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SECTION C

WASTE CHARACTERISTICS

As required by 40 CFR 264.14(b)(2), this section contains a description of the proposed hazardous waste streams to be received at the Elcon site. The facility intends to receive and treat a wide variety of industrial acidic, alkaline, and organic waste streams, including both characteristic and listed hazardous wastes as well as residual wastes. The hazardous waste codes that may be accepted at the facility are included on the Part A form and on Table A-1 in Section A of this permit application. The proposed waste treatment system is capable of safely and effectively treating a wide variety of waste codes and constituents. However, a few waste codes are specifically excluded, such as chlorinated dioxin- and furan-containing wastes. The facility will also treat some Pennsylvania Residual Wastes that are listed in Table A-2 of Section A of this application. The facility will not accept radioactive materials, medical waste, fracking waste, PCBs, and reactive materials.

Elcon will handle all of the waste streams received at the facility as hazardous waste, even those that do not meet the regulatory definition of hazardous waste. Elcon's waste analysis program is designed to ensure that waste streams are stored and processed appropriately. In broad terms, a typical incoming waste stream can be broken down as follows:

Suspended solids:	4 to 5%
Organic materials:	3 to 6%
Salts:	4 to 8%
Water:	81 to 89% (up to 95%)

Table C-1, below, shows a typical breakdown of the organic constituents in a typical incoming waste stream. Table C-2 provides similar information for a typical non-organic waste stream.

Elcon's process can also effectively treat waste streams with higher organic contents than the 3 to 6 percent shown above for a typical waste stream. The higher organic waste stream may contain up to approximately 70 percent organic materials, which are typically the same types of organic materials shown on Table C-1, but at higher concentrations.

TABLE C-1
TYPICAL INCOMING ORGANIC WASTE CONSTITUENTS

Organic Constituent	% by Weight[1]
Methanol	23.6
Triethylamine	23.6
Isopropyl alcohol	15.7
Acetonitrile	9.4
Ethanol	7.9
Acetone	2.4
Ethylene glycol	2.4
Dimethylformamide	2.0
Dichloromethane	1.6
n-Propanol	1.6
Trimethylsilanol	1.6
2-MethoxyEthanol	1.6
2-EthoxyEthanol	1.6
Tertiary butyl alcohol	0.8
Tetrahydrofuran	0.7
Toluene	0.5
Trichloroethylene	0.4
Dimethyl acetamide	0.4
Dimethyl sulfoxide	0.4
Ethyl acetate	0.3
n-Butanol	0.3
1,4 Dioxane	0.3
Methyl isobutyl ketone	0.3
Chloroform	0.2
N-Methyl-2-pyrrolidone	0.2
Propylene glycol;	0.2
Butyl diglycol	0.2

[1] Percent by weight for organic constituents, not total waste stream.

TABLE C-2
TYPICAL INCOMING INORGANIC WASTE STREAM

Component	% by Weight
Water	85 – 95
Sodium chloride	1 – 10
Metal Salts	1 – 10
Organic residues	0.5 - 1
Organic salts	0.5 - 1

C-1 CHEMICAL AND PHYSICAL ANALYSES

Figure 1 of the attached Waste Analysis Plan (See Attachment C-1) provides a general depiction of the procedures for determining that a waste can be properly managed at the facility. Before a waste stream is accepted for treatment at the facility, its generator is required to submit a sample and profile information to Elcon for approval. The profile must include all appropriate hazardous waste or residual waste codes and constituents for land disposal restriction treatment standards under 40 CFR 268.40 and 268.48, along with distinguishing physical characteristics. The sample will be analyzed at the Elcon laboratory for fingerprint analyses. The profile and analyses will be reviewed by the Elcon facility to determine whether the waste stream can be properly treated and whether special handling is needed (for example, incompatibilities).

For each waste received at the facility for the first time (or alternate frequency determined by the Pennsylvania Department of Environmental Protection (Department)), Elcon will submit a form (Module 1/Form U, or equivalent) to the Department that includes the following information as required by 25 PA Code §264a.13:

- Detailed chemical and physical analysis of the waste
- Description of the waste and the process generating the waste
- Name and address of the hazardous waste management facility
- Description of Elcon's treatment, storage and disposal methods for the waste
- Assessment of the impact of the waste on the treatment system
- Copy of the generator's source reduction strategy (Pennsylvania generators)
- Documentation that the generator has complied with the federal waste minimization law (non-Pennsylvania generators)
- Other information the Department may prescribe for the Elcon facility

Upon arrival of a pre-approved waste stream at the facility, Elcon will collect a representative sample of the waste for laboratory fingerprint analyses to confirm that the waste is consistent with the approved profile. Sampling methods are described in greater detail in Section C-2, Sub-section C-2c. The waste stream may arrive at the site as bulk shipments by truck, or may arrive in smaller containers by truck. Specific analyses will be conducted on all incoming waste streams for positive identification against the profile and to ensure safe handling and proper treatment. The waste stream will not be formally received at the facility until the fingerprint analyses confirm the identity of the waste. Waste-receiving procedures are described in greater detail in the Waste Analysis Plan provided in Appendix C-1.

It typically takes approximately three hours to analyze the samples to confirm that the waste is consistent with the manifest. Trucks will remain in the unloading area while the waste is being analyzed, which will not exceed 1 day. The trucks will either remain directly adjacent to the unloading bay or relocate elsewhere within the hazardous waste facility boundary.

C-1a Containerized Waste

Elcon anticipates that it may receive waste in containers from some of its customers. Although Elcon's intent is to immediately transfer the containerized waste to a storage tank, its facility includes provisions for storing wastes in containers, if necessary. Any waste that is received in a container that is damaged or is showing signs that the container is incompatible with the waste in the container will be returned to the customer or immediately transferred to an appropriate storage system. The profiles and analyses for each waste will be reviewed by Elcon to confirm that the wastes are put into the appropriate storage vessel.

Elcon is also proposing to use containers for storage of salts and sludge generated from its treatment process. These waste streams will be treated as hazardous waste until they are de-listed as hazardous waste. The salts, sludges (including baghouse dust), and other spent solids (e.g., spent lime, gypsum, carbon) will be stored in bags (e.g., Supersacks) or totes. The container systems will be compatible with the various solid waste streams.

40 CFR Part 270.15(b)(1), related to containers that do not contain free liquids, as identified on the Department's application checklist, does not apply to the incoming waste streams. The incoming waste streams will be predominately water. The salt stream generated by Elcon will not be liquid due to the nature of the process (i.e., crystallization and drying). The sludge stream, which includes baghouse dust, is processed in a drying oven and a thermal treatment heater; therefore, the moisture content will be low (less than 5%).

Additional information on the storage containers is provided in Section D-1 of this application.

C-1b Waste in Tank Systems

The profiles and analyses for each waste will be reviewed by Elcon to confirm that the wastes are put into the appropriate storage tank. The materials of construction for the various storage tanks are provided in Section D of this application. In general, incoming waste will be stored in carbon steel tanks with polyethylene linings; acids will be stored in polyethylene/high density polyethylene or polypropylene tanks; caustic materials will be stored in carbon steel tanks; and flammable materials will be stored in carbon or stainless steel tanks.

A written assessment that has been reviewed and certified by a qualified Professional Engineer as to the structural integrity and suitability for handling the hazardous waste in each tank system is provided in Section D of this application.

C-1c Waste in Piles

Elcon is not proposing to store wastes in piles at the facility. Therefore, this section is not applicable.

C-1d Landfilled Wastes

Elcon is not proposing to operate a landfill at the facility. Therefore, this section is not applicable.

C-1e Wastes Incinerated and Wastes Used in Performance Tests

Elcon is not proposing to utilize an incinerator at the facility. Therefore, this section is not applicable.

C-1f Wastes to be Land Treated

Elcon is not proposing any land treatment for wastes at the facility. Therefore, this section is not applicable.

C-1g Wastes in Miscellaneous Treatment Units

Some of the treatment technologies proposed for the facility, such as distillation, dryers, or filter presses, are not classified as boilers, landfills, storage tanks, or other specifically listed treatment technologies under RCRA. Therefore, Elcon considers these technologies as "Miscellaneous Treatment Units." Information on these units is provided in Section D-8 of this application.

The effectiveness of the treatment technologies for removing hazardous constituents from the waste streams will be determined by ongoing or periodic monitoring of the final treated stream. This may include direct monitoring of parameters in the salt, sludge, or treated water that is used internally, as well as periodic monitoring of the overall effectiveness of the treatment system to comply with Clean Air Act requirements in the air quality permit. Data from an operating facility in Israel is provided in Appendix C-2, which shows the overall effectiveness of the existing treatment technology. This appendix shows data for salt and sludge.

C-1h Wastes in Boilers and Industrial Furnaces

Elcon is not proposing waste treatment of disposal via boilers and industrial furnaces. Therefore, this section is not applicable.

C-1i Wastes on Drip Pads

Elcon is not proposing use of drip pads at the facility. Therefore, this section is not applicable.

C-2 WASTE ANALYSIS PLAN

A copy of Elcon's Waste Analysis Plan is provided as Appendix C-1. This Waste Analysis Plan describes the manner in which Elcon will confirm the identity of approved waste streams accepted at the site and the safe, proper management of the waste stream within the facility once

received. A copy of the Waste Analysis Plan will be maintained at the facility. Since the facility has not been constructed at this time, Elcon anticipates that it will need to fine tune its Waste Analysis Plan once the facility is operating.

The waste streams received at the facility are characterized by the generator prior to shipment to the Elcon facility using analysis and/or generator knowledge. Protective procedures are followed for acceptance of waste streams at the facility and these criteria must be met for receipt into the storage tank farm. Chemical analyses, visual analyses, physical testing, and recordkeeping methods will be followed to assure sufficient information is available for the safe handling of incoming waste streams.

The facility will maintain an on-site laboratory with the capability of conducting fingerprint analyses. Elcon will obtain certification as required by the Pennsylvania Environmental Laboratory Accreditation Act of 2002 for the on-site laboratory once the laboratory is constructed.

All of the tanks systems will be used to store or treat hazardous waste that contains free liquids; no exemptions from the requirements in §264.193 are necessary.

C-2a <u>Parameters and Rationale</u>

The facility has two overall needs for analysis. One is to confirm the identity of the waste and the other is to determine proper handling, storage, and recordkeeping requirements.

Elcon's treatment process is very flexible and can effectively process an extremely wide range of materials. Any free flowing liquid that is on the list of hazardous and residual waste codes that Elcon is seeking to treat (see Tables A-1 and A-2 in Section A of this application) can be processed. As part of its operations, materials are blended so that a steady state of material is processed through the treatment system. There are several compounds that cannot be fed through the process at high rates. Specifically, these include an upper limit of 200 metric tons per month of ammonia, 100 kilograms per hour of halogenated volatile organic compounds, and 300 metric tons per month of halogenated volatile organic compounds. So, while there are no parameter limits for individual waste streams accepted by Elcon beyond the approved waste code(s), there are upper limits on the amount of ammonia and halogenated volatile organic compounds that the process itself is designed to handle.

In general, the facility manages four types of waste streams: acidic, alkaline, flammable, and general (moderate dissolved solids, moderate organic content). As these waste stream types may be incompatible, the storage Tank Farm for incoming wastes includes separately diked areas (secondary containment) to maintain separation, if needed, of incompatible waste streams. The treatment system has four "units," which include different treatment steps based on the type of waste. Figure 2 of the attached Waste Analysis Plan is a simplified and generalized logic diagram that shows how different, and perhaps incompatible, waste streams are treated at the site. In actual practice, decisions for the treatment of a particular waste are more complex and

detailed, but result in the waste being treated in one of the four units based on the parameters in the Waste Analysis Plan.

Table 3 of the attached Waste Analysis Plan lists the parameters and rationale for the general fingerprint analyses. Some waste streams may require specific additional analyses, which will be part of the acceptance criteria for the waste stream when it is first submitted for acceptance at the Elcon facility.

C-2b Test Methods

Test methods for the parameters discussed in Section C-2a are provided on Table 4 of the attached Waste Analysis Plan. Test methods are from USEPA guidance document SW-846, *Test Methods for Evaluating Solid Wastes – Physical/Chemical Methods*.

C-2c Sample Methods

Sampling methods will vary depending on the nature of the waste and the type of container it arrives in. Most wastes received at the facility will be aqueous based. However, some may phase-separate, and some may have significant amounts of suspended solids. Sampling methods for the facility are designed to collect representative samples regardless of whether the waste stream has stratified prior to collection of the sample.

Table C-3 summarizes general sampling methods anticipated for use at the site. These sampling methods are consistent with 40 CFR Part 261, Appendix I, related to Representative Sampling Methods. It is anticipated that some waste streams may provide unique challenges to representative sampling that will require some flexibility and creativity in sample collection. When alternative methods are used, the method will be described in brief summary in the facility's operating record.

The following method is the normal or default method for collecting a sample from a tank:

- Sampling will be performed using a 3-meter-long rod that holds a sampling bottle at the tip. The tip will be inserted into the tank to collect the sample.
- Each sample will contain 1 liter of the waste stream and will be collected into a standard sampling bottle.
- Three samples will be collected: from the tank top one-meter layer, from the middle one-meter layer, from the bottom one-meter layer.
- These three samples will be visually observed to assess the similarities or differences between the three layers.
- If the three samples present a similar appearance, they will be composited to create a single 3-liter sample for analysis.

TABLE C-3
SAMPLING METHODS SUMMARY

Circumstance	Sampling Method
Tank – initial or non-stratified	Dipper
Tank – stratified	Transparent tube and Dipper
Container – drum or tote	Composite Liquid Waste Sampler (COLIWASA)

- If the samples present significantly different appearances, the different layers will be analyzed separately and a transparent tube sampler will be used to collect a full depth sample to assess the relative proportions of the layers.
- A representative reference sample of 0.5 liters will be held at the facility for a 30-day period for reference. The sample will be held in the sampling cabinet at the facility laboratory.

The following method is the normal or default method for collecting a sample from a container:

- Push down and hold the rod at the top of the COLIWASA to close the valve.
- Lower the COLIWASA to the proper level and pull up on the rod approximately 2"-3" (5-8 cm) to open the valve and collect the sample.
- Push the rod down to close the valve and remove the sampler from liquid.
- Pull up on the rod to empty the sample into an appropriate container. Or hold the valve slightly open while submersing the COLIWASA into the liquid to collect the sample from the surface down to the desired level. Push the valve closed, remove from the liquid, and empty into a container.
- A representative reference sample of 0.5 liters will be held at the facility for a 30-day period for reference. The sample will be held in the sampling cabinet at the facility laboratory.

C-2d <u>Frequency of Analysis</u>

Generators of hazardous waste sent to the Elcon facility are required to properly characterize their waste under the RCRA regulations before it is offered for off-site transportation and disposal in accordance with 40 CFR 262.11. In accordance with 40 CFR 264.13(a)(3)(i), the characterization must be repeated whenever there is a change in the process that potentially affects the characterization of the waste.

The generator information and a waste sample must be provided to Elcon for pre-acceptance of the waste for treatment. Updated profiles will be required if a waste stream is observed to vary from its description.

For wastes that are received in containers, a sample representing the full depth of the container will be collected and analyzed. For each set of containers representing a single waste stream, a

random sample of approximately 10 percent will be sampled. Additional containers may be sampled if the sampled drums are observed to have variable waste qualities.

C-2e Additional Requirements for Wastes Generated Off Site

The Elcon facility is a commercial facility that receives hazardous waste from off-site clients. Prior to first-time receipt of a particular waste stream, the facility requires a profile from the generator that provides sufficient information about the waste stream to determine the following:

- That the hazardous waste stream is limited to hazard codes allowed under this permit to be received at the facility
- That the hazardous waste stream can be positively identified upon receipt
- That the hazardous waste stream can be safely and effectively treated at the facility
- Whether the hazardous waste stream requires special handling for ignitability or incompatibility
- What treatment steps will be needed for effective treatment

Once the facility has determined that the waste stream is appropriate for acceptance, first time waste streams must also be accepted by the Department as described in Section C-1.

Upon agreement that the waste may be received at the Elcon facility, each waste shipment is subject to verification sampling. Receiving procedures include the following:

- Each waste shipment is accompanied by a shipping document (a uniform hazardous waste manifest for hazardous wastes, a bill of lading for wastes that are not hazardous waste under RCRA) that includes the type and quantity of waste stream.
- The Process Operator in the receiving area checks the shipping document and weighs the truck to verify the quantity of the waste stream received.
- Samples are collected of the incoming waste stream (see Section C-2c) and analyzed by the on-site laboratory to confirm that it matches its acceptance profile (see Sections C-2a and C-2b).
- Assuming the quantity and quality of waste stream is consistent with the shipping document and profile, the shipment is directed to the incoming storage tank farm for receipt (see Section D of this application)

Regarding the statistical sampling method to determine if the sampling is representative, Elcon will conduct at least some portion fingerprint analysis on each incoming sample (i.e., 100 percent sampling) that it receives at the facility. The specific parameters that are analyzed at this frequency are those parameters (e.g., pH, total solids) that are critical for the proper categorization and treatment of the waste stream.

Profiles are required to be updated whenever the generator has reason to believe the quality of the waste is significantly changed, such as a change in the processes generating the waste stream.

Additionally, the Elcon facility may request profile information to be updated if waste quality is observed to vary significantly.

As part of the treatment process, some of the waste streams will be blended. It is not necessary to track the waste streams individually.

40 CFR §264.73(b) does not apply because this section applies only to those who treat, store, or dispose of hazardous wastes on site where such wastes were generated per 40 CFR §264.70(a).

C-2f Additional Requirements for Ignitable, Reactive, or Incompatible Wastes

Reactive wastes will not be accepted at the Elcon facility. Ignitable waste streams may be accepted at the facility, generally as a phase-separated waste stream. Ignitable wastes will be stored in the flammable dike within the storage Tank Farm. Details on the storage tanks in this area are provided in Section D-2 of this application. These tanks will be designed to comply with the flammable materials requirements of National Fire Protection Code (NFPA) 30): Flammable and Combustible Liquids Code, as well as the International Codes Council (ICC) Fire Code, adopted by Pennsylvania and Falls Township. Flammable wastes will be treated separately in Unit 23.

Some waste streams accepted at the Elcon facility may be incompatible with other accepted waste streams. This information will be part of the waste stream profile and will guide the storage and treatment of the waste stream. Incompatible waste streams will not be intermingled until the waste streams are neutralized or otherwise treated to remove the incompatibility. System interlocks will prevent the intermingling of incompatible wastes. Sensors within the system will notify Process Operators of conditions (such as temperature and pressure) outside normal operating ranges that may indicate the intermingling of incompatible wastes. This will enable Process Operators to halt feed systems and shut down units in a timely manner to prevent damage to the system.

