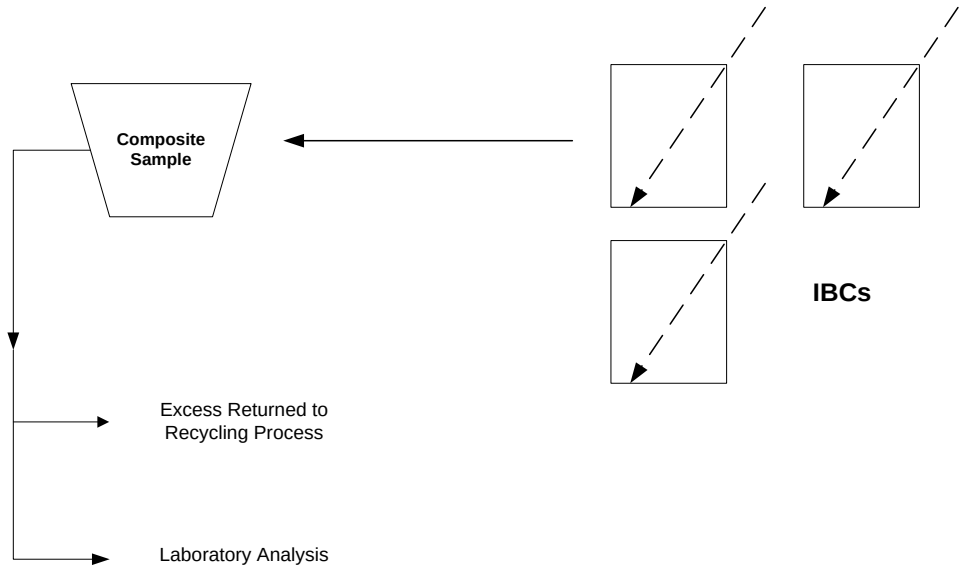
Figure 5-3: Sampling of Outgoing Concentrate Shipments in Bulk



When the product is prepared for the loading of the shipment, the certified sampler samples the product. The product should be no more than 3.5 feet in depth.

1. Sample the material utilizing a 4-foot grid pattern. The locations where the markings intersect denote the places where core samples need to be taken using a trier.
2. Discharge the material from the trier into the lined sample bucket. (Do not stab the trier into the bottom of the bucket.)
3. Twist liner closed.
4. Attach the filled-out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

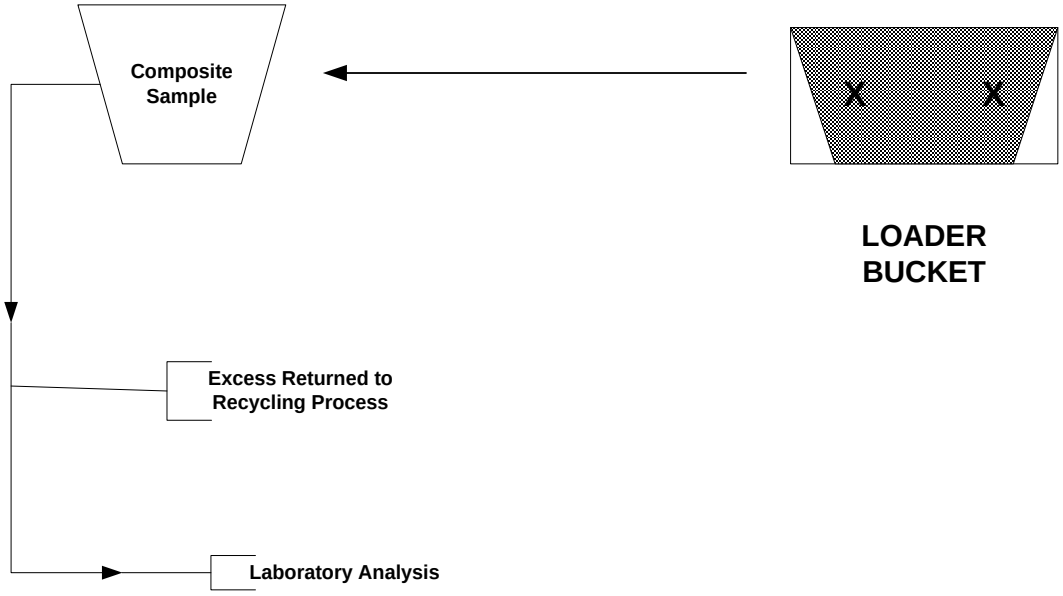
Figure 5-4: Sampling of Outgoing Concentrate Shipments in IBCs



When the product is prepared for the loading of the shipment, the certified sampler samples the product.