Additionally, Elcon will use generator knowledge as necessary to meet the additional waste analysis requirements for specific waste management methods, including organic content of the waste and the absence or presence of free liquids. Records of any such determination will be maintained at the facility.

Some of the equipment at Elcon will be subject to the requirements of §264 Subparts AA, BB, and CC. Details on conformance with these requirements is provided in Sections M, N, and O of this application.

C-2g Additional Requirements Pertaining to BIF Facilities

The facility will not operate a boiler or industrial furnace for hazardous waste treatment or disposal. Therefore, this section is not applicable.

C-2h Additional Requirements Pertaining to Containment Buildings

The facility will not operate a containment building for hazardous waste treatment or disposal. Therefore, this section is not applicable.

C-3 WASTE ANALYSIS REQUIREMENTS PERTAINING TO LAND DISPOSAL RESTRICTIONS

Wastes received at the Elcon facility will be treated in tank systems and other units as described in Section A of this permit application. The treatment process will not generate a liquid waste stream for discharge to a body of water. Incoming hazardous waste or hazardous constituents will not be applied to the land prior to treatment. Volatile constituents in the waste streams will be managed via an air permit.

As discussed in Section C-1, generators will be required to submit profile information to Elcon prior to acceptance of the waste stream that includes Land Disposal Restriction (LDR) information. Such information will include hazardous waste codes and underlying hazardous constituents, as appropriate, for the waste codes. Also as discussed in Section C-1, Elcon will provide the appropriate form to the Department prior to processing each new hazardous waste stream from a specific generator for the first time in accordance with 25 PA Code §264a.13 identifying any LDR information.

There will be no liquid waste streams generated from the treatment process; therefore, LDR standards do not apply to the treated liquid waste stream.

The waste treatment facility generates several solids waste streams. Residual solids from the treatment process will be land disposed as a hazardous waste and will be subject to LDR treatment standards for the contributed waste streams in accordance with the "derived from" rule (40 CFR 261.3 (c) and (d)) unless and until the residual solids are delisted.

C-3a Waste Analysis

Wastes received at the facility will be accompanied by profiles from the waste generators, including land disposal restriction information about the waste stream. The Waste Analysis Plan provided in Appendix C-1 of this permit application provides a description of analyses intended to confirm waste profiles and provide essential information for safe management of the received waste streams. No additional analysis of incoming waste streams is anticipated specific to Land Disposal Restrictions. Elcon will not land dispose received waste streams.

The Elcon facility will generate solid residuals from the treatment of received hazardous wastes. The solid residuals will retain the listing codes and associated land disposal restrictions from the contributing waste streams. A solid residual may also exhibit a characteristic of hazardous waste. Based on generator knowledge of the treatment undergone by the received waste streams, the characteristics of ignitability, corrosivity, and reactivity will not apply to the solid residual.

Generated solid wastes from the facility (salt and sludge) will be analyzed for toxicity characteristics and applicable LDR treatment standards. Initially, composite samples will be collected for each shipment of site-generated solids for off-site disposal. Once sufficient data are available to assess the variability of the solids waste streams, the frequency of analysis will be reduced according to statistical calculations presented in USEPA *Data Quality Assessment: Statistical Tools for Practitioners* (QA/G-9S) for waste characterization purposes. The frequency of sampling the solid waste streams from the facility will be reviewed annually and adjusted, as needed.

As required, a one-time notice will be sent with the initial shipment of waste or contaminated soil to the land disposal facility. A copy of the notice will be retained by Elcon. The one-time notice will include:

- EPA Hazardous Waste Numbers and Manifest Number of first shipment.
- A statement that the waste is subject to the LDRs.
- The applicable wastewater/ nonwastewater category.
- Waste analysis data (when available).
- A certification using the language specified in 40 CFR Part 268.7(b)(4).

Wastes that exhibit a characteristic are also subject to notification requirements, except that once the waste is no longer hazardous, a one-time notification and certification will be placed in the on-site files. The notification and certification will be updated if the process or operation generating the waste changes and/or if the Subtitle D facility receiving the waste changes. The notification will include the following information:

- Name and address of the RCRA Subtitle D facility receiving the waste shipment; and
- A description of the waste as initially generated, including the applicable EPA hazardous waste code(s), treatability group(s), and underlying hazardous constituents, unless the waste will be treated and monitored for all underlying hazardous constituents. If all underlying hazardous constituents will be treated and monitored, there is no requirement to list any of the underlying hazardous constituents on the notice.
- A certification must be signed by an authorized representative and must state the language found in 40 CFR §268.7(b)(4).
- If treatment removes the characteristic but does not meet standards applicable to underlying hazardous constituents, then the certification found in 40 CFR §268.7(b)(4)(iv) applies.

C-3a(1) Spent Solvent and Dioxin Wastes

Elcon is not proposing to receive, treat, or dispose of dioxin containing waste or soils. Therefore, this section is not applicable.

C-3a(2) California List Wastes

This section is not applicable to the Elcon facility.

C-3a(3) Listed Waste

Many wastes received at the Elcon facility will have listed waste codes. Waste treatment residues (salt and sludge) will retain these listed codes unless or until the solids generated by the treatment processes are delisted.

Until the salt or sludge is delisted, Elcon will demonstrate that its waste treatment technology meets one of the following requirements identified in 40 CFR §268.40 prior to off-site disposal:

- All hazardous constituents in the treatment residue are at or below the values identified in the table in 40 CFR §268.40 ("total waste standards")
- The hazardous constituents in the extract of the treatment residue are at or below the values found in the table ("waste extract standards")
- The waste will be treated using the technology specified in the table ("technology standard"), which are described in detail in 40 CFR §268.42, Table 1-Technology Codes and Description of Technology-Based Standards.

C-3a(4) Characteristic Waste

Many wastes received at the Elcon facility will be characteristically hazardous and will also have underlying hazardous characteristics above the LDR treatment standards upon receipt at the facility. Through the waste treatment processes at the facility, the treatment residuals may or may not retain the hazardous characteristics and the concentrations of underlying hazardous constituents may change. Therefore, sampling and analysis of generated treatment residuals will be necessary to determine whether characteristic waste codes are applicable to the residues and whether the residues require further treatment to meet LDR treatment standards prior to land disposal. Unit 12 will treat waste acids that are characteristic only by corrosivity. The solid waste residue from this unit will be managed separately and is anticipated to be non-hazardous.

C-3a(5) Radioactive Mixed Waste

Elcon is not proposing to receive, treat, or dispose of radioactive waste. Therefore, this section is not applicable. A Radiation Protection Action and Monitoring Plan is provided in Appendix C-3 to demonstrate continued conformance with this commitment.

C-3a(6) Leachates

Elcon may receive waste classified as K169 (crude oil tank sediment from petroleum refining operations). Under §268.35, this waste is prohibited from land disposal unless the waste meets the applicable treatment standards specified in Subpart D of 40 CFR Part 268 this part. Elcon's treatment process will be able to achieve the treatment requirements specified in 40 CFR Part 268, Subpart D.

C-3a(7) Lab Packs

Elcon is not proposing to receive, treat, or dispose of lab packs. Therefore, this section is not applicable.

C-3a(8) Contaminated Debris

Elcon is not proposing to receive, treat, or dispose of contaminated debris. Therefore, this section is not applicable.

C-3a(9) Waste Mixtures and Wastes with Overlapping Requirements

Many wastes received at the Elcon facility will have multiple hazardous waste codes, including both characteristic and listed codes. Additionally, compatible waste streams from multiple generators will be treated concurrently in the waste treatment system. Therefore, the residuals generated from treatment will include multiple "derived-from" waste codes and potentially will also have characteristic codes as well. For each hazardous constituent, the most stringent applicable treatment requirement will be used for the waste for purposes of ultimate disposal at an off-site landfill.

As indicated above, Elcon is not proposing to treat or dispose of hazardous debris; therefore, 40 CFR 268.45(a), as listed on the Department's checklist, does not apply.

C-3a(10) Dilution and Aggregation of Wastes

Waste will be blended and treated in one of the four general treatment trains at the facility. This does not involve land disposal, so the LDR dilution prohibition is not applicable.

Solids residues from the waste treatment processes are wastes generated by Elcon. The residues (i.e., salts and sludges) will be aggregated from the treatment of a variety of waste streams but will have a common point of generation. No generated waste will be diluted.

C-3b <u>Notification, Certification, and Recordkeeping Requirements</u>

As stated above, Elcon will require generators to submit profile information for waste to be received for treatment. This Section describes the required notifications and certifications and the required recordkeeping of those notifications and certifications.

C-3b(1) Retention of Generator Notices and Certifications

Generator profiles for accepted wastes will be kept on file at the Elcon facility for a minimum of 3 years. The profiles will include the appropriate notices and certifications by the generator regarding waste characterization and land disposal restrictions applicable to the waste stream. The forms for first-time waste acceptance submitted to and approved by the Department will be kept on file at the Elcon facility as long as the subject waste stream is accepted at the facility. Required notices and certifications by the waste generator to Elcon under 40 CFR 268.7(a) will be retained at the facility for a minimum of 3 years.

C-3b(2) Notification and Certification Requirements for Treatment Facilities

Wastes received at the Elcon facility will be wastewaters, and the treatment standards will be for the wastewater category in terms of milligrams per liter (mg/L). Residuals derived from treating the incoming wastewaters from client generators will carry listed waste codes from the received wastes. These residuals will be dry solids and will be disposed of at a Subtitle C landfill unless or until the residuals are exempted by delisting.

Upon offering residuals from the treatment process to an off-site landfill for land disposal, Elcon will make the appropriate notices and certifications to the land disposal facility.

C-3b(3) Notifications and Certifications for Land Disposal Facilities

The Elcon facility is not a land disposal facility.

C-3b(4) Wastes Shipped to a Subtitle C Landfill

Solids residuals generated at Elcon will be derived from the treatment of listed and characteristic hazardous wastes. The residuals will retain the listings from the treated wastes. The solids residuals from waste stream treatment will be land-disposed at a Subtitle C landfill. Elcon will follow profiling, notification, and certification procedures as required by the regulations and the disposal facility.

C-3b(5) Wastes Shipped to a Subtitle D Landfill

Residuals from the treatment of listed hazardous waste streams at the Elcon facility will not be eligible for disposal at a Subtitle D landfill unless they go through the delisting process. If delisting is successfully conducted, the delisting conditions will be followed for disposal in a Subtitle D landfill or recycled. Residuals from Unit 12, treatment of waste acids hazardous only by corrosivity, will not be hazardous and will be disposed of at a Subtitle D landfill.

C-3b(6) Recyclable Material

Elcon will treat and dispose of hazardous waste streams. Recycling of sludge derived from received waste streams is not anticipated. However, recycling of salt is being considered, but only after delisting.

C-3b(7) Recordkeeping

Elcon will maintain records of all waste streams accepted for treatment at the facility. These records will include waste profiles and LDR notifications and certifications. Forms indicating the Department's approval of first time waste streams will be kept for a period of 3 years as required by 25 PA Code §265a.13(1).

Elcon will conduct fingerprint analyses of incoming wastes to confirm that they are consistent with the approved waste profiles. Records of the analyses will be kept for a minimum of 3 years.

Elcon will conduct characterization analyses of residual solids derived from treatment of the received waste streams. Records of the analyses will be retained, along with notifications and certifications by the Elcon facility to the disposal facility for a minimum of 3 years.

C-3c <u>Requirements Pertaining to Storage of Restricted Wastes</u>

Restricted wastes (i.e., wastes restricted from land disposal) generated by off-site facilities will be received at the Elcon facility and, upon acceptance, stored in storage tank systems or containers. The storage tank systems and container storage are described in Sections D-2 and D-1 of this application, respectively. The storage tank and container areas will be designed and operated to meet the requirements of 40 CFR 268.50.

Restricted wastes generated by Elcon, consisting of solids residuals from the treatment of hazardous wastes, will be stored in storage tanks or containers meeting the requirements of 40 CFR 268.50 until they are shipped to an approved off-site disposal facility.

C-3c(1) Restricted Wastes Stored in Containers

When a restricted waste is stored in a container, the container will be clearly marked to identify its contents and the date each period of accumulation began in accordance with 40 CFR 268.50(a)(2)(i).

C-3c(2) Restricted Wastes Stored in Tanks

In accordance with 40 CFR 268.50(a)(2)(ii), when a restricted waste is stored in a tank, the tank will be clearly marked with a description of its contents, the quantity of each hazardous waste received, and the date each period of accumulation began, or such information for each storage tank will be recorded and maintained in the operating record for the facility.

C-3c(3) Storage of Liquid PCB Wastes

The facility will not treat PCB-containing wastes.

C-3d Exemptions, Extensions, and Variances to Land Disposal Restrictions

The Elcon facility does not anticipate utilizing exemptions, extensions, or variances to Land Disposal Restrictions. Therefore, this section and subparts C-3d(1) through C-3d(4) are not applicable.

APPENDIX C-1

WASTE ANALYSIS PLAN

WASTE ANALYSIS PLAN

ELCON RECYCLING FACILITY

FALLS TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

OWNER / OPERATOR OF FACILITY:

ELCON RECYCLING SERVICES, LLC
100 DEAN SIEVERS PLACE
MORRISVILLE, PA 19067

PREPARED BY:
IES ENGINEERS, INC.
1720 WALTON ROAD
BLUE BELL, PA 19422

IES PROJECT NO. EV171065.01

FEBUARY 2017

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1. INTRODUCTION

This document was created to fulfill the Resource Conservation and Recovery Act (RCRA) requirement for all owner/operators of hazardous waste treatment, storage, and disposal facilities (TSDFs) to properly identify and characterize, through waste testing and/or acceptable knowledge, all hazardous wastes that are generated, treated, stored, or disposed of at their facility. The proposed Elcon Recycling Services, LLC (Elcon) facility will accept hazardous waste for treatment.

This Waste Analysis Plan (WAP) describes the manner in which Elcon will confirm the identity of approved waste streams accepted at the site and the safe, proper management of the waste stream within the facility once received. A copy of the Waste Analysis Plan will be maintained at the facility.

2. FACILITY DESCRIPTION

Elcon is proposing to construct a commercial hazardous and residual waste treatment facility to be located at the Keystone Industrial Port Complex (KIPC) in Falls Township, Pennsylvania.

Elcon is an Israeli-based company that has developed a patented technology for treating industrial wastewater with energy recovery. The technology extracts organic materials in the form of organic vapors from liquid waste streams. The organics are converted into heat energy, which is used within the process.

The facility is proposing to use various chemical and physical treatment technologies to remove hazardous constituents from liquid waste streams. The waste streams will be generated by a variety of different off-site operations, such as pharmaceutical manufacturing operations, petroleum refineries, semi-conductors, and petrochemicals. Major operational steps in the proposed operation will consist of acid/base neutralization; coagulation; dissolved metals precipitation and separation; suspended solids separation; sludge filtration; sludge dewatering, drying, and thermal treatment; steam stripping; distillation; crystallization; and salt drying. A thermal oxidizer, selective non-catalytic reduction, and scrubber will be used to control air emissions from the process operations. Baghouses will be used to control handling of dry materials. Storage and treatment of hazardous waste from off-site sources is subject to RCRA Part B permitting in accordance with 40 CFR 270.1(c) and 25 PA Code §270a.1(b).

The waste streams received at the facility are characterized by the generator prior to shipment to the Elcon facility using analysis and/or generator knowledge. Protective procedures are followed for acceptance of waste streams at the facility and criteria must be met for receipt into the storage Tank Farm or container storage area. Chemical analyses, visual analyses, physical testing, and recordkeeping methods are followed to assure sufficient information is available for the safe handling of incoming waste streams.

The facility will maintain an on-site laboratory with the capability of conducting fingerprint analyses. The laboratory certification ID No. for the facility is _____ under the Environmental Laboratory Accreditation Act. (This certification will be obtained prior to start-up.)

A more detailed facility description is included as Attachment 1 to this WAP.

3. WASTE PRE-ACCEPTANCE AND ACCEPTANCE PROCESS

A. Rationale, Needs, and Criteria for Pre-Acceptance

Figure 1 provides a general description of the procedures for determining that a waste can be properly managed at the site. Prior to waste receipt, Elcon will require the following information regarding the waste from the waste generator:

- The process that generated the waste
- The physical and chemical description of the waste
- The analytical procedures and results used to characterize the waste or acceptable knowledge documentation
- EPA hazardous waste codes
- Certifications and notifications as applicable to Land Disposal Restriction (LDR) wastes

In most cases, this information will be provided to Elcon in the form of a Waste Profile Sheet (WPS). Prior to first-time receipt of a particular waste stream, the facility requires a profile from the generator that provides sufficient information about the waste stream to determine the following:

- That the hazardous waste stream is limited to hazardous or residual waste codes allowed under this permit to be received at the facility
- That the waste stream can be positively identified upon receipt
- That the waste stream can be safely and effectively treated at the facility
- Whether the waste stream requires special handling for ignitability or incompatibility
- What treatment steps will be needed for effective treatment

Once the facility has determined that the waste stream is appropriate for acceptance, first time waste streams must also be accepted by the Pennsylvania Department of Environmental Protection (Department). For each waste received at the facility for the first time, or alternative frequency approved by the Department, Elcon will submit a form (Module 1 or Form U) to the Department that includes the following information as required by §264a.13:

- Detailed chemical and physical analysis of the waste
- Description of the waste and the process generating the waste

- Name and address of the hazardous waste management facility
- Description of Elcon's treatment, storage and disposal methods for the waste
- Assessment of the impact of the waste on the treatment system
- Copy of the generator's source reduction strategy (Pennsylvania generators)
- Documentation that the generator has complied with the federal waste minimization law (non-Pennsylvania generators)
- Other information the Department may prescribe for the Elcon facility

Receiving procedures include the following:

- Each waste shipment is accompanied by a shipping document (a uniform hazardous waste manifest for hazardous wastes, a bill of lading for wastes that are not hazardous waste under RCRA) that includes the type and quantity of the waste stream
- The receiving operator checks the shipping document and weighs the truck/railcar to verify the quantity of waste stream received
- Samples are collected of the incoming waste stream (see Section 7) and analyzed by the on-site laboratory to confirm that it matches its acceptance profile
- Assuming the quantity and quality of waste stream is consistent with the shipping document and profile, the shipment is directed to the incoming storage area for receipt

Profiles are required to be updated whenever the generator has reason to believe the quality of the waste is significantly changed, such as a change in the processes generating the waste stream. Additionally, the Elcon facility may request profile information to be updated if the waste characteristics are observed to vary significantly.

B. Incoming Waste Evaluation

Upon arrival of a pre-approved waste stream at the facility, Elcon will collect a representative sample of the waste for laboratory fingerprint analyses to confirm that the waste is consistent with the approved profile. Sampling methods are described in greater detail in Section 7. The waste stream may arrive at the site as bulk shipments by truck or may arrive in smaller containers. Specific analyses will be conducted on all incoming waste streams for positive identification against the profile and to ensure safe handling and proper treatment. The waste stream will not be formally received at the facility until the fingerprint analyses confirm the identity of the waste.