1. For each Intermediate Bulk Container (IBC) loaded into the railcar, obtain one core sample by inserting the clean, stainless steel sampling trier diagonally into the IBC bag, from any one top corner toward the opposing bottom corner.
2. Discharge the material from the trier into the lined sample bucket. Do not stab the trier into the bottom of the bucket.
3. Twist the liner closed.
4. Attach the filled out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

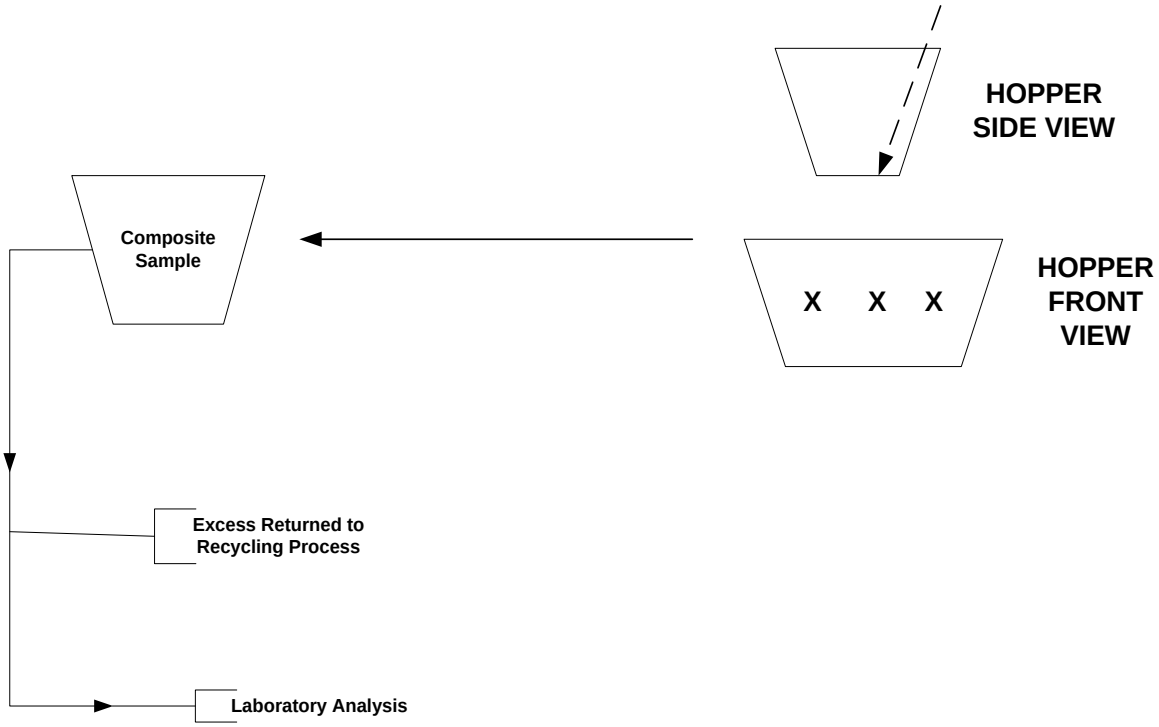
Figure 5-5: Sampling of Outgoing Product Shipments in Loader Bucket



When the product is prepared for the loading of the shipment, the certified sampler samples the product.

1. From each loader bucket obtain a core sample by inserting the clean, stainless steel sampling trier perpendicular to the top plane of the loader bucket toward the bottom-center of the loader bucket. For each loader bucket, two samples should be taken in this manner in line with the loader arms.
2. Discharge the material from the trier into the lined sample bucket. Do not stab the trier into the bottom of the bucket.
3. Twist liner closed.
4. Attach the filled-out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

Figure 5-6: Sampling of Outgoing Product Shipments from Dryer Hopper



When the product is prepared for the loading of the shipment, the certified sampler samples the product.

1. From each dryer hopper obtain a core sample by inserting the clean, stainless steel sampling trier from the front of the dryer hopper diagonally (approximately 60° angle) towards the bottom. For each dryer hopper, a representative sample will be taken.
2. Discharge the material from the trier into the lined sample bucket. Do not stab the trier into the bottom of the bucket.
3. Twist liner closed.
4. Attach the filled-out sample identification tag to the bucket handle.
5. Take bucket to the Laboratory.
6. Clean and return all sampling tools and equipment to their designated areas.