It typically takes approximately three hours to analyze the samples to confirm that the waste is consistent with the manifest. Trucks will remain in the unloading area while the waste is being analyzed, which will not exceed 1 day. The trucks will either remain directly adjacent to the unloading bay or relocate elsewhere within the hazardous waste facility boundaries. Once Elcon confirms and accepts the waste, the following procedures will be utilized for the waste transfer:

- The Process Operator in the receiving area connects the tank to the pump, and notifies the control room that the tank is ready to be unloaded.
- The Process Operator in the control room enables the unloading pump and engages the appropriate valves to make the transfer to the correct tank in the storage tank farm.
- Once the transfer is complete, the Process Operator in the receiving area drains the piping, when needed, with the dedicated drain pump.
- The Process Operator in the receiving area then informs the Process Operator in the control room that the unloading has been completed and that the valves should be closed.
- The Process Operator in the receiving area disconnects the connection to the unloading pump.

4. ACCEPTABLE WASTE CODES

Elcon is seeking permission to treat a wide variety of hazardous waste codes as listed on Table 1.

Additionally, Elcon is seeking permission to treat the residual wastes listed on Table 2. The residual waste streams will be blended with the hazardous waste streams, thereby making the full waste stream hazardous.

5. REJECTION POLICY

Elcon's treatment process is very flexible and can effectively process an extremely wide range of materials. Any free flowing liquid that is on the list of hazardous and residual waste codes that Elcon is seeking to treat (see Tables 1 and 2) can be processed.

Elcon will retain the right to reject certain wastes if there is a discrepancy in the amount or contents of a waste delivery. Upon rejecting a waste, Elcon will consult with the generator prior to forwarding the waste to a treatment or disposal facility that can manage the waste. If it is impossible to locate an alternative facility that can receive the waste, Elcon will return the rejected waste to the generator. Elcon will send the waste to the alternative facility or to the generator within 60 days of the rejection of the waste.

While Elcon is making arrangements for forwarding the rejected wastes, it will ensure that the delivering transporter retains custody of the waste, or Elcon will provide for secure, temporary custody of the waste, pending delivery of the waste to the first transporter designated on the manifest. Prior to transfer to the alternate facility, the waste manifest will be updated as required by 40 CFR 264.72(e) and 40 CFR 264.72(f).

6. DISCREPANCY POLICY

A. Manifest Discrepancies

Manifest discrepancies are defined as:

- Significant differences between the quantity or type of hazardous waste designated on the manifest or shipping paper, and the quantity and type of hazardous waste (or residual waste) a facility actually receives. Significant differences in quantity are, for bulk waste, variations greater than 10 percent in weight; for batch waste, any variation in piece count, such as a discrepancy of one drum in a truckload. Significant differences in type are obvious differences, which can be discovered by inspection or waste analysis, such as waste solvent, substituted for waste acid, or toxic constituents not reported on the manifest or shipping paper.
- Rejected wastes, which may be a full or partial shipment of hazardous waste that the Treatment, Storage, or Disposal Facility (TSDF) cannot accept; or
- Container residues, which are residues that exceed the quantity limits for "empty" containers set forth in 40 CFR §261.7(b).

Upon identification of a manifest discrepancy, Elcon will attempt to reconcile the discrepancy with the waste generator or transporter. If the discrepancy is not resolved within 15 days after receiving the waste, Elcon will immediately submit a letter to U.S. Environmental Protection Agency (EPA) and the Department describing the discrepancy and the attempts to reconcile it, along with a copy of the manifest or shipping paper at issue.

Elcon will then determine if the waste can be managed in a manner that is safe, effective, and in accordance with the provisions of the facility's permit. If so, Elcon may accept the waste despite the discrepancy. If the waste cannot be accepted, Elcon will reject the waste as described in Section 5.

If necessary, Elcon will require the generator to re-evaluate and/or re-certify the waste profile prior to any future waste deliveries. Elcon will maintain records of each manifest or shipping paper discrepancy.

B. Discrepancies Between Incoming Waste and Profile

As described above in Section 3.B, Elcon will confirm that each incoming waste matches its corresponding waste profile through visual inspection and/or sample analysis. If Elcon identifies a discrepancy between the incoming waste and the waste profile, Elcon will proceed with similar procedures as described in Section 6.A, above. However, since there is no federal policy regarding the amount of time a waste can remain on-site during a waste profile discrepancy, Elcon will evaluate each discrepancy individually. Records of these discrepancies will be maintained onsite.

7. SAMPLING STRATEGIES AND FREQUENCY

A. Number of Samples to be Collected

Generators of hazardous waste sent to the Elcon facility are required to properly characterize their waste under RCRA before they offer it for off-site transportation and disposal in accordance with 40 CFR 262.11. In accordance with 40 CFR 264.13(a)(3)(i), the characterization must be repeated whenever there is a change in the process that potentially affects the characterization of the waste.

The generator information and a waste sample must be provided to Elcon for pre-acceptance of the waste for treatment. Updated profiles will be required if a waste stream is observed to vary from its description.

For wastes that are received in containers, a sample representing the full depth of the container will be collected and analyzed. For each set of containers representing a single waste stream, a random sample of approximately 10 percent will be sampled. Additional containers may be sampled if the sampled containers are observed to have variable waste qualities.

Under most circumstances, once the waste is on site, Elcon will collect three confirmatory samples from each tank: from the top one-meter layer, from the middle one-meter layer, and from the bottom one-meter layer.

B. Sampling Procedures

Sampling methods will vary depending on the nature of the waste and the type of container it arrives in. Most wastes received at the facility will be aqueous based. However, some may phase-separate, and some may have significant amounts of suspended solids. Sampling methods for the facility are designed to collect representative samples regardless of whether the waste stream has stratified prior to collection of the sample.

The table below summarizes general sampling methods anticipated for use at the site.

CIRCUMSTANCE	SAMPLING METHOD
Tank – initial or non-stratified	Dipper
Tank – stratified	Transparent tube and Dipper
Container – drum or tote	Composite Liquid Waste Sampler (Coliwasa)

It is anticipated that some waste streams may provide unique challenges to representative sampling that will require some flexibility and creativity in sample collection. When alternative methods are used, the method will be described in brief summary in the facility's operating record.

The following method is the normal or default method for collecting a sample from a tank:

- Sampling will be performed using a 3-meter-long rod that holds a sampling bottle at the tip. The tip will be inserted into the tank to collect the sample.
- Each sample shall contain 1 liter of the waste stream that will be collected into a standard sampling bottle.
- Three samples will be collected: from the tank top one-meter layer, from the middle one-meter layer, from the bottom one-meter layer.
- These three samples will be visually observed to assess the similarities or differences between the three layers.
- If the three samples present a similar appearance, they will be composited to create a single 3-liter sample for analysis.
- If the samples present significantly different appearances, the different layers will be analyzed separately and a transparent tube sampler will be used to collect a full depth sample to assess the relative proportions of the layers.
- A representative reference sample of 0.5 liters will be held at the facility for a 30-day period for reference. The sample will be held in the sampling cabinet at the facility laboratory.

The following method is the normal or default method for collecting a sample from a container:

- Push down and hold the rod at the top of the COLIWASA to close the valve.
- Lower the COLIWASA to the proper level and pull up on the rod approximately 2"-3" (5-8 cm) to open the valve and collect the sample.
- Push the rod down to close the valve and remove the sampler from liquid.
- Pull up on the rod to empty the sample into an appropriate container. Or hold the valve slightly open while submersing the COLIWASA into the liquid to collect the sample from the surface down to the desired level. Push the valve closed, remove from the liquid, and empty into a container.
- A representative reference sample of 0.5 liters will be held at the facility for a 30-day period for reference. The sample will be held in the sampling cabinet at the facility laboratory.

C. Sampling Equipment Decontamination and Maintenance Procedures

When dedicated sampling equipment cannot be utilized for sample collection, the equipment will be decontaminated after each use. Elcon will establish a decontamination area within the facility that will progress from "dirty" to "clean" end with an area for drying the equipment.

The equipment will be washed thoroughly with a soapy, laboratory-grade detergent solution. If necessary, equipment will be disassembled prior to washing. A stiff-bristled brush will be used to dislodge any clinging material. The equipment will then be rinsed in clear potable water and then spray rinsed with ASTM Type II Reagent water. If necessary, the equipment will then be rinsed with pesticide-grade methanol followed by pesticide-grade hexane. The equipment will then be dried, re-assembled (if needed) and stored to prevent contamination until the next use. Decontamination fluid will be containerized and handled as legally required.

Equipment being used to collect the waste samples will be visually inspected prior to each use to certify that it is in proper operating condition. Equipment, instruments, tools, gauges, and other items that require preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedures developed by the operators. Service logs will be established and maintained for each piece of equipment that requires regular maintenance.

D. Sampling Health and Safety Procedures

All employees that are involved with the sample collection and sample analysis of the incoming wastes will wear appropriate Personal Protective Equipment (PPE). The PPE to be utilized may include, but will not be limited to:

- Nitrile gloves
- Acid resistant gloves
- Apron
- Face shield
- Respirator
- Safety glasses / goggles
- Lab coat
- Tyvek suit

All employees who may handle the waste will be properly trained to select and effectively use the correct PPE for the task.

8. ANALYTICAL PARAMETERS AND TEST METHODS

The facility will manage four types of waste streams: acidic, alkaline, flammable, and general (moderate dissolved solids, moderate organic content). The receiving area (storage tank farm and container storage area) for incoming waste streams includes separately diked areas (secondary containment) to maintain separation, if needed, of incompatible waste streams. The treatment system has four "units," which include different treatment steps based on the type of waste. Figure 2 is a simplified and generalized logic diagram that shows how different, and perhaps incompatible, waste streams are treated at the site. In actual practice, decisions for treatment of a particular waste are more complex and detailed, but result in the waste being treated in one of the four units based on the parameters included within this Plan.

The facility has two overall needs for analysis. One is to confirm the identity of the waste and the other is to determine proper handling, storage, and recordkeeping requirements.

Table 3 lists the parameters and rationale for the general fingerprint analyses. Some waste streams may require specific additional analyses, which will be part of the acceptance criteria for the waste stream when it is first submitted for acceptance at the Elcon facility. The sample frequencies shown on this table are based on Elcon's experience with treating more than a million tons of liquid waste streams at its Israeli operation. Table 4 identifies the test methods that will be utilized for each analysis.

The Elcon facility will generate solid residuals from the treatment of received hazardous wastes. The solid residuals will retain the listing codes and associated land disposal restrictions from contributing waste streams. The solid residual may also exhibit a characteristic of hazardous waste. Based on generator knowledge of the treatment undergone by the received waste streams, the characteristics of ignitability, corrosivity, and reactivity will not apply to the solid residual. However, some toxicity characteristics may potentially apply.

Generated solid wastes from the facility will be analyzed for toxicity characteristics and applicable LDR treatment standards. Initially, composite samples will be collected for each shipment of site-generated solids for off-site disposal. Once sufficient data are available to assess the variability of the solids waste streams, the frequency of analysis will be reduced according to statistical calculations presented in US EPA Guidance Document SW-846 for waste characterization purposes. The frequency of sampling the solid waste streams from the facility will be reviewed annually and adjusted as needed to remain consistent with the requirements of SW-846.

Additionally, Elcon will use generator knowledge as necessary to meet the additional waste analysis requirements for specific waste management methods, including organic content of the waste and the absence or presence of free liquids. Records of any such determination will be maintained at the facility.

9. QUALITY ASSURANCE/QUALITY CONTROL AND DATA REPORTING

A. Quality Assurance Program / Quality Control Procedures

The following quality assurance / quality control (QA/QC) information for this facility is being provided as required by 40 CFR 270.30(e). QA/QC procedures are necessary for both sampling and analytical techniques. This section does not provide specific QA/QC performance standards for individual sampling and analysis techniques. Such specifics are defined on a corporate-wide basis and will be revised as warranted to reflect technological advances in sampling and analytical techniques. (See Attachment 2 of this WAP for an example.)

Elcon staff who are responsible for waste sampling and waste analysis will be trained in the following:

- Sample strategy
- Sampling identification numbers and locations
- Preservation reagents and techniques, as appropriate
- Chain-of-custody procedures
- Types of sampling equipment and sample containers
- Analytical procedures
- Decontamination procedures
- Field and laboratory QC procedures
- Relevant health and safety concerns

Sampling procedures for specific facility operations are described in Section 7 of this WAP. The selection of the sample collection device depends on the type of sample, the sample container, and the sampling location. The selection and use of the sampling device is supervised by the Laboratory Manager, who is thoroughly familiar with both the sampling and analytical requirements.

Sampling equipment is constructed of non-reactive materials such as glass, PVC plastic, aluminum, or stainless steel. Care is taken in the selection of the same pier to prevent contamination of the sample and to ensure compatibility of materials.

Sampling is performed for each waste stream in a manner that ensures the samples are as representative as possible under the conditions of the sampling event. Full vertical sections are drawn from tanks and containers, where appropriate and where access allows, as described in Section 7.

With a few exceptions, all bulk and containerized waste loads will be sampled (see Section 3). Container samples that are related to one generator and waste profile may be composited prior to analysis, provided that individual samples are similar in physical

appearance. Precautions are taken to minimize loss of volatiles. Any deviations from the facility procedures will be documented accordingly.

Confirmatory analysis by an accredited off-site laboratory may be completed periodically to ensure that the on-site lab results are accurate. Any discrepancies between lab reports will be evaluated and documented.

B. Data Records Maintained

Elcon will conduct fingerprint analyses of incoming wastes to confirm that they are consistent with the approved waste profiles. Records of the analyses will be kept for a minimum of 3 years.

Elcon will conduct characterization analyses of residual solids derived from treatment of the received waste streams. Records of the analyses will be retained, along with notifications and certifications by the Elcon facility to the disposal facility for a minimum of 3 years.

All data will be evaluated for accuracy and precision by the Chemist/Laboratory Technician and the Laboratory Manager. If the data is determined to be unacceptable or invalid due to deviations from acceptable QA parameters or the lack of comparability to other data generated for similar analysis or if data indicates a non-compliance condition, the test procedures will be repeated to verify the results. All data, both valid and invalid, will be logged on a laboratory bench sheet that is retained for future reference. Acceptable and/or validated data will also be logged in the laboratory "Truck Waste Log Book" and/or on the laboratory computer data base for archiving. If the waste corresponds to a particular Hazardous Waste Manifest Number or other identification (i.e., Source or destination for bulk shipped wastes), this will also be noted on the "Truck Waste Log Book."

All laboratory bench sheets and truck logs will be kept in Elcon files for at least one year before they are moved into an extended storage facility. Some laboratory data will be stored on the laboratory computer database as part of the Elcon facility's computer network and will be maintained and archived by personnel on site.

10. RECORDKEEPING

Elcon will maintain records of all waste streams accepted for treatment at the facility. These records will include waste profiles, LDR notifications and certifications, and records of waste discrepancies. Forms indicating the Department approval of first time waste streams will be kept for a period of 3 years as required by 25 PA Code §264a.13.

11. CORRECTIVE AND PREVENTIVE ACTION

While the goal of the Elcon QA/QC program is to provide sufficient training, equipment, facilities, technical support, and supervisory oversight to avoid inadequate measurements or data, it is recognized that data quality can fall outside established limits for a variety of reasons. The program provides for reporting and reviewing procedures that permit early and effective corrective action should it be needed. Specifically:

- All samples will be registered and tracked electronically to ensure that the necessary analyses are performed.

- These systems will provide an opportunity for quick review of the data to see if the various results are internally consistent. Apparent discrepancies will brought to the attention of the Laboratory Manager or Plant Manager.

The Laboratory Manager or the Plant Manager will review completed data information on all samples prior to shipment receipt. This data will then be filed for future reference.

If problems are found, several corrective actions will be considered depending on the apparent source. These will include, but will not be limited to:

- Re-sampling
- Re-analysis of the sample
- Performance audit of the analyst
- Systems audit
- Inter laboratory comparison study
- Review of Standard Operating Procedure (SOP) for error or inadequacy.

12. ADDITIONAL REQUIREMENTS OF "SUBPART BB"

40 CFR Part 264, Subpart BB pertains to air emission standards for equipment leaks. Details on this portion of the rule are provided in Section N of this application. However, the WAP is required to include information on how Elcon will determine whether the equipment contains or contacts a hazardous waste with organic concentration that equals or exceeds 10 percent by weight. The following methods can be used to determine the organic content:

1. Methods described in ASTM Methods D 2267-88, E 169-87, E 168-88, E 260-85 (incorporated by reference under §260.11);

2. Method 9060A (incorporated by reference under 40 CFR 260.11) of "Test Methods for Evaluating Solid Waste," EPA Publication SW-846, for computing total organic concentration of the sample, or analyzed for its individual organic constituents; or

3. Application of the knowledge of the nature of the hazardous waste stream or the process by which it was produced. Documentation of a waste determination by knowledge is required. Examples of documentation that shall be used to support a determination under this provision include production process information documenting that no organic compounds are used, information that the waste is generated by a process that is identical to a process at the same or another facility that has previously been demonstrated by direct measurement to have a total organic content less than 10 percent, or prior speciation analysis results on the same waste stream where it can also be documented that no process changes have occurred since that analysis that could affect the waste total organic concentration.

Elcon proposes to use Item 3 above to determine the organic content of hazardous waste streams.

If Elcon determines that a piece of equipment contains or contacts a hazardous waste with organic concentrations at least 10 percent by weight, the determination can be revised only after following the procedures in Items 1 or 2 listed above.

If Elcon and the PADEP (or EPA) do not agree on whether a piece of equipment contains or contacts a hazardous waste with organic concentrations at least 10 percent by weight, the procedures in Items 1 or 2 of this section can be used to resolve the dispute.

Samples used in determining the percent organic content will be representative of the highest total organic content hazardous waste that is expected to be contained in or contact the equipment.

TABLES

TABLE 1
PART A SITE INFORMATION FORM ITEM 11.A.
HAZARDOUS WASTE CODES TO BE PROCESSED
ELCON, FALLS TOWNSHIP, PENNSYLVANIA

Code	Description
D001	Ignitable Waste
D002	Corrosive Waste
D004	Arsenic
D005	Barium
D006	Cadmium
D007	Chromium
D008	Lead
D009	Mercury
D010	Selenium
D011	Silver
D012	Endrin(1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimeth-ano-naphthalene)
D013	Lindane (1,2,3,4,5,6-hexachlorocyclohexane,gamma isomer)
D014	Methoxychlor (1,1,1-trichloro-2,2-bis [pmethoxyphenyl]ethane)
D015	Toxaphene (C10 H10 Cl8, Technicalchlorinated camphene, 67-69 percentchlorine)
D017	2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid)
D018	Benzene
D019	Carbon tetrachloride
D020	Chlordane
D021	Chlorobenzene
D022	Chloroform
D023	o-Cresol
D024	m-Cresol
D025	p-Cresol
D026	Cresol
D027	1,4-Dichlorobenzene
D028	1,2-Dichloroethane
D029	1,1-Dichloroethylene
D030	2,4-Dinitrotoluene
D031	Heptachlor (and its epoxide)
D032	Hexachlorobenzene
D033	Hexachlorobutadiene
D034	Hexachloroethane
D035	Methyl ethyl ketone
D036	Nitrobenzene
D037	Pentachlorophenol
D038	Pyridine
D039	Tetrachloroethylene
D040	Trichloroethylene
D041	2,4,5-Trichlorophenol

Code	Description
D042	2,4,6-Trichlorophenol
D043	Vinyl chloride
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F003	The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc, and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process. Wastewater treatment sludges from the manufacturing of motor vehicles using a zinc phosphating process will not be subject to this listing at the point of generation if the wastes are not placed outside on the land prior to shipment to a landfill for disposal and are either:

Code	Description
	disposed in a Subtitle D municipal or industrial landfill unit that is equipped with a single clay liner and is permitted, licensed or otherwise authorized by the state; or disposed in a landfill unit subject to, or otherwise meeting, the landfill requirements in §258.40, §264.301 or §265.301. For the purposes of this listing, motor vehicle manufacturing is defined in paragraph (b)(4)(i) of this section, and (b)(4)(ii) of this section describes the recordkeeping requirements for motor vehicle manufacturing facilities
F024	Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in §261.31 or §261.32.)
F032	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross-contaminated wastes that have had the F032 waste code deleted in accordance with §261.35 of this chapter or potentially cross-contaminated wastes that are otherwise currently regulated as hazardous wastes (i.e., F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol
F034	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol
F035	Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol
F037	Petroleum refinery primary oil/water/solids separation sludge—Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in §261.31(b)(2) (including sludges generated in one or

Code	Description
	more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing. This listing does include residuals generated from processing or recycling oil-bearing hazardous secondary materials excluded under §261.4(a)(12)(i), if those residuals are to be disposed of
F038	Petroleum refinery secondary (emulsified) oil/water/solids separation sludge—Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in §261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing
F039	Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part. (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and no other Hazardous Wastes retains its EPA Hazardous Waste Number(s): F020, F021, F022, F026, F027, and/or F028.)
K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments
K003	Wastewater treatment sludge from the production of molybdate orange pigments
K004	Wastewater treatment sludge from the production of zinc yellow pigments
K005	Wastewater treatment sludge from the production of chrome green pigments
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated)
K007	Wastewater treatment sludge from the production of iron blue pigments
K008	Oven residue from the production of chrome oxide green pigments
K009	Distillation bottoms from the production of acetaldehyde from ethylene
K010	Distillation side cuts from the production of acetaldehyde from ethylene
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile
K015	Still bottoms from the distillation of benzyl chloride
K016	Heavy ends or distillation residues from the production of carbon tetrachloride
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin
K018	Heavy ends from the fractionation column in ethyl chloride production
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production

Code	Description
K021	Aqueous spent antimony catalyst waste from fluoromethanes production
K022	Distillation bottom tars from the production of phenol/acetone from cumene
K023	Distillation light ends from the production of phthalic anhydride from naphthalene
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene
K026	Stripping still tails from the production of methy ethyl pyridines
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene
K031	By-product salts generated in the production of MSMA and cacodylic acid
K032	Wastewater treatment sludge from the production of chlordane
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane
K035	Wastewater treatment sludges generated in the production of creosote
K037	Wastewater treatment sludges from the production of disulfoton
K038	Wastewater from the washing and stripping of phorate production
K040	Wastewater treatment sludge from the production of phorate
K041	Wastewater treatment sludge from the production of toxaphene
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds
K048	Dissolved air flotation (DAF) float from the petroleum refining industry
K049	Slop oil emulsion solids from the petroleum refining industry
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry
K051	API separator sludge from the petroleum refining industry
K052	Tank bottoms (leaded) from the petroleum refining industry
K062	Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332)
K071	Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used
K083	Distillation bottoms from aniline production
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes
K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene
K095	Distillation bottoms from the production of 1,1,1-trichloroethane
K096	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane

Code	Description
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane, Chlordane, heptachlor.
K098	Untreated process wastewater from the production of toxaphene, Toxaphene.
K099	Untreated wastewater from the production of 2,4-D, 2,4-dichlorophenol, 2,4,6-trichlorophenol.
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds
K103	Process residues from aniline extraction from the production of aniline
K104	Combined wastewater streams generated from nitrobenzene/aniline production
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes
K106	Wastewater treatment sludge from the mercury cell process in chlorine production
K107	Column bottoms from product separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides
K108	Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides
K110	Condensed column overheads from intermediate separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides
K111	Product washwaters from the production of dinitrotoluene via nitration of toluene
K112	Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene
K113	Condensed liquid light ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene
K115	Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene
K116	Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine
K117	Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene
K123	Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salt, Ethylene thiourea.
K124	Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts, Ethylene thiourea.
K131	Wastewater from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide, Dimethyl sulfate, methyl bromide.
K143	Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke by-products produced from coal
K144	Wastewater sump residues from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke by-products produced from coal
K148	Residues from coal tar distillation, including but not limited to, still bottoms

Code	Description
K151	Wastewater treatment sludges, excluding neutralization and biological sludges, generated during the treatment of wastewaters from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups
K157	Wastewaters (including scrubber waters, condenser waters, washwaters, and separation waters) from the production of carbamates and carbamoyl oximes. (This listing does not apply to wastes generated from the manufacture of 3-iodo-2-propynyl n-butylcarbamate.)
K159	Organics from the treatment of thiocarbamate wastes
K169	Crude oil storage tank sediment from petroleum refining operations
K170	Clarified slurry oil tank sediment and/or in-line filter/separation solids from petroleum refining operations
K175	Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process
K178	Residues from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process
K181	Nonwastewaters from the production of dyes and/or pigments (including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of any of the constituents identified in paragraph (c) of this section that are equal to or greater than the corresponding paragraph (c) levels, as determined on a calendar year basis. These wastes will not be hazardous if the nonwastewaters are: (i) disposed in a Subtitle D landfill unit subject to the design criteria in §258.40, (ii) disposed in a Subtitle C landfill unit subject to either §264.301 or §265.301, (iii) disposed in other Subtitle D landfill units that meet the design criteria in §258.40, §264.301, or §265.301, or (iv) treated in a combustion unit that is permitted under Subtitle C, or an onsite combustion unit that is permitted under the Clean Air Act. For the purposes of this listing, dyes and/or pigments production is defined in paragraph (b)(1) of this section. Paragraph (d) of this section describes the process for demonstrating that a facility's nonwastewaters are not K181. This listing does not apply to wastes that are otherwise identified as hazardous under §§261.21-261.24 and 261.31-261.33 at the point of generation. Also, the listing does not apply to wastes generated before any annual mass loading limit is met
U001	Acetaldehyde (I), Ethanal (I)
U002	Acetone (I), 2-Propanone (I)
U003	Acetonitrile (I,T)
U004	Acetophenone, Ethanone, 1-phenyl-
U007	Acrylamide, 2-Propenamide
U008	Acrylic acid (I), 2-Propenoic acid (I)
U012	Aniline (I,T), Benzenamine (I,T)
U025	Dichloroethyl ether, Ethane, 1,1′-oxybis[2-chloro-
U031	1-Butanol (I), n-Butyl alcohol (I)
U032	Calcium chromate, Chromic acid H_2CrO_4, calcium salt
U037	Benzene, chloro-, Chlorobenzene

Code	Description
U038	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester, Chlorobenzilate
U043	Ethene, chloro-, Vinyl chloride
U044	Chloroform, Methane, trichloro-
U045	Methane, chloro- (I, T), Methyl chloride (I,T)
U048	o-Chlorophenol, Phenol, 2-chloro-
U052	Cresol (Cresylic acid), Phenol, methyl-
U066	1,2-Dibromo-3-chloropropane, Propane, 1,2-dibromo-3-chloro-
U067	Ethane, 1,2-dibromo-
U067	Ethylene dibromide
U068	Methane, dibromo-
U068	Methylene bromide
U070	Benzene, 1,2-dichloro
U070	o-Dichlorobenzene
U071	Benzene, 1,3-dichloro-
U071	m-Dichlorobenzene
U072	Benzene, 1,4-dichloro-
U072	p-Dichlorobenzene
U077	Ethane, 1,2-dichloro-, Ethylene dichloride
U080	Methane, dichloro-, Methylene chloride
U082	2,6-Dichlorophenol
U082	Phenol, 2,6-dichloro-
U083	Propylene dichloride
U083	Propane, 1,2-dichloro-
U092	Dimethylamine (I), Methanamine, N-methyl- (I)
U098	1,1-Dimethylhydrazine, Hydrazine, 1,1-dimethyl-
U099	1,2-Dimethylhydrazine, Hydrazine, 1,2-dimethyl-
U101	2,4-Dimethylphenol, Phenol, 2,4-dimethyl-
U103	Dimethyl sulfate, Sulfuric acid, dimethyl ester
U108	1,4-Diethyleneoxide, 1,4-Dioxane
U111	Di-n-propylnitrosamine, 1-Propanamine, N-nitroso-N-propyl-
U112	Acetic acid ethyl ester (I), Ethyl acetate (I)
U113	Ethyl acrylate (I), 2-Propenoic acid, ethyl ester (I)
U116	Ethylenethiourea
U116	2-Imidazolidinethione
U117	Ethane, 1,1′-oxybis-(I), Ethyl ether (I)
U118	2-Propenoic acid, 2-methyl-, ethyl ester
U118	Ethyl methacrylate
U122	Formaldehyde
U123	Formic acid (C,T)
U134	Hydrofluoric acid (C,T), Hydrogen fluoride (C,T)
U135	Hydrogen sulfide, Hydrogen sulfide H_2 S
U140	Isobutyl alcohol (I,T), 1-Propanol, 2-methyl- (I,T)

Code	Description
U144	Acetic acid, lead(2+) salt, Lead acetate
U145	Lead phosphate, Phosphoric acid, lead(2+) salt (2:3)
U152	Methacrylonitrile, 2-Propenenitrile, 2-methyl- (I,T)
U153	Methanethiol (I, T), Thiomethanol (I,T)
U154	Methanol (I), Methyl alcohol (I)
U155	1,2-Ethanediamine, N,N-dimethyl-N′-2-pyridinyl-N′-(2-thienylmethyl)-, Methapyrilene
U159	2-Butanone (I,T), Methyl ethyl ketone (MEK) (I,T)
U161	Methyl isobutyl ketone (I), 4-Methyl-2-pentanone (I), Pentanol, 4-methyl-
U162	Methyl methacrylate (I,T), 2-Propenoic acid, 2-methyl-, methyl ester (I,T)
U173	Ethanol, 2,2′-(nitrosoimino)bis-, N-Nitrosodiethanolamine
U174	Ethanamine, N-ethyl-N-nitroso-, N-Nitrosodiethylamine
U176	N-Nitroso-N-ethylurea, Urea, N-ethyl-N-nitroso-
U182	Paraldehyde, 1,3,5-Trioxane, 2,4,6-trimethyl-
U183	Benzene, pentachloro-, Pentachlorobenzene
U184	Ethane, pentachloro-, Pentachloroethane
U185	Benzene, pentachloronitro-, Pentachloronitrobenzene (PCNB)
U188	Phenol
U191	2-Picoline, Pyridine, 2-methyl-
U194	1-Propanamine (I,T), n-Propylamine (I,T)
U196	Pyridine
U204	Selenious acid, Selenium dioxide
U209	Ethane, 1,1,2,2-tetrachloro-
U210	Ethene, tetrachloro-
U210	Tetrachloroethylene
U211	Carbon tetrachloride
U211	Methane, tetrachloro-
U214	Acetic acid, thallium(1+) salt, Thallium(I) acetate
U216	Thallium(I) chloride
U216	Thallium chloride TlCl
U217	Nitric acid, thallium (1+) salt
U217	Thallium(I) nitrate
U220	Toluene
U226	Ethane, 1,1,1-trichloro-, Methyl chloroform, 1,1,1-Trichloroethane
U227	Ethane, 1,1,2-trichloro-, 1,1,2-Trichloroethane
U228	Ethene, trichloro-, Trichloroethylene
U235	1-Propanol, 2,3-dibromo-, phosphate (3:1), Tris(2,3-dibromopropyl) phosphate
U238	Carbamic acid, ethyl ester, Ethyl carbamate (urethane)
U239	Benzene, dimethyl- (I), Xylene (I)
U240	Acetic acid, (2,4-dichlorophenoxy)-, salts & esters, 2,4-D, salts & esters
U249	Zinc phosphide $Zn_3 P_2$, when present at concentrations of 10% or less
U359	Ethanol, 2-ethoxy-, Ethylene glycol monoethyl ether

Code	Description
U395	Diethylene glycol, dicarbamate, Ethanol, 2,2′-oxybis-, dicarbamate.
U404	Ethanamine, N,N-diethyl-, Triethylamine.

TABLE 2
PART A SITE INFORMATION FORM ITEM 11.B.
WASTE CODES FOR STATE-REGULATED RESIDUAL WASTES
ELCON, FALLS TOWNSHIP, PENNSYLVANIA

Code[1]	Description
111	Lubricating Soaps
201	Water Treatment Plant Sludge/Sediment
203	Industrial Wastewater Treatment Sludge/Sediment Including Acid Mine Drainage Sludge
204	Metallurgical Sludge
205	Food Processing Sludge
206	Paint, Coating Sludge and Scale
207	Tank Bottoms
208	Still Bottoms
209	Oily Sludge, Petroleum Derived
213	Lime-Stabilized Spent Pickle Liquor
214	Cooling Tower Sediment/Sludge
301	Acidic Chemicals (pH<6)
302	Basic Chemicals (pH>8)
303	Combustible Chemicals, Non-Haz
304	Chemical Salts
308	Spent Dyes
310	Detergents, Cleaning Agents
311	Off-Spec Products, Intermediates
312	Pharmaceutical, Biological (Mfg and Lab Wastes)
313	Wax, Paraffin
314	Alcohols (Non-Haz)
315	Solvents (Non-Aqueous, Non-Haz)
316	Solvents (Aqueous, Non-Haz)
317	Glycols/Antifreeze, Machine Coolants
318	Photographic Chemicals (Non-Haz)
320	Spent Plating Baths (Non-Haz)
399	Other Chemical Wastes
401	Leather Wastes
411	Agricultural Wastes (Fertilizers, Pesticides, Feed, Feed Supplements)
420	Process Wastewaters (Non-Haz)
421	Contaminated Non-Contact Cooling Waters
422	Oil/Water Emulsions, Oily Wastewaters
423	Landfill Leachate
430	Food Wastes (Excluding Wastewater Treatment Sludge)
440	Resins
503	Oil Containing Waste (absorbent, rags)
504	Paints (Liquid)
509	Waste Oil That is Not Hazardous Waste Oil (automotive, machining, cutting, etc.)

Code[1]	Description
801	Non-oil and Gas Well Drilling Waste -includes drilling fluids, residuals, and drill cuttings from monitoring well and drinking water well construction
802[2]	Produced Fluid – includes flow-back[2], brine and any other formation fluids recovered from the wellbore. Flow-back is defined as fracturing/stimulation fluids, including fracturing sand recovered from the wellbore after injection into the wellbore.
803	Drilling Fluid Waste – oil and gas drilling mud, other drilling fluids other than fracturing fluid and spent lubricant.
804	Wastewater Treatment Sludge – sludge generated during the processing of any oil and gas-related wastewater including any sediment generated during storage of oil and gas-related wastewater. Mixed loads of wastewater treatment sludge with other waste for disposal purposes, such as filter socks (RWC 812), will be coded as RWC 804.
808	Servicing Fluid – oil and gas production well maintenance/work over fluids, oil/water-based mud and foam and well cellar cleanout waste after drilling operations have been completed. Does not include well cellular cleanout waste covered under existing RWCs, well cellular fluids that are recycled/reused, or rainwater that is collected in a well cellular that has not been mixed with a residual waste.
809	Spent Lubricant Waste (spent oil and gas drilling lubricants, spent plug drilling lubricants)
899	Other Oil and Gas Wastes – all remaining oil and gas wastes other than those already covered under existing RWCs. Includes containment water. Does not include rainwater that is collected in a containment area that has not been mixed with residual waste.
902	Non-Hazardous Residue from Treatment of Hazardous Waste (other than 203)
999	Other

[1] Residual Waste Codes are from 2540-PM-BWM0404, revised May 2016. The Department appears to be updating this list again but final is not yet available. Elcon is proposing to accept non-fracking drilling fluids.

[2] Elcon will not accept flowback wastes as this is related to fracking. Elcon will accept brine and other formation liquids generated by non-fracking drilling methods.

Note

Elcon will not accept liquid waste related to fracking. Pennsylvania Residual Waste Code 805, Unused Fracturing Fluid Waste (oil and gas fracturing/stimulation fluid waste and fracturing sand waste that has not been injected into a wellbore), has not been included in the list above.

TABLE 3
PARAMETERS AND RATIONALE FOR GENERAL FINGERPRINT ANALYSIS
ELCON, FALLS TOWNSHIP, PENNSYLVANIA

Parameter	Rationale	Use
pH	Fingerprint and proper management	All incoming wastewaters
Conductivity	Fingerprint and proper management	All incoming wastewaters
Total Solids	Fingerprint and proper management	Initially, each waste stream from customer; ultimately reduce to once per month per customer waste stream
Total Dissolved Solids	Fingerprint and proper management	All incoming wastewaters
Karl Fisher – non water content	Fingerprint and proper management	Weekly per customer per waste stream
Total Organic Carbon	Fingerprint and proper management	Weekly per customer per waste stream
Normality	Fingerprint and proper management	All incoming wastewaters
Loss on Drying at 105 °C	To determine water content	Twice a month per customer per waste stream
Loss on Drying at 550 °C	To determine water content	Twice a month per customer per waste stream
Ammonia	Fingerprint and proper management	Once a month per customer for ammonia-containing waste streams
Metals	Fingerprint and proper management	Once per month per customer waste stream
GC for halogenated VOC and non-halogenated VOCs[1]	Fingerprint and proper management	Once per month per customer waste stream

[1] Full scan for compounds in the GC library will be conducted.