5.4.4 Concrete Replacement Sampling

Information will be recorded on chain-of-custody forms, sampling log sheets, and a field notebook. The field notebook is used to keep a diary of field activities and to record pertinent data that are not necessarily included on the chain-of-custody form or the sampling data log sheet. The information recorded on the sampling data sheets includes the following:

- Sample identification number recorded on the container label;
- Type of sample, e.g., concrete, soil within soil layer, soil beneath the lowermost liner;
- Sample location number;

- HWMU Site Map/Site Inspection Log, Section 6 of RCRA Permit Application, showing sample location (by sample location number) relative to area (pad) being sampled;
- Random or biased sampling location coordinates;
- Sampling equipment used;
- Sampling depth (in inches if sample collected above lowermost membrane liner or in feet if sample is collected below lowermost liner);
- Moisture observations;
- Visual observations
- Sampling time and date; and
- Identification of blind duplicate samples and fictitious sampling times.

5.5 QA/QC

5.5.1 Data Quality Objectives

Table 5.2 provides a summary of the seven steps of the data quality objective process. These steps will be utilized in developing sampling and analytical requirements for waste streams when acceptable knowledge is insufficient to characterize the waste stream (i.e., a new waste stream from a different generating process). The data quality objectives process provided in Table 5.2 was outlined in the RCRA Waste Sampling Draft Technical Guidance, EPA 530-D-02-002 (August 2002). The DQO process will be applied commensurate with the complexity of the waste stream in question.

Table 5-2. Data Quality Objectives Process

DQO Step	Description	Purpose
1.	State the Problem	Summarize the contamination problem that will require environmental data and identify the resources available to resolve the problem.
2.	Identity the Problem	Identify the decision that requires new environmental data to address the contamination problem.
3.	Identify Inputs to the Decision	Identify the information needed to support the decision and specify which inputs require new environmental measurements or waste generation/process knowledge.
4.	Define the Study Boundaries	Specify the spatial and temporal aspects of the waste or environmental media that data must represent to support the decision.
5.	Develop a Decision Rule	Develop a logical if/then statement that defines the conditions that would cause the decision maker to choose among alternative actions.
6.	Specify Limits on Decision Errors	Specify the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in data.

7.	Optimize the Design for Obtaining Data	Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs. To identify a resource-effective data collection design for generating data that are expected to satisfy the DQOs.

The WRC Laboratory has established general data quality objectives for precision and accuracy that are used to determine the acceptability of quantitative data generated. The method-specific requirements are indicated in the procedures and are determined according to the calculations given below.

5.5.1.1 Precision

Precision is measured as relative percent difference (RPD) between duplicate samples and/or duplicate spike samples, and is a measure of the Laboratory's ability to obtain reproducible results on a given sample.

Duplicates are additional aliquots of samples subjected to the same preparation and analytical schemes as the original sample. In cases where the analyte concentration is consistently below the detection limit, duplicate spikes are substituted for duplicates. The RPD between duplicates or duplicate spikes measures the precision of a given analysis. RPDs are calculated as follows:

$$RPD = \left| \frac{S1 - S2}{S\ average} \right| X\ 100$$

where:
S1 and S2 = observed concentrations of analyte in the sample or spike and its duplicate, and
S average = average of observed analyte concentrations in the sample or spike and its duplicate.
Duplicates and/or duplicate spikes are prepared and analyzed at the frequency indicated in the procedures.

5.5.1.2 Accuracy

Accuracy is expressed as percent spiked analyte recovery (%R), and measures the ability of the Laboratory to determine the actual concentration of an analyte.

Spikes are aliquots of samples to which known amounts of a target analyte have been added. They are subjected to the sample preparation or extraction procedure and are analyzed as samples.

The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination. Spike recoveries are calculated as follows:

$$Recovery\ \% = \left| \frac{S - A}{T} \right| X\ 100$$

where:
S = observed concentration of analyte in the spiked sample,
A = analyte concentration in the original sample, and
T = theoretical concentration of analyte added to the spiked sample.

If the recovery of any analyte falls outside of the designated range, and the Laboratory performance is shown to be in control for that analyte, then the recovery problem is judged to be matrix-related, not system-related. The data user is then informed that the result is suspect.

Spikes are prepared and analyzed at the frequency indicated in the procedure. Because WRC deals with such a wide array of solid wastes that lack homogeneity, it is sometimes impossible to achieve acceptable spike recoveries. This is due to the difficult sample matrix, and is so noted in the analytical report.

5.5.1.3 Sensitivity

Sensitivity of analytical measurements is indicated by the Instrument and Method Detection Limits (MDL) established by the Laboratory. MDLs are determined on a periodic basis and in response to other criteria specified in methodology. Calculated IDLs, MDLs, and all supporting documentation, are on-file in the Laboratory.