TABLE 4
TEST METHODS FOR GENERAL FINGERPRINT ANALYSIS
ELCON, FALLS TOWNSHIP, PENNSYLVANIA

Test	Analysis Method
pH	SW-846 9040C
Conductivity	SW-846 9050A
Total Solids	EPA 1684 or similar
Total Dissolved Solids	EPA 160.1
Karl Fisher – Non water content	SW-846 9000
Total Organic Carbon	SW-846 9060A
Normality	EPA 310.1; Standard Methods 2310B(4a)
Loss on Drying at 105 °C	ASTM-E1868-10
Loss on Drying at 550 °C	ASTM-E1868-10
Ammonia	EPA 350.2 or ASTM-D1476-08
Metals	SW-846 6010C
Non-halogenated VOCs	SW-846 8015C
Halogenated VOCs	SW-846 8021B

FIGURES

FIGURE 1
WASTE RECEIVING PROCEDURE
ELCON, FAIRLESS HILLS, PENNSYLVANIA

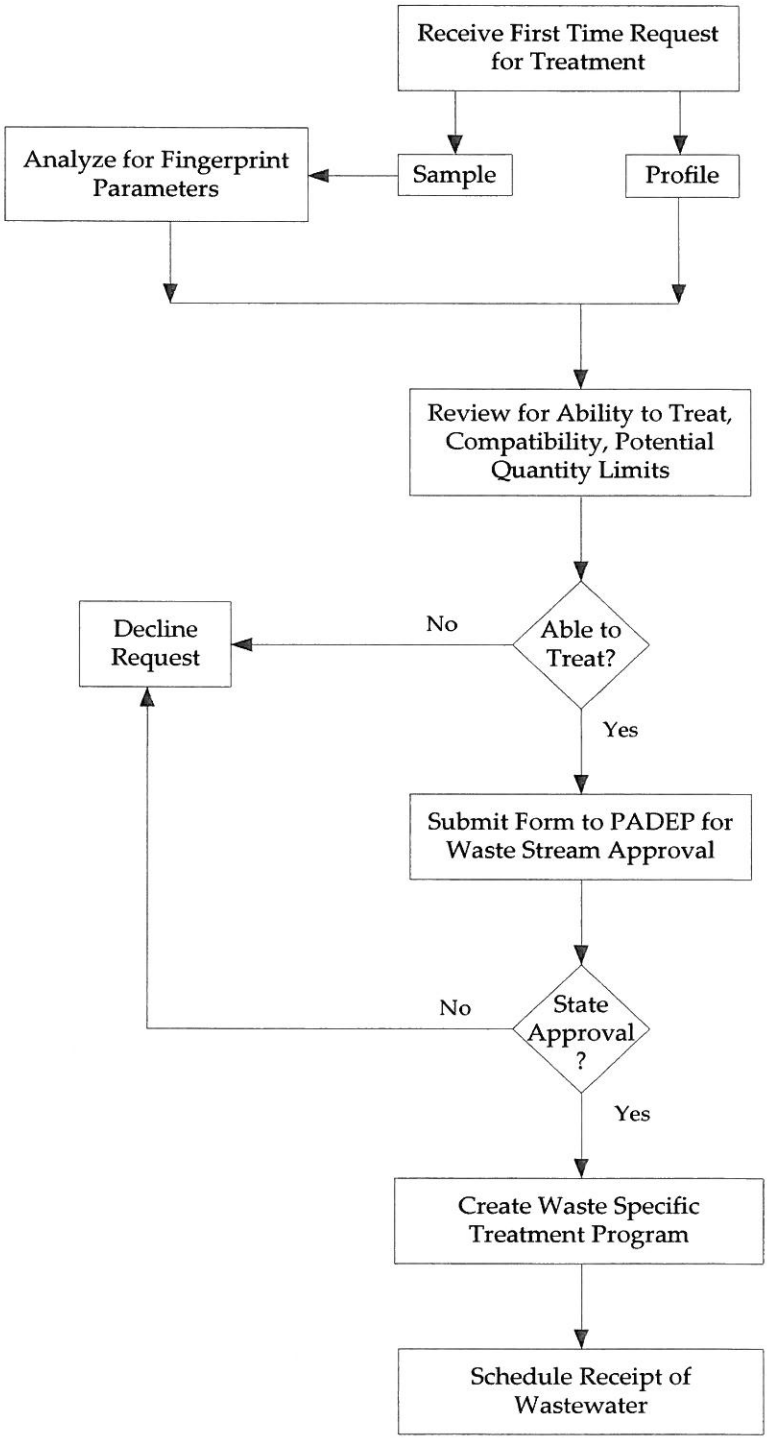
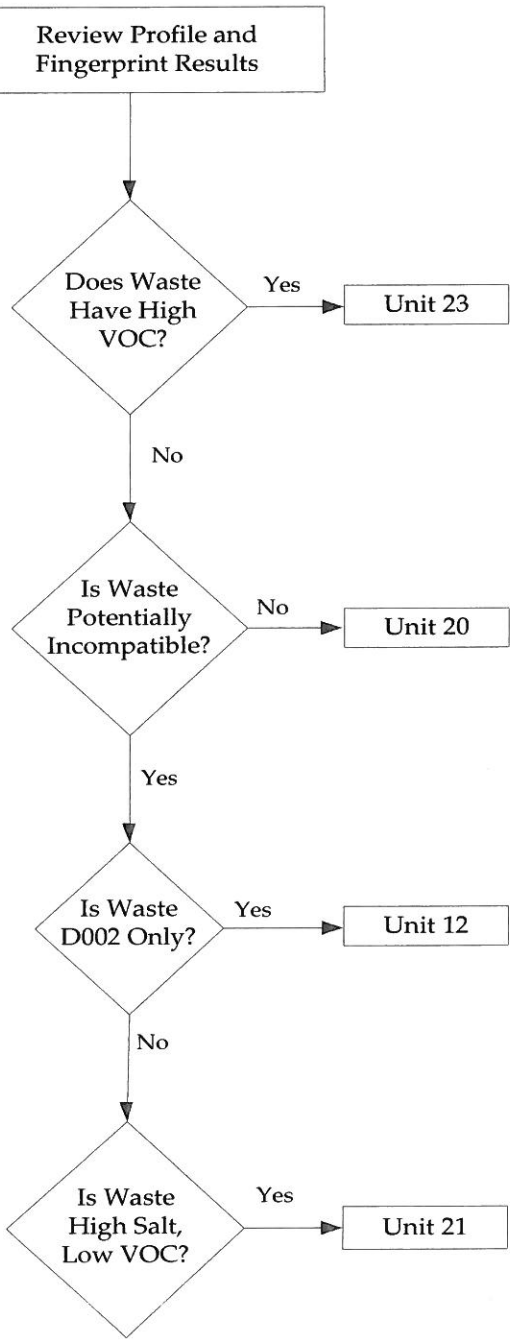


FIGURE 2
GENERALIZED WASTE TREATMENT PROGRAM
ELCON, FAIRLESS HILLS, PENNSYLVANIA



ATTACHMENT 1
DETAILED FACILITY DESCRIPTION

Proposed KIPC, Morrisville, Pa. Plant Process Description

General

Capacity: Nominal 175,000 metric tons/year (Units 20, 21, and 23 have a nominal 150,000 metric tons/year capacity, and Unit 12 has a nominal 25,000 metric tons/year capacity) of industrial RCRA Listed and Characteristic Wastewater from various sources

Daily capacity: Nominal 410 metric tons/day average flow

Mode of operations: 24 hours/day, 7 days/week

Technology: The technology used for Units 20, 21, and 23 include physical-chemical separation, thermal oxidation, thermal distillation of volatile organic compounds (VOCs), evaporation and salt crystallization. The technology used for Unit 12 includes physical-chemical separation.

Organics extraction: Flash Evaporation Distillation technology (FED)

Total plant area: 100,000 ft^2

Total area: 300,000 ft^2

Water discharge: Zero Liquid Discharge

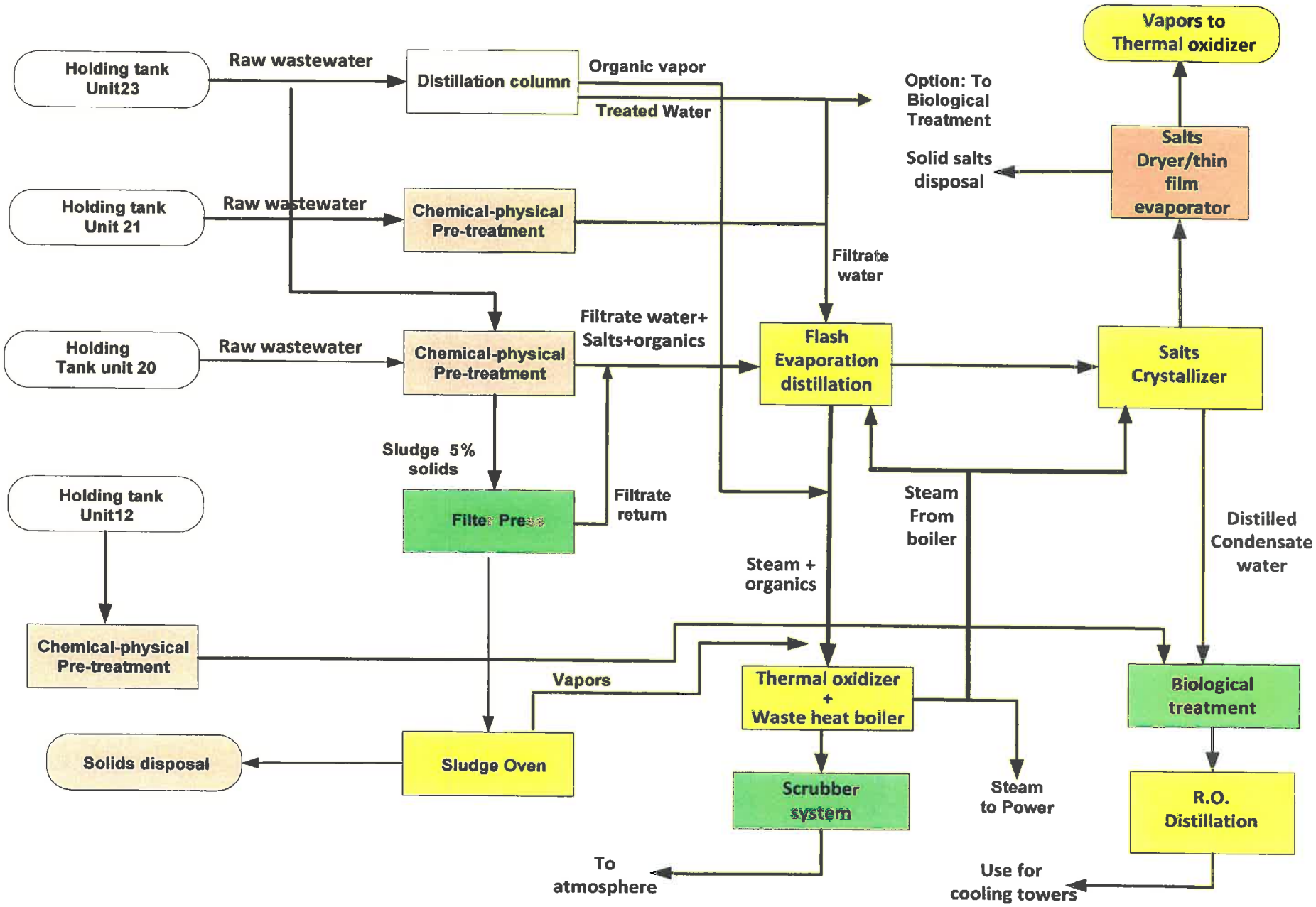
Number of employees: approximately 55

Control: Single control room for the plant. All is automatically controlled.

Process steps: 8

Process Summary

- Facility receives Resource Conservation and Recovery Act (RCRA) listed and characteristic wastewater in tanks from trucks.
- Wastewater is stored and treated in various tanks and reactors.
- Sludge and salt is removed from the wastewater and dried.
- The dried sludge and salt are treated to remove VOCs for recycling.
- The VOCs in the wastewater are extracted.
- The VOCs in gaseous form from the FED are vented from different areas throughout the plant and are then sent to the thermal oxidizer to be oxidized. The energy is recycled into the process.


Holding tank Unit23
Raw wastewater
Distillation column
Organic vapor
Treated Water
Option: To Biological Treatment
Vapors to Thermal oxidizer
Solid salts disposal
Salts Dryer/thin film evaporator
Holding tank Unit 21
Raw wastewater
Chemical-physical Pre-treatment
Filtrate water
Holding Tank unit 20
Raw wastewater
Chemical-physical Pre-treatment
Filtrate water+ Salts+organics
Flash Evaporation distillation
Salts Crystallizer
Sludge 5% solids
Holding tank Unit12
Filter Press
Filtrate return
Steam From boiler
Distilled Condensate water
Steam + organics
Chemical-physical Pre-treatment
Vapors
Thermal oxidizer + Waste heat boiler
Biological treatment
Solids disposal
Sludge Oven
Scrubber system
Steam to Power
R.O. Distillation
To atmosphere
Use for cooling towers

Summary of the Regulatory Approach

- All RCRA listed and characteristic wastewater stored and/or treated will require a RCRA Permit, subject to 40 CFR270.
- All salts and sludges will be derived from the listed hazardous wastewater and will, therefore, be considered hazardous. All storage, treatment, and drying of these salts and sludges will require a RCRA Permit unless or until they are delisted.
- Wastewater from various parts of the process will "contain" hazardous waste and must be managed as hazardous waste until "contained-out".
- All VOC emissions extracted from the wastewater will be in gaseous form and treated by a thermal oxidizer.
- All VOC emissions obtained from the drying of the salts, sludges, and other parts of the process, will be in gaseous form and treated by a thermal oxidizer.
- Since the VOCs treated by the Thermal Oxidizer will not be solids, liquids, or contained gases, they are not solid or hazardous waste and not subject to RCRA.
- Emissions from the thermal oxidizer will be subject to applicable air permitting requirements. "Best Available Technology" requires 98% destruction of VOCs.

Step 1 – Receiving Tanks

The plant will receive industrial wastewater deliveries, some with high organic concentrations and/or acids, from tanker trucks 24 hours/day, 7 days/week. The unloading station will be in a contained area and the wastewater will be piped from the trucks to onsite storage tanks. These tanks will be closed and vented to the thermal oxidizer and then scrubbed to regulate air emissions. Separate storage tanks will be onsite for the varying types of incoming wastewater. The site will contain RCRA-regulated hazardous waste storage tanks and tanks that contain fresh acid and alkaline. The tanks will:

- Contain the raw wastewater from the various clients
- Contain acid and alkaline waste, used as a hydrological buffer for the process
- Be located within secondary containment areas

The contents and nominal capacities of the tanks are:

- 10 acid waste tanks, approximately 184,800 gallons total capacity
- 1 alkaline waste tank, approximately 11,000 gallons total capacity
- 4 flammable waste tanks, approximately 52,900 gallons total capacity
- 10 aqueous waste tanks, approximately 1,360,000 gallons total capacity
- 1 fresh caustic tank, approximately 11,000 gallons total capacity

Step 2 – Unit 20 (Main Unit) Chemical-Physical Treatment

Incoming wastewater will be sent to three separate but similar treatment units, depending on characteristics of the wastewater. Unit 20 is the main wastewater treatment unit. This unit contains continuous reactors and settling tanks. Reagents are added to the reactors to facilitate neutralization and the settling of solids at a rate of approximately 5,300 gallons/hour.

Function:

- Acid and base neutralization
- Flocculent and coagulant addition
- Dissolved metals precipitation and separation
- Suspended solids separation and filtration

Process description:

a. First RCRA Treatment Tank: pH control and coagulation

The pH of the wastewater in the first reactor is adjusted to 9-10. The addition of acid or caustic soda is computer controlled. Then, coagulation material is added in the form of ferric chloride or ferric sulfate. The pH is also maintained at 9-10 as necessary, by addition of bases. The capacity of this system is 20 tons/hour.

b. Second RCRA Treatment Tank: flocculation

Polymeric flocculation material is added in the second reactor. The flocculation material acts as a binder to capture small particles formed by the previous process of coagulation. Once the particles form, they are difficult to capture since they are too small. The polymeric flocculent is a long chain of polymer material that captures the small particles to form much larger particles that are easier to filter. The capacity of this system is 20 tons/hour.

c. Third RCRA Treatment Tanks: settling in two phases

Water and particles are gravity separated into two phases in the settling tanks. In the lower phase the large, heavy particles formed through coagulation and flocculation settle to the bottom of the tank to form sludge. The water in the upper phase is clear of suspended matter. The two types of contaminants that remain in the wastewater after this phase separation are:

- Soluble organic matter, like solvents, and
- Soluble inorganic matter, like salts.

The clear water phase will be sent to a holding tank to be sent to the Flash Evaporator Distillation (FED) holding tank.

Sludge phase – 7% dry matter then goes to the 3,000-gallon sludge treating reactors.

The tanks in this area are to be vented to a thermal oxidizer and then scrubber.

Step 2 – Unit 21 Chemical-Physical Treatment

This unit receives wastewater that contains salts and no VOCs. This unit contains batch reactors for neutralization and flocculation. Reagents are added to the reactors to facilitate neutralization and the settling of solids. After neutralization, the solids are removed by using a filter press. The treated wastewater contains only dissolved salts and is then sent to the FED (Flash Evaporation Distillation). The tanks are to be vented to a thermal oxidizer and then scrubber. Capacity of this system is approximately 3 tons/hour.

Step 2 – Unit 12 Chemical-Physical Treatment

This unit receives wastewater with a high acid content but does not contain VOCs or salts. The unit treats acid in several concentrations. This unit contains batch reactors for neutralization. Reagents and lime (pH ~9-10) is added to the reactors to facilitate neutralization and the settling of solids. After neutralization, the solids are removed by using a filter press or centrifuge. The waste acid does not contain any VOCs or salts so the resultant sludge is not hazardous. The tanks are to be vented to a thermal oxidizer and then scrubber.

Step 3 – Sludge Processing

a. Sludge Filtration and Dewatering

The sludge in the holding tank is RCRA hazardous pursuant to the "derived from rule". The sludge is filtered in a filter press to remove the water so the remaining solid sludge contains about 30% dry matter. The filtrate water from the filter press flows to the clear water holding tank and is sent to the FED holding tank to be further treated. From the filter press the dry sludge falls into a closed hopper that directs the sludge to the next process, the sludge dryer oven. Hoods shall be located over the sludge dewatering and drying area to vent all emissions to the thermal oxidizer and scrubber. The capacity of this process is 1 ton/hour of wet cake, 30% solids.

b. Sludge Dryer

The sludge dryer heat treatment oven is a completely closed process unit. The drying process is accomplished using a rotary dryer. The process is continuous and

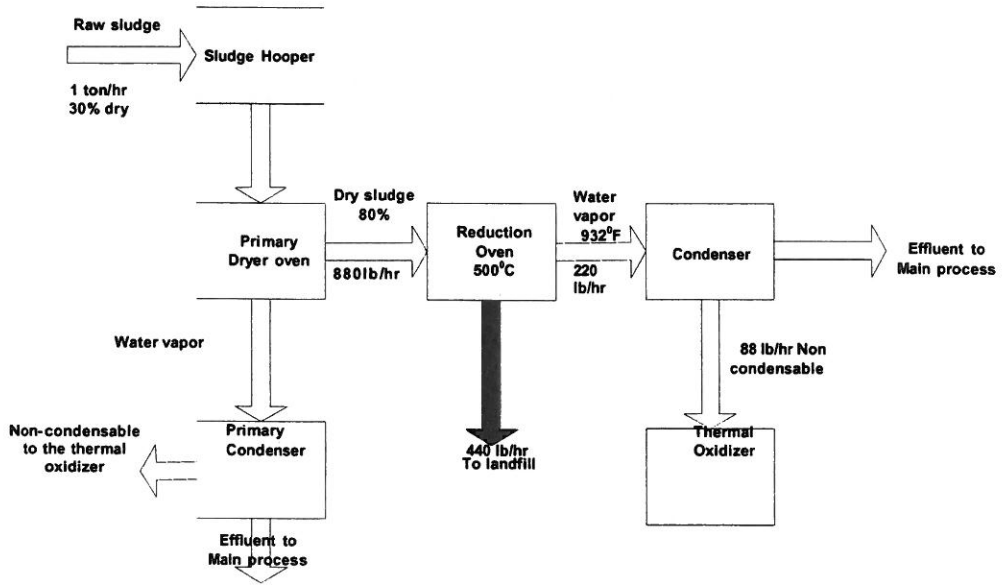
the sludge retention time and the temperature dictate the final moisture content of the product. The water from the sludge is vaporized. The emissions from the rotary oven contain particulate matter, which is removed by a cyclone. Downstream of the cyclone, the emissions are vented through the thermal oxidizer, and then a scrubber. The water which has been condensed flows back to the water holding tank where it is recycled to be treated in the plant.

The dry sludge then contains 70-85% dry matter and is ready for the next and final process of thermal treatment, where any remaining organics in the sludge are removed. The capacity of this section is approximately 1 ton/hour of wet cake, 30% solids at the inlet to the dryer, 880 lbs/hr of dry sludge (75% solids) at the outlet of the dryer.

c. Sludge Thermal Treatment

The sludge contains mainly oxides and other materials that need further treatment to separate the organic materials in the sludge. In the thermal process, the sludge is heated by a thermal screw to 550 °C (1,022 °F). As a result, all the residual organics are removed in gaseous form. The dried sludge will be collected in a closed silo. The RCRA hazardous sludge can then be transported and appropriately disposed or delisted. The dried sludge will still be hazardous pursuant to the "derived from rule". The organic vapor phase flows into a thermal oxidizer, where the organics are treated and the energy is captured and re-used. A bag filter will be located in the treatment area to collect any dust distribution in the air.

Schematic process diagram for the entire sludge process



Note: The projected flow rates, above, are approximate values

Step 4 – Unit 20 Flash Evaporation Distillation

The water, after settling and filtration, flows to the holding tank for the next process (FED holding tank). The water flows into the Flash Evaporation Distillation (FED) process to remove the entire organic load from the water by using steam as the organics extraction agent in the FED). The FED is comprised of an evaporator and flash chamber in which the wastewater is circulated. The wastewater enters the evaporator and is superheated with steam coming from the waste heat boiler to about 112 °C (233.6 °F). When the wastewater exits the evaporator and enters the flash chamber, the wastewater boils spontaneously (flashing), and the resultant steam which contains all the organics from the wastewater is pumped out of the flash chamber into the thermal oxidizer.

The FED combines complete organics extraction with distillation to achieve total organics destruction with evaporation distillation.

The FED is designed for 22 tons/hour with 100,000 COD and 4% total dissolved solids (TDS).

The FED conditions are important in order to achieve best performance, so all conditions are highly controlled: pH, steam flow, temperature, steam pressure, water temperature, circulation ratio, etc. The steam with the gaseous volatile organics rises from the top of the FED unit, and the VOC and steam mixture are sent to the thermal oxidizer.

The treatment of the VOCs is subject to Air Permitting, rather than RCRA, since the gaseous VOCs are neither solid nor liquid and therefore, not a hazardous waste. The water from the bottom of the FED unit flows into a holding tank, which acts as the hydraulic buffer between the FED process and the next process. Although still RCRA hazardous, the contaminants now left in the water are primarily the dissolved salts which must be distilled in order for the process to be complete and the water can be released. The wastewater is then biologically treated at a rate of 4 tons/hour.

Step 4 – Unit 23 Distillation

In case there is not enough VOCs in the main unit (Unit 20), it is possible to treat high concentrated organic waste (10-30% VOCs). The organic waste is distilled in a dedicated distillation column or in an evaporating vessel. The concentrated VOCs (about 70-80% VOCs) are then sent in a gaseous phase to the thermal oxidizer to be treated. The water is sent to the FED for further treatment along with the main unit's wastewater. The capacity of this system is approximately 10,000 tons/year.

Step 5 – Thermal Oxidation

In the proposed Elcon Recycling Facility, the thermal oxidizer is the main process to achieve destruction of the gaseous organics that were extracted from the wastewater in the FED unit.

The thermal oxidizer is regulated under the Air Program and operates at a minimum of 1,800 °F (approximately 1,000 °C). It is expected that at that temperature, 99.9% of the organics will be oxidized. The process is continuous and steady state.

The heat of combustion of the organics in the thermal oxidizer is captured using the waste heat boiler to generate steam. This steam is re-used in the FED unit for the next cycle. This technology allows for the process to be energy neutral when the feed wastewater contains more than 3% organics, which is expected for this facility.

All of the organic emission sources in the facility will be vented though the thermal oxidizer and then to a scrubber, before being vented to the atmosphere. The majority of the VOC emissions from the plant will be from the FED and distillation column. When the FED and thermal oxidizer are shut down due to process issues, the storage tanks and other vessels that emit negligible amounts VOCs shall be vented to a carbon filter.

The thermal oxidizer is designed for maximum of 1400 °C (2,552 °F) and will generate about 48 MM BTU/hr of energy that will be used for steam production. In the thermal oxidizer, the VOCs are oxidized to CO_2 and H_2O. The waste heat boiler is at the exit of the thermal oxidizer and will produce steam, which is then transmitted to the entire plant, where the steam is used in the FED process unit.

After passing through the waste heat boiler, the hot gases are cooled to 300 °C (572 °F) and flow through an air-air heat exchanger, which uses the residual heat in the hot air to heat up the incoming fresh air to the thermal oxidizer. This maximizes the recycling of the BTUs in the VOCs and minimizes external energy consumption. The flue gases shall be treated with urea for NOx reduction, when necessary, and then in a NaOH solution scrubber to treat any halogens at the outlet. The clean flue gases shall be vented to the atmosphere through a stack.

Step 6 – Water Distillation – Flash Evaporation Distillation (FED)

The separation distillation process is carried out using Flash Evaporation Distillation (FED) technology. The FED evaporation process combines distillation with evaporation and the organics extraction into the thermal oxidizer. It is more reliable than membrane reverse osmosis (RO), which frequently has plugging problems. The brine (salts) concentration can be approximately 25% TDS. This means that the FED process can deliver a concentration ratio of 1:5 when the incoming wastewater concentration is about 5% TDS.

In the FED process 60%-70% of the wastewater evaporates through the thermal oxidizer with the organic materials (the VOC) and passing through the scrubber.

The remaining 30%-40% of the wastewater which is now concentrated with salts is directed to a holding tank prior to the salt crystallization and drying process.

The thermal distillation has a nominal capacity of 22 tons/hour of wastewater. The concentrated brine at 15%-25% TDS, derived from hazardous waste after the FED process, flows to a holding tank from which it flows to crystallization, the next process.

Step 7 – Brine (Salts) Crystallization

The concentrated brine flows from the previous process (FED) to the brine holding tank where it is held for crystallization.

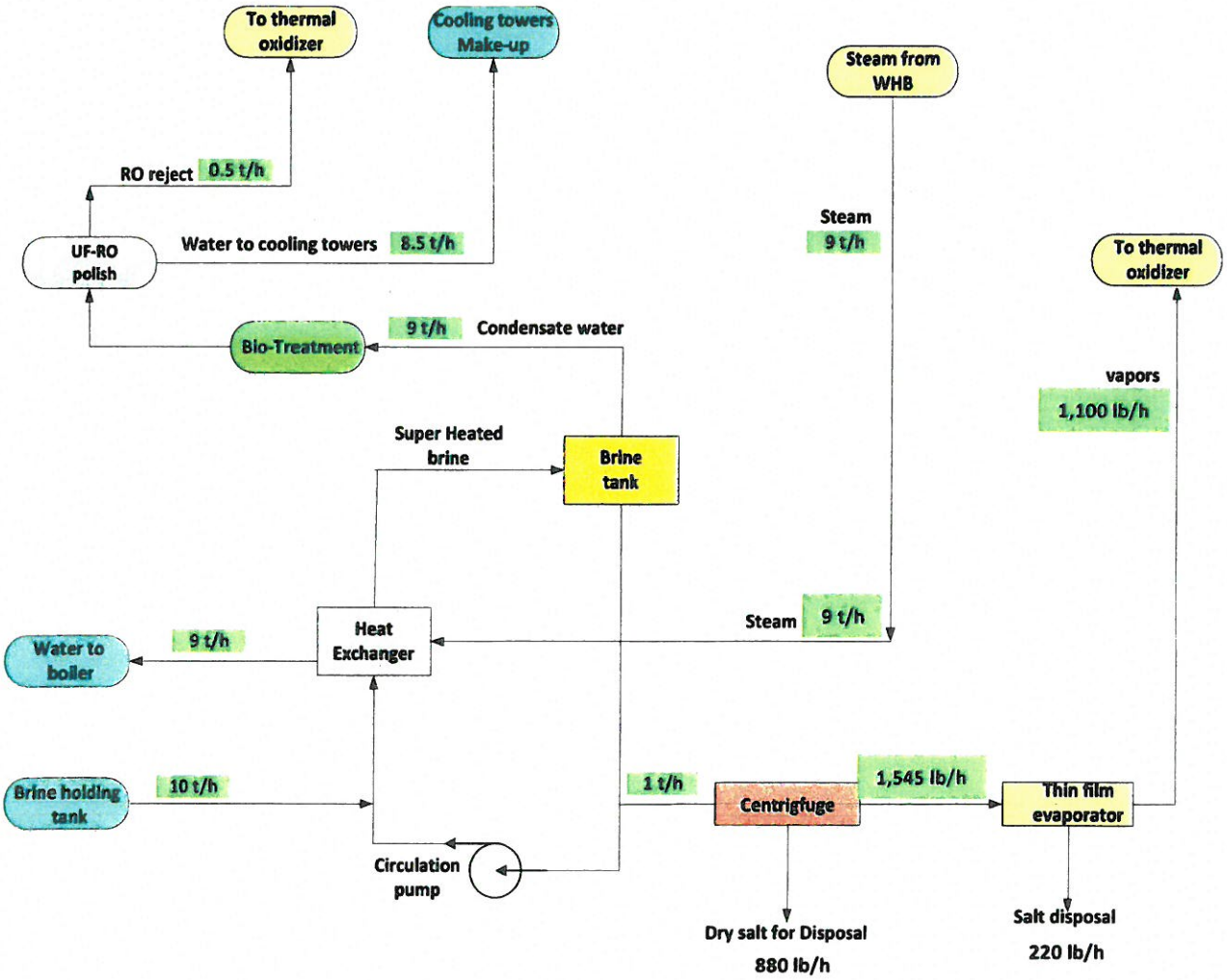
From the holding tank the concentrated wastewater (brine) containing 15%-20% salts flow through the heat exchanger where it is heated and enters the brine tank. In the brine tank the brine boils and the vapors are emitted from the top, collected, cooled and condensed into water that flows to the biological treatment unit.

The brine in the brine tank thus is further concentrated to achieve 75% salts concentration, by circulation using a circulation pump through a decanter-thin film evaporator unit. The salt crystals are removed with the decanter-thin film evaporator combination unit.

The steam to the heat exchanger is supplied from the waste heat boiler recovered from the waste. The crystallized salts flow to the centrifuge and then, into the brine dryer, in which the next process of drying takes place. The total capacity of this step is 10 tons/hour, with 15%-20% TDS at the inlet.

About 19 MM BTUs/hr of steam will be used to heat the crystallizer and about 1 ton/hour of salts 80-90% TDS will be removed.

Salts crystallization process diagram

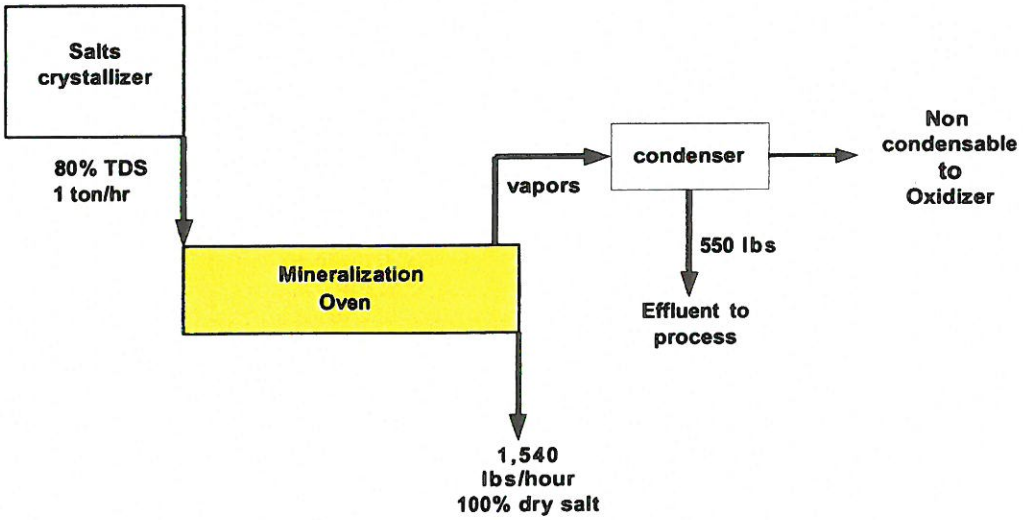


Note: The projected flow rates, above, are approximate values

Step 8 –Salt Drying

The salts, that are still hazardous pursuant to the "derived from" rule, are now in the form of liquid crystals. After crystallization at a temperature of 100 °C (212 °F), they flow to the drying salts oven, which is electrically heated and operates at max 240 °C (464 °F). The salts achieve 100% dry matter and the residual organic content of the salts is removed. The salts will be appropriately disposed as hazardous waste, or they can subsequently be delisted. The VOCs, in gaseous form, are oxidized in the thermal oxidizer, and then scrubber.

Schematic Salts Oven Drying Process Diagram



Note: The projected flow rates, above, are approximate values

Wastewater Discharge

The process has Zero Liquid Discharge

Air Emissions

The facility will be a minor air pollution emission source under the Clean Air Act and state regulations. The entire facility will utilize best available technology for air emissions control through the use of a thermal oxidizer as the main control device. When the process is not operating, emissions will be vented through activated carbon adsorption, as a backup.

The design will have the following:

1. **Tanks and Reactors**

   All tanks will be connected to a main blower that is directly vented to the thermal oxidizer unit, which will operate 24/7 to ensure compliance with Air Pollution requirements.

2. **Exhaust Air Treatment**

   The exhaust gases from the thermal oxidizer are vented as follows:

   - Rapid quenching of the air to cool from about 200 °C to 60 °C (392 °F to 140 °F)
   - Scrubber with caustic soda to eliminate all traces of acids such as HCl.

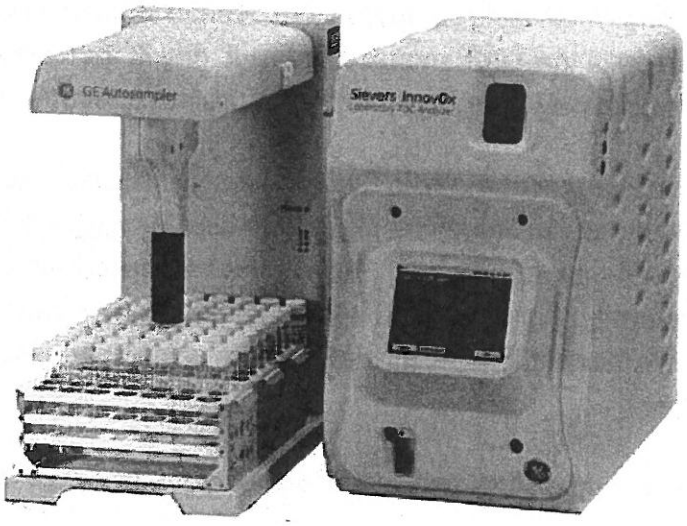
ATTACHMENT 2
CORPORATE QA/QC EXAMPLE

GE Power & Water
Water & Process Technologies

Sievers InnovOx Laboratory TOC Analyzer

Operation and Maintenance Manual

Firmware Version 2.00 and Later



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Chapter 6. Calibration and Verification for Organic Carbon Measurements

Overview

Calibration of the Sievers InnovOx Laboratory TOC Analyzer for NPOC, TC, and TOC measurements is accomplished using standards that contain known concentrations of TOC. These calibrations are performed in the NPOC mode. As a result, any IC that exists in the standards is removed automatically by sparging, and the IC does not affect the accuracy of the calibration.

Each measurement range in the Analyzer is calibrated separately. The Sievers InnovOx Laboratory TOC Analyzer can store multiple calibrations for each of its four ranges. Each calibration can be made with one to six points. Those points can be individual calibration standards of different concentrations, or the Auto Dilution feature can be used. When Auto Dilution is selected, the Analyzer automatically dilutes a standard solution to a lower concentration selected by the operator.

When an application involves measurement of samples containing less than about 100 ppm TOC, you may want to correct the calibration for the blank associated with the reagents and dilution water. Blank Corrected calibrations and verifications are described on "Blank Correction" on page 110.

When you analyze a sample, the Sievers InnovOx Laboratory TOC Analyzer allows you to specify which calibration will be used for that analysis; thus, you can specify the use of different

calibrations with particular sample matrices. Or, you may use calibrations that focus on particular concentration ranges that may be appropriate to your different applications.

To use the Auto Range feature (see page 104) all four of the Analyzer's measurement ranges should be calibrated[1]. Four calibrations that you select for use in the Auto Range measurement are stored as a Calibration Group.

Because verification options are similar to calibration options, the information presented below applies to calibration and verification procedures.