5.5.1.4 Quality Control Mechanisms

The quality control necessary for each method is indicated in the written procedure. Specific quality assurance required for analyses is addressed in each of the certified methods used by licensed laboratories. However, in general the following are the QA/QC requirements for the various analyses:

- Metal Analysis – Digestion for a batch of 20 samples or less
  - Digestion per batch for prepared samples
  - Blank
  - Fortified Blank (Blank Spike)
  - Duplicate sample
  - Matrix spike and matrix spike duplicate
  - Post digested Spikes if necessary
  - Proficiency Testing (if required)
- Metal Analysis – Performed on ICP
  - Calibration using certified standards
  - Calibration Verification - initial
    - Blank
    - Calibration Verification using second source
    - Interferent Standards (A and B)
  - Continuing Calibration Verification conducted every 10 samples and at end
    - Blank
    - Calibration Verification
  - Interferent Standards (A and B) conducted every 20 sample and at end
- pH Calibration
  - Calibration Verification
    - Duplicate sample
    - 10 samples
  - Calibration verification (or at end)
- Cyanide Distillation – with a batch defined as 20 samples or less
  - High and low standard are prepared
  - Sample duplicate
  - Matrix spike
  - Proficiency Testing (if required)
- Cyanide Analysis – Performed on Spectrometer
  - Blank
  - Low curve std
  - High curve std
  - Check std (second source)

- Reporting limit std
- Sample(s)
- Duplicate sample

After identification of a data quality problem, measures will be taken to correct the non-conformance. Such corrective action may include, but would not be limited to:

- Replicate analyses of the material;
- A comprehensive review of
  - the sampling procedure;
  - the integrity of analytical instrumentation (and programming, as applicable);
  - the integrity of any other equipment involved in the testing process;
  - the applicability of the method to the sample matrix;
  - the technical proficiency of the analyst;
  - the susceptibility of the method to analyte interference; and
  - the necessity for an alternate, approved analytical method and/or instrument.

5.6 Records of Waste Analysis

Records maintained by WRC track each incoming waste stream from arrival at the facility through the complete process until shipped off site as product. These records include the Material Received Evaluation, Form FM-M02 (attached); the Land Disposal Restriction Notice, if required; information concerning each waste load; and analytical data conducted by licensed laboratories. All analytical records are maintained in WRC's proprietary electronic database or are maintained electronically, and for each incoming load the data is tied to each generator (See Attachment 5-C). Various reports are generated from the proprietary electronic database, which are considered a portion of WRC's operating record, which must be retained until closure of the facility. Necessary information for inclusion in the operating record includes a description and quantity of the waste; manifest tracking number and company identification number; date received; shipping container type; waste location in the HWMU; type of waste process activities; and analytical data related to the waste's composition.

Pursuant to 40 CFR 268.7, WRC is responsible for maintaining copies of the Land Disposal Restrictions (LDR) documentation certified by the generator and accompanying either each shipment of the waste stream into the facility or the initial shipment of the waste stream into the facility (dependent on whether the generator state and TSDF allow use of a 1-time only LDR form as allowed in 40 CFR 268.7). These LDR Notices will become part of the generator's shipping file. Notices to import recyclable materials from international sources are provided to the USEPA Regional Administrator at least four weeks prior to the initial receipt of such materials. Copies of these notices are sent to ADEQ for informational purposes.

ATTACHMENT 5-A

Screening and Analytical Methods

Screening and Analytical Methods

Waste Category	EPA Hazardous Waste Code	Parameter	Analytical Method(s)
		Free Liquids	9095B(a)
Ignitable	D001	Ignitability	1030(a); ASTM[1] D4982
Corrosive	D002	pH	9045D(a)
Reactive	D003	Cyanide	9010C(a); 9012B; 9014(a); ASTM D5058-12 Method A
Heavy Metals	D004	Arsenic	3050B(a); 6010B(a)
	D005	Barium	3050B(a); 6010B(a)
	D006	Cadmium	3050B(a); 6010B(a)
	D007	Chromium	3050B(a); 6010B(a)
	D008	Lead	3050B(a); 6010B(a)
	D009	Mercury	3050B(a); 7470(a); 7471(a)
	D010	Selenium	3050B(a); 6010B(a)
	D011	Silver	3050B(a); 6010B(a)
	-	Aluminum	3050B(a); 6010B(a)
	-	Antimony	3050B(a); 6010B(a)
	-	Beryllium	3050B(a); 6010B(a)
	-	Cobalt	3050B(a); 6010B(a)
	-	Copper	3050B(a); 6010B(a)
	-	Manganese	3050B(a); 6010B(a)
	-	Vanadium	3050B(a); 6010B(a)
	F006	Nickel	3050B(a); 6010B(a)
	-	Thallium	3050B(a); 6010B(a)
	-	Tin	3050B(a); 6010B(a)
	-	Zinc	3050B(a); 6010B(a)
	D007; F006; F019	Chromium (hexavalent)	3050B(a); 7196(a)
		Radionuclides	ASTM D5928-96

(a) Environmental Protection Agency, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW 846*, 3rd edition, 1996.