Handling Standards

GE Analytical Instruments recommends special handling of all standards to ensure proper preparation and analysis. Most standards are provided in 250 mL bottles. Before performing calibration or verification, standards solutions should be transferred into 40 mL vials for use with the Analyzer's vial port. Additionally, observe the following practices:

- Keep all standards containers refrigerated at all times to help ensure stability; store at approximately 5 °C (±4 °), away from light, in a box or solid-door refrigerator. Warm standards to ambient temperature prior to starting analysis.
- Certified reference materials should be stored separate from other chemicals, such as IPA, acetone, and acetic acid.
- Avoid storage of standards in uncapped containers.
- Shake the 250 mL bottle containing reference materials prior to pouring into vials.
- Remove vial caps only when prepared to pour standards and replace caps immediately after pouring.
- Avoid handling of vial septa. Also avoid touching the top of the vial to protect against introducing foreign particles, TOC, and IC.
- Wear gloves when preparing standards.
- Pour standards in a clean area to avoid introducing contaminants.

1. The Auto Range feature can be used without calibrating all four ranges; however, it will not be as accurate as when the ranges are calibrated. When any of the ranges are not calibrated, the default calibration constants for that range are used. This method is useful for a quick, approximate measurement of an unknown sample.

Calibration and Verification Options

Single-Point Calibration

When a single-point calibration is performed, only one standard is used, as shown in Figure 17. For that reason, single-point calibrations are convenient and rapid; however, the analysis of samples may be less accurate than when other calibration methods are used.

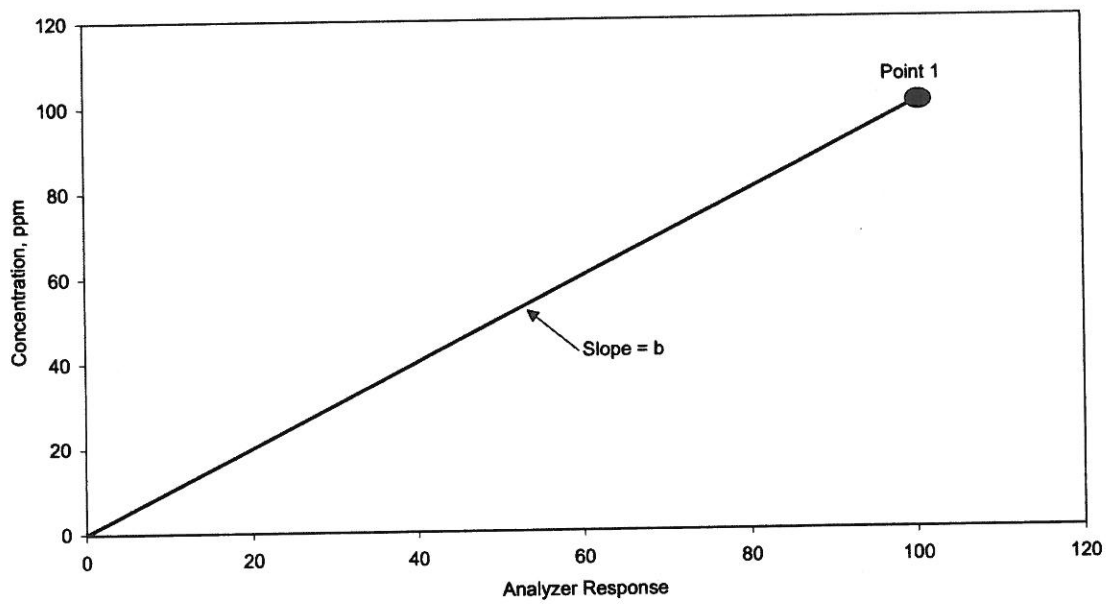

Figure 17: Calibration Curve for Single-Point Calibration

The concentration of samples is calculated from a calibration equation of the form:

$C = b*R$

where,

C = Concentration of the sample, ppm

b = Calibration constant (slope)

R = Response of the Analyzer

In a single-point calibration, the calibration constant is the slope of the curve shown in Figure 17, and the response of the Analyzer is assumed to pass through the origin.

Certain recommendations can be made about the use of single-point calibrations:

- If the highest accuracy is sought, calibrate using at least two points.
- The concentration of the calibration point in a single-point calibration should be greater than the expected concentration of the samples, but not exceed them by too much.
- Because Auto Dilution contributes some uncertainty to the calibration, single-point calibrations using Auto Dilution normally are not recommended.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration (see page 108).

Two-Point Calibration

The Analyzer can be calibrated with up to 6 points. A special case is when two points are used. The concentrations of the two points should be selected to bracket the range of concentrations expected in the samples that will be subsequently analyzed.

As in all calibrations involving more than a single point, the point having the lowest concentration is measured first. In most cases the Analyzer will be used to analyze samples containing substantial TOC concentrations. However, if the Analyzer will be used to measure samples having very low TOC concentrations, then Point 1 may have to be reagent water (TOC ≤ 0.1 ppm) in order to bracket the concentrations of the samples.

When you plan on measuring TOC(TC-IC) in your samples, it is recommended that the first calibration point be reagent water, because the IC concentration in most samples is less than 1 ppm.

Figure 18 depicts a two-point calibration in which point 1 is not reagent water. The concentrations of both points are entered into the calibration protocol.

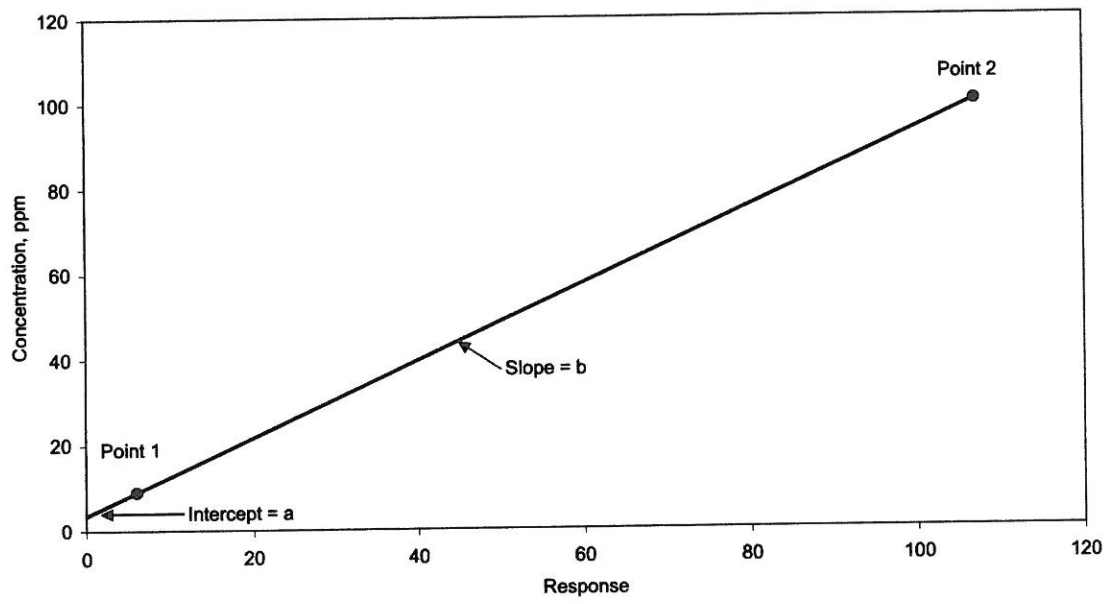

Figure 18: Two-Point Calibration (Point 1 is Standard)

The response of the Analyzer is defined by the equation:

$C = a + b*R$

where,

C = Concentration of the sample, ppm

a = Calibration intercept

b = Calibration constant (slope)

R = Response of the Analyzer

The calibration of the Analyzer is defined by the intercept, a, and the slope, b.

For the case in which point 1 is reagent water, the calibration of the Analyzer is depicted graphically in Figure 19. The operator designates point 1 as reagent water in the protocol by setting its concentration to 0 ppm. The Analyzer interprets "0 ppm" as "reagent water."

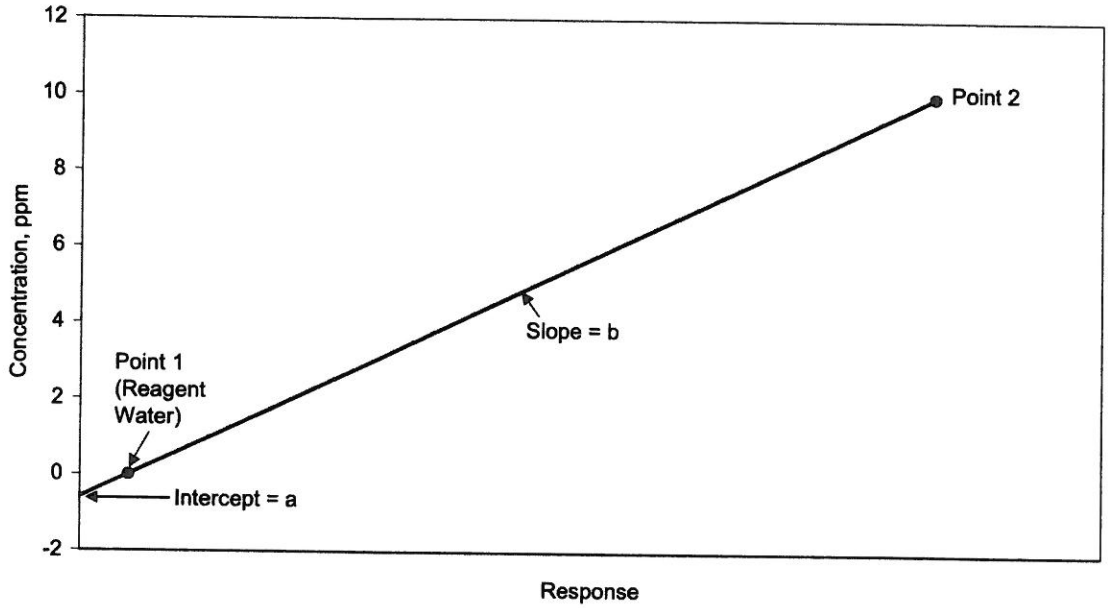

Figure 19: Two-Point Calibration (Point 1 is Reagent Water)

When the Analyzer measures the reagent water, it also measures the TOC in the reagents and any dilution water used in the measurement. Because the TOC concentration in the reagent water is very low, this measurement approximates the TOC concentration in the reagents and dilution water for the particular amounts of reagents and dilution water used in the calibration. The Analyzer corrects the calibration for the TOC in the reagents and dilution water by adjusting the measurement to equal 0 ppm (see Figure 21).

The operator enters the concentration of point 2 into the calibration protocol. The concentration of the standard used for point 2 is referred to as TOC_2. In the example in Figure 12, the operator set the concentration of point 2 to 10.0 ppm, so TOC_2 = 10.0 ppm.

The calibration constant, b, is calculated from the difference in the response to the two points:

$$b = \frac{TOC_2}{R_2 - R_{RW}}$$

where,

R_2 = Response of Analyzer to point 2, and

R_{RW} = Response of Analyzer to reagent water

Certain recommendations can be made about the use of two-point calibrations:

- The concentrations of the points should bracket the expected range of concentrations of the samples. When TOC in samples will be measured, the first calibration point should be reagent water.
- The accuracy of the calibration will be maximized when the concentrations of the points are close to the concentrations of the samples.
- Because Auto Dilution contributes some uncertainty to the calibration, the calibration will be most accurate if the calibration at point 2 is not done using Auto Dilution.
- It is recommended that the 5,000 ppm range and higher ranges be calibrated using at least two points.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration (see page 108).

Calibration with More than Two Points

When the calibration is performed with more than two points (multi-point calibration), the user has the choice of having the Analyzer calculate the calibration constants from a linear fit of the points, or from a point-to-point fit.

Linear Fit Multi-Point Calibration

The advantage of selecting the linear fit is that the calibration is affected less by uncertainties in the measurement, or errors in the concentration, of any one point.

Figure 20 depicts a linear fit calibration with 6 points. The point having the lowest concentration is measured first, and the points must increase in concentration at each step. Point 1 can either be reagent water or a higher, known concentration.

In either case, the Analyzer performs a linear regression to calculate the intercept, a, and slope, b, of the calibration:

$$C = a + b*R$$

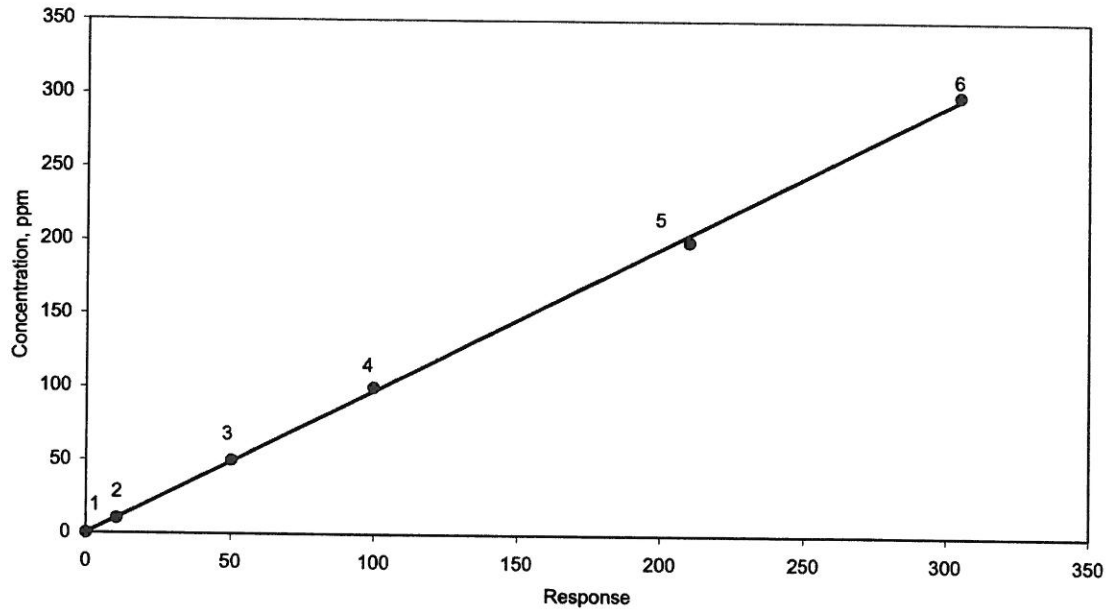

Figure 20: Linear Fit Six-Point Calibration

Point-to-Point Multi-Point Calibration

The advantage of selecting the point-to-point calibration is that any nonlinearity of response is compensated for during the calibration.

Figure 21 depicts a point-to-point calibration with 6 points. Like the linear fit, the point having the lowest concentration is measured first, and the points must increase in concentration at each step. Point 1 can either be reagent water or a higher, known concentration.

The Analyzer calculates an intercept and slope for the line connecting each pair of points, as shown in Figure 21. When this calibration is later applied to a sample, the Analyzer applies the appropriate intercept and slope, based on the magnitude of its response to that sample.

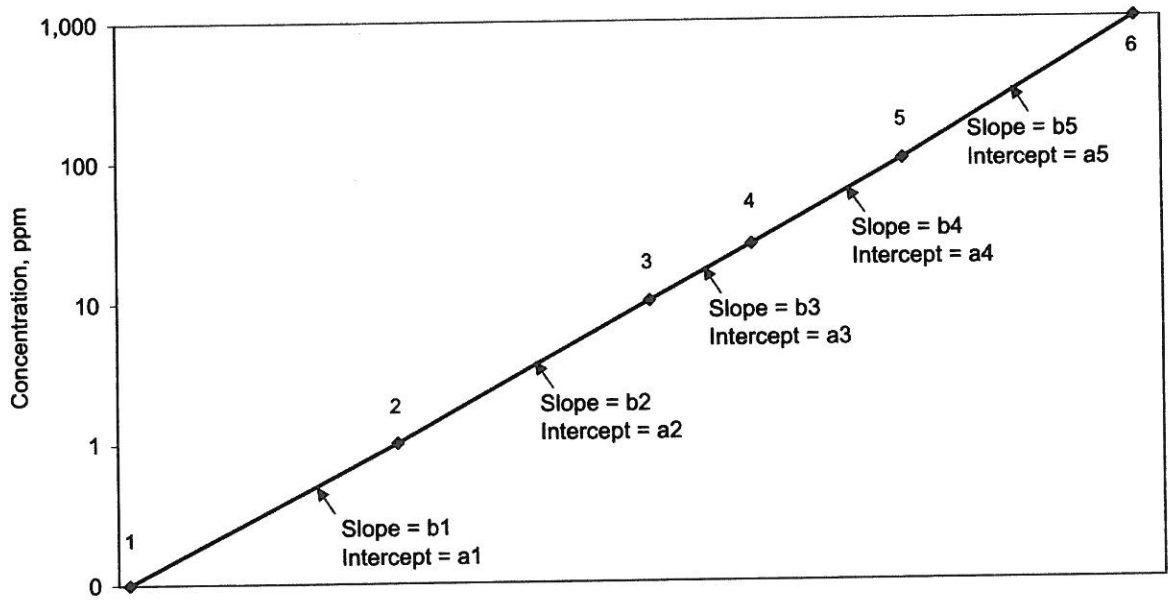

Figure 21: Point-to-Point Calibration with Six Points

Certain recommendations can be made about the use of multi-point calibrations:

- The concentrations of the points should extend beyond both ends of the expected concentration range of the samples. When TOC in samples will be measured, the first calibration point should be reagent water.
- The accuracy of the calibration will be maximized when the concentrations of the points are close to the concentrations of the samples.
- It is recommended that the 5,000 ppm range and higher ranges be calibrated using at least two points, but the use of reagent water is not recommended.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration. The recommended points are: Reagent Water, 100 ppm, 1,000 ppm, 5,000 ppm, 20,000 ppm and 50,000 ppm.

Auto Dilution

If you are calibrating with multiple points within a range, you can use one standard and the Analyzer will dilute it for additional calibration points. For example, if you are calibrating in the Up to 1000 ppm range and want to calibrate at 6 points, you could use a stock standard solution of 1000

ppm TOC. You can use the Auto Dilution feature to dilute the standard to five additional points (such as 40, 100, 250, 500, and 750 ppm). Diluting beyond 40 ppm would exceed a dilution ration of 25:1, which is not permitted. So, if you wanted to calibrate at a point below 40 ppm via Auto Dilution, you must start with a standard less than 1000 ppm TOC.

The dilution ratio available for use in Auto Dilution is limited in the higher concentration ranges, as shown in Table 1.

Table 1: Maximum Dilution Allowed Using Auto Dilution Feature

Range	Maximum Dilution
Up to 1,000 ppm	25:1
Up to 5,000 ppm	10:1
Up to 20,000 ppm	2.5:1
Up to 50,000 ppm	Not available

Blank Correction

Use the blank correction feature if you want the Analyzer to automatically calculate the TOC contribution from the acid, oxidizer, and dilution water used with the Analyzer and exclude TOC contributions from these sources when calculating calibration values. For additional information, see "Blank Correction" on page 135.