[1] American Society for Testing and Materials

ATTACHMENT 5-B

Form:

FM-M02 Material Received Evaluation

WORLD RESOURCES COMPANY

FORM **FM-M02**

MATERIAL RECEIVED EVALUATION

COMPANY I.D. No.: | **PI No.:**

Arrival Time: ☐AM ☐PM | **SHIPMENT No.:**

Date: | **Inspector** [PRINT NAME]:

❶PAST DISCREPANCIES	PREVIOUS Shipment/Sample❷		INCOMING SHIPMENT BEFORE unloading	AFTER unloading	
PARAMETER		**OBSERVATION**			**C O M M E N T S**
1. HCN Gas		**PASS/NOT DETECTED**			**If HCN is >0, reject shipment, or specific container.**
		← FAIL/DETECTED →			
2. Organic Vapors		**← NOT PRESENT →**			**If VOC is >5ppm, reject shipment, or specific container.**
		PRESENT			
3. Radionuclides		**NOT DETECTED**			
		DETECTED			**If >0.05 mR/hr, reject load, or specific container.**
4. Odor		**← NONE →**			
		MILD			
		STRONG			
5. Color(s)		**← BROWN →**			
		TAN			
		GREEN			
		BLUE			
		BLACK			
		OTHER			
6. Texture [similar to]		**← WET CLAY →**			
		DRY CLAY			
		SAND			
		POWDER			
		OTHER			
7. Appearance		**← HOMOGENOUS →**			
		BILAYERED			
		MULTILAYERED			
8. Debris		**← NO →**			
		YES			
9. Free Liquids		**← NO →**			**If free liquids, reject load, or specific container.**
		YES			
10. Moisture		**← WET →**			
		DAMP			
		DRY			
11. pH		**← 2.0 – 5.9 →**			**If pH is ≤2.0 or ≥12.5, reject shipment, or specific container.**
		6.0 – 8.0			
		8.1 – 12.5			
12. Ignitability		**← PASS →**			
		FAIL			**If fails, reject load or specific container.**

❶Enter number of times waste stream has **not** met acceptance criteria, and detail in "Comments" column.
❷Immediate previous shipment or, if no shipments have been received, exploration sample information.

S H I P M E N T S T A T U S

ACCEPTED / TOTAL: ☐ **REJECTED** / TOTAL: ☐
ACCEPTED / **PARTIAL**: ☐ REJECTED / **PARTIAL**: ☐

QUANTITY ACCEPTED: | **QUANTITY** REJECTED:

INSPECTOR SIGNATURE | DATE

ATTACHMENT 5-C

Table: WAP Records Maintained in MIS2

WAP Records Maintained in MIS2

Generator Information, Material EPA Waste Code, Generator EPA I.D. Number, Variance Failure (if applicable)	
PARAMETER	CRITERIA
Hydrogen Cyanide	Present - rejected
Volatile Organics	> 5 ppm - rejected
*pH	EPA 9045D: ≤ 2 or ≥ 12.5 - rejected
*Free liquids	EPA 9095B: rejected if failed
Radionuclides	>0.05 mR/hr - rejected
*Flashpoint/Ignitability	EPA 1030: reject if failed
*Antimony	EPA 3050B, EPA 6010B
*Arsenic	EPA 3050B, EPA 6010B
*Barium	EPA 3050B, EPA 6010B
*Beryllium	EPA 3050B, EPA 6010B
*Cadmium	EPA 3050B, EPA 6010B
*Chromium, Total	EPA 3050B, EPA 6010B
*Copper	EPA 3050B, EPA 6010B
*Cyanide	EPA 9010C, EPA 9014
*Lead	EPA 3050B, EPA 6010B
*Nickel	EPA 3050B, EPA 6010B
*Selenium	EPA 3050B, EPA 6010B
*Silver	EPA 3050B, EPA 6010B
*Thallium	EPA 3050B, EPA 6010B
*Tin	EPA 3050B, EPA 6010B
*Zinc	EPA 3050B, EPA 6010B
Mercury	EPA 7470
Hexavalent Chromium	EPA 7196
Gold, Silver, Platinum, Palladium	Fire Assay

* WRC Licensed to Perform