Only calibrate the Analyzer with blank correction turned on if your samples contain less than 100 ppm TOC or NPOC and you also plan to measure your unknown samples with the blank correction feature turned on.

In order to perform a calibration with blank correction on, first calibrate the Analyzer in the Up to 1,000 ppm range with blank correction off. Then perform the blank measurement using that calibration. See "Measuring the Blank" on page 136 for the procedure.

Calibration Groups

If you are using the Analyzer's Auto Range function, you will need to specify at least one calibration group. The calibration group tells the Analyzer which calibration to use in each range. The Analyzer can store up to 20 calibration groups.

To set up a calibration group

1. Select the **Cal/Ver** tab.
2. Press the **Calibration Groups** button.
3. Press the **New** button.
4. Specify the calibration to use in each range. For each range, press the range button and then select the calibration from the list,

NOTE: The factory default values may be used; however, these values are not as accurate as the actual calibrations.

If you want to use a factory default calibration for one of the ranges, do NOT press the default button and try to select the calibration for that range. The Analyzer will automatically include the factory default.

5. Press the **Save** button.
6. Enter a name for the calibration group and then press the **Save** button.

Preparing for Calibration

Save System Settings

Prior to performing any calibration procedure or system protocol, save the current system settings, in the event they need to be re-loaded.

To save the system settings

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **System Properties** button.
4. Press the **USB Backup** button. Make sure that the USB flash memory drive is attached to the USB port[1], and then press the **Save System** button.

Perform Maintenance Tasks

Before calibrating the Analyzer, perform any necessary maintenance tasks. Ensure that the oxidizer reagent is fresh. If the reagent has been stored at room temperature, it is recommended that the oxidizer be less than two weeks old.

To perform a blank-corrected calibration

1. Install fresh dilution water.
2. Perform a flush of the reagents and dilution water (**Maintenance → Consumables → Flush → Flush All**).
3. Rinse down the Analyzer by analyzing low-TOC water until the response of the Analyzer has stabilized. To do this, start by placing the check standard tube in a container of low-TOC water.
4. Make sure the Check Standard port is activated. Press the **Setup** tab, and then press the **Check Standard** button. The **Check Standard Setup** button displays.
5. Press the **Check Standard Setup** button, and verify that the **Check Standard** button in the upper left portion of the screen displays "Enabled." If this feature is disabled, press the **Check Standard** button, and then press the **Enabled** button that displays on the right.
6. Press the **Flush Check Standard** button to flush out the previous check standard solution.
7. When the flush is complete, press the **Back** button.
8. Press the **Back** button to return to the Menu screen.
9. Press the **Rinse** button, and then press the **Start Analysis** button. The Analyzer will begin analyzing the low-TOC water in NPOC mode. Rinsing will continue until you press the **Stop Analysis** button. The Analyzer is rinsed down adequately when the NPOC readings are significantly below the concentration of the first standard if that standard is greater than 1 ppm. If the first standard is less than 1 ppm, including reagent water, then the readings should stabilize and display less than 1 ppm.
10. Perform the Blank Measurement to ensure that the blank concentrations in the Analyzer's memory accurately reflect the status of the reagents and dilution water that will be used in the calibration. See "Measuring the Blank" on page 126 for additional information.

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1. Three USB ports are provided for your convenience. However, you can only export data from one port at any time. The Analyzer will export to the first inserted USB flash storage device. While this USB flash storage device is inserted, the Analyzer will not recognize any additional USB storage devices inserted in other USB ports.

The Analyzer is now ready for calibration. Set up the calibration as described in the following section.

To perform a calibration that is not blank-corrected

1. Consider installing fresh dilution water if it is more than a few days old.
2. Perform a flush of the reagents and dilution water (**Maintenance → Consumables → Flush**).
3. Rinse down the analyzer if it has been analyzing samples more concentrated than the first (lowest concentration) calibration point. Rinse down can be expedited when necessary by repeating a dilution water flush (see Step 2).

Setting Up Calibration

You can set up multiple calibration protocols for each of the Analyzer's four ranges.

To set up a new calibration

1. Select the **Cal/Ver** tab.
2. Press the **Calibrate** button.
3. To create a new calibration, select an existing calibration and press the **Modify** button.
4. Specify the settings for the new calibration.
    - Press **Num. Points** to set the number of calibration points (1 to 6)
    - Press **Range** to specify the range for this calibration.
    - Press the **Acid** and **Oxidizer** buttons to change the percentage of each reagent that will be added.
    - Press **Auto Dilut.** to specify whether the Auto Dilution feature should be set to **On** or **Off**.
    - Press **Sparge** to change the sparging time for this calibration.
    - Press **Blank Correction** to specify whether the blank correction feature should be set to **On** or **Off**. Blank correction is unavailable if reagent water is selected as the first point in a multi-point calibration.

- Press **Cal. Type** if the number of calibration points is 3 or larger. This button allows the user to select either a **Linear** best-fit calibration curve or a point-to-point (**Pt-Pt**) calibration curve.

5. Press the **Next** button to specify the settings for the first calibration point. The first point has to have the lowest concentration, and the concentration of each subsequent point has to be greater than the preceding points.
   - If Auto Dilution is on, enter the **Standard** concentration.
   - Press the **Point** button to set the TOC level for the calibration point.
   - Press the **Reps** button to change the number of measurements (repetitions) the Analyzer will make for this calibration point (see Table 2).
   - Press the **Rejects** button to change the number of measurements the Analyzer should exclude from its calculations. The number of rejects must be less than the number of NPOC repetitions.
   - Press the **Sample Flush** button to change the number of sample flushes to be performed before measurement of the standard.
   - Press the **Sample Flush** button to select from 0 to 5 sample flushes. These sample flushes will be performed before this calibration point is measured. The use of more than 3 sample flushes is not recommended. The optimum number of flushes depends upon the difference between the concentration of the prior calibration point and the current point.
6. Press the **Next** button if you specified more than one calibration point. Specify the settings indicated in the previous step. If you have entered the settings for the last calibration point, press the **Save** button to continue.
7. Enter a name for the new calibration protocol, and then press the **Save** button.

Table 2: Approximate Number of Calibration Repetitions Possible

These ranges are based on a completely filled 40-mL Vial and no sample flushes. The maximum number of repetitions that can be selected is 20.

Range			
1,000 ppm	**5,000 ppm**	**20,000 ppm**	**50,000 ppm**
9	19	20	20

To calibrate the Analyzer

1. Select the **Cal/Ver** tab.
2. Press the **Calibrate** button.
3. Select a calibration protocol from the list by using the arrow buttons to navigate through the list and highlight the appropriate protocol. If you want to create a new calibration, follow the previous steps in "To set up a new calibration".
4. Press the **Start Calibration** button and follow the on-screen prompts. The prompts will vary depending on the settings you have specified in the selected calibration.
5. After the Analyzer has completed measurements on all standards vials, the Calibration Results screen displays the following values. (Refer to Figure 22 on page 116.)

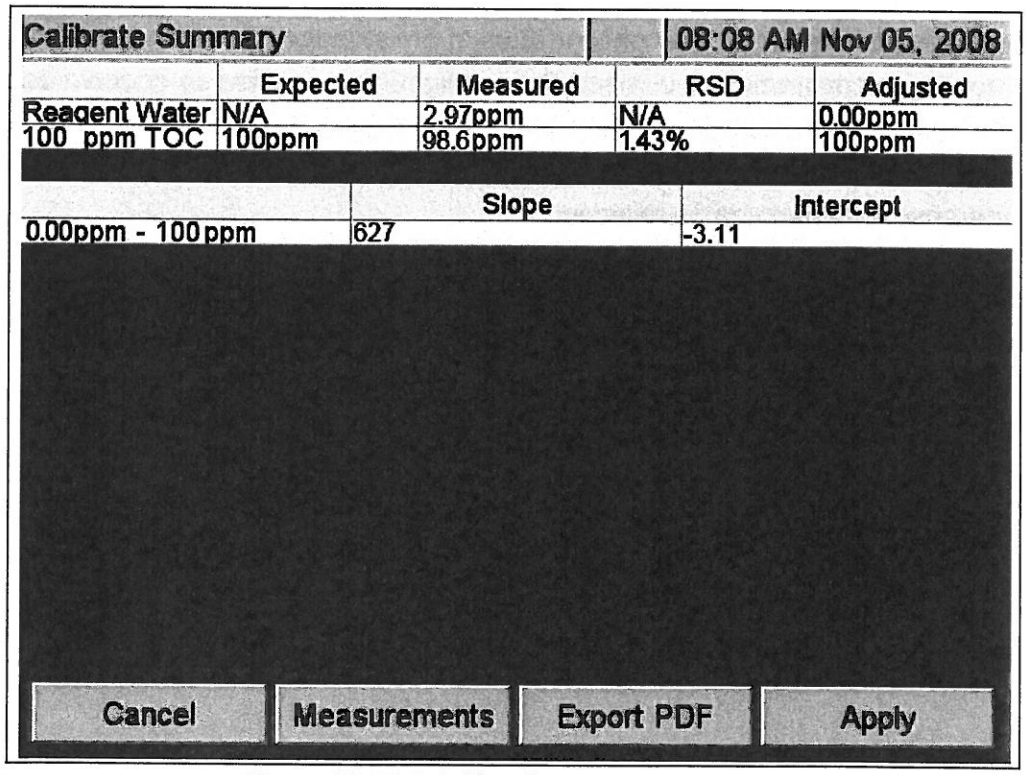
   - Expected - Indicates the expected concentration of the standard.

     When Auto Dilution is Off, the expected concentration is the Certified Concentration of the standard. For reagent water, there is no expected concentration, so the entry is "N/A."

     When Auto Dilution is On, the Expected concentration is the concentration of the standard after dilution. For example, if a 1,000 ppm TOC standard is used in the calibration, and is diluted to calibrate the Analyzer at 100 ppm, the Expected concentration will be 100 ppm.
   - Measured: Indicates the average measured concentration of the standard, using default calibration constants or the most recent previous calibration constants.
   - RSD: Indicates the percent relative standard deviation of the non-rejected measurements of the standard.
   - Adjusted: Indicates the calculated concentration of the standard, using the new calibration constants from the calibration just completed.
   - R^2: Indicates the correlation coefficient for the linear regression of the Adjusted values (for a 3-6 point linear calibration only).
   - Slope: One or more values of calibration slope will be displayed, depending upon the type of calibration. The slope is one of the key calibration constants, and is defined in "Calibration and Verification Options" on page 103.
   - Intercept: The intercept is another calibration constant, and an intercept value is listed for each slope value. See "Calibration and Verification Options" on page 103 for a definition.
   - **Cancel**: Closes the results screen without saving the new calibration constants.

- **Measurements**: Displays a screen that allows the user to edit the calibration (see Section "Editing the Calibration").
- **Export PDF**: Permits user to export calibration results in PDF form to a USB flash memory drive.
- **Apply**: Saves the new calibration constants.

6. To export a PDF when the calibration is completed, containing the results of the calibration, insert a USB flash memory drive into the external USB port[1], and then press the **Export PDF** button. It is strongly recommended that the calibration PDF be exported and saved on a PC for future reference whenever the Analyzer is calibrated.
7. Depending on the calibration results, either press the **Apply** button to save the calibration results, press the **Measurements** button to edit the calibration (see "Editing a Calibration" below), or press the **Cancel** button to discard the calibration results.



Calibrate Summary 08:08 AM Nov 05, 2008

	Expected	Measured	RSD	Adjusted
Reagent Water	N/A	2.97ppm	N/A	0.00ppm
100 ppm TOC	100ppm	98.6ppm	1.43%	100ppm

	Slope	Intercept
0.00ppm - 100 ppm	627	-3.11

Cancel | Measurements | Export PDF | Apply

Figure 22: TOC Calibration Summary Screen

1. Remember to first disconnect any other USB flash memory drives from other USB ports, if installed. When multiple USB flash memory drives are connected to more than one USB port, the Analyzer will only export to the first USB flash memory drive inserted.

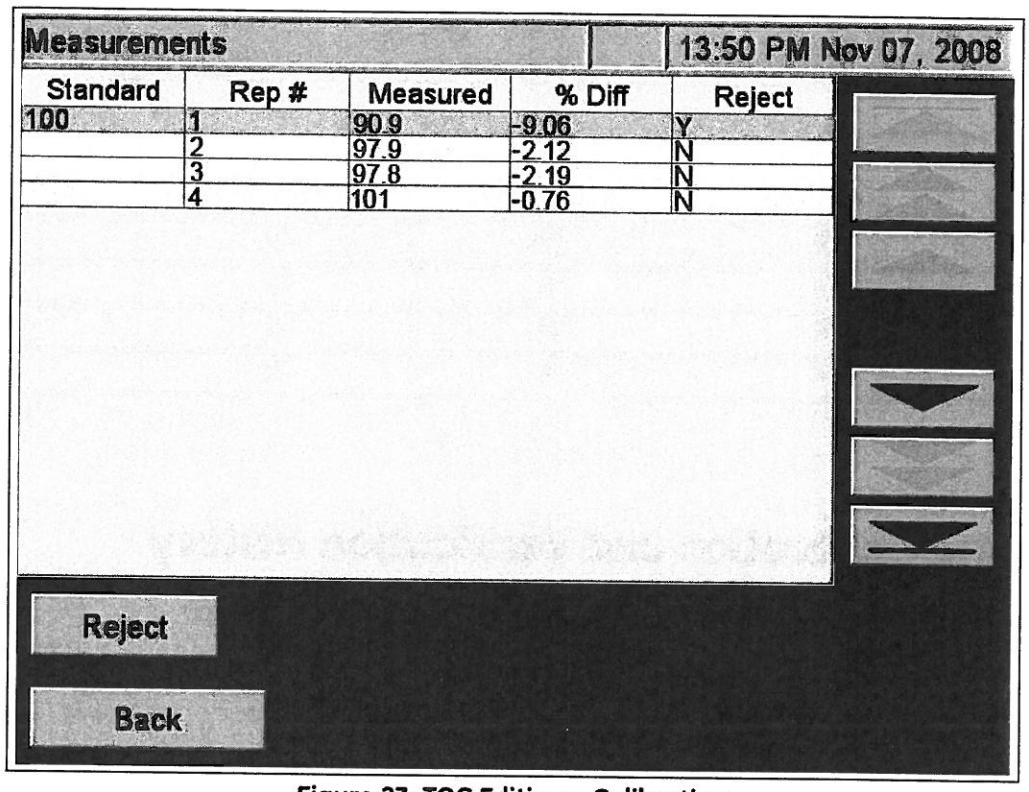
Editing a Calibration

If a calibration measurement is inaccurate (e.g., due to a bubble in the sample or oxidizer lines), it can be rejected from calibrations. Any measurement can be rejected if there are at least two 'good' calibration measurements at that calibration point following the rejection. After the inaccurate measurement is deleted, the Analyzer will calculate a new slope, intercept, and measured and % RSD values for the calibration.

When the **Apply** button then is pressed, the new slope and intercept are placed in the Analyzer's memory, and are used whenever this calibration is selected. No editing can be performed after the **Apply** button has been pressed.

To edit a calibration, press the **Measurements** button when the calibration is complete (see Figure 23). The column on the left of the new display shows the concentration of the standard at each calibration point. The next column displays the repetition number. The measured value for each repetition is displayed in the third column, and the fourth column displays the % Difference between the measured value and the concentration of the standard. The fifth column identifies whether or not that measurement is a reject. The highlighting is scrolled up or down using the arrows on the right side of the display. The **Reject** button toggles the status (**Y** or **N**) of the highlighted measurement. A calibration point must have at least two non-rejected measurements before another measurement can be rejected.

When the **Back** button is pressed, the calibration summary screen is shown again, with the new slope and intercept (measured and % RSD also). Remember to press the **Apply** button to save the edited calibration.



Standard	Rep #	Measured	% Diff	Reject
100	1	90.9	-9.06	Y
	2	97.9	-2.12	N
	3	97.8	-2.19	N
	4	101	-0.76	N

Figure 23: TOC Editing a Calibration

Performing a Calibration Verification

Verification parallels the options available under calibration menu choices. Verifications, however, may be performed in TOC, NPOC, TC, or IC analysis modes. As with calibration, you can save multiple verification protocols in each of the Analyzer's four ranges, and you can save up to 20 verification protocols in total.

For more detailed information regarding options available under verification menus, consult the relevant sections describing calibration, keeping in mind that you must press the **Verification** button rather than the **Calibrate** button in any given process, and for each verification protocol you must specify a calibration protocol for the measurements.

Table 3 lists the approximate number of repetitions that are possible from a 40-mL vial, completely filled with the standard solution. If Auto Dilution is employed, more repetitions are possible than are shown in Table 3, but the maximum number of repetitions that can be selected is 20.

Table 3: Approximate Number of Verification Repetitions Possible

This estimation is based on a completely filled 40-mL vial and no sample flushes.l

Mode	Range			
	1,000 ppm	5,000 ppm	20,000 ppm	50,000 ppm
NPOC	9	19	20	20
TOC	4	9	20	20
IC	9	19	20	20
TC	4	9	20	20

Reviewing Calibration and Verification History

The Analyzer stores a separate history of calibration and verification data.

To review calibration and verification history

1. Select the **Cal/Ver** tab.
2. To display a list of calibrations or verifications stored on the Analyzer, press one of the following buttons:
   - **Calibration History**
   - **Verification History**
3. Select a calibration or verification to view by scrolling up or down the list to highlight a selection, and then press the **View** button. A summary of the selected calibration (or verification) displays.
4. To export all of the calibrations (or verifications) on the list, press the **Export All** button.
5. To export calibration or verification summary data to a USB flash memory drive, make sure a USB flash memory drive is connected to one of the Analyzer's USB ports. (Only ONE USB flash memory drive should be inserted at a time in one of the three available USB ports). Then press the button that corresponds to the desired data format (CSV or PDF).
6. To export calibration or verification summary data to Ethernet, first set up a PC to collect data using a program such as HyperTerminal from the Ethernet port on the Analyzer. See "Appendix C: Transferring Data to a PC" on page 203 for further information on using HyperTerminal. Set the HyperTerminal port number to 10802 to access the exported file,

and capture the file under file name you select. Then, press the **Cal. CSV to Ethernet** button or the **Ver. CSV to Ethernet** button.

APPENDIX C-2

TREATED WASTE STREAM DATA FROM ISRAELI FACILITY

SUMMARY OF TRE IENT EFFICIENCIES

Subject/Parameter	Units	Average Raw Waste Data	Intermediate Process Data		Intermediate Process Treatment Efficiency (%)	Control Device Efficiency (%)	Overall Efficiency (%)
Total Organic Carbon (TOC)	mg/L	60,000		253	99.58	99.90	>99.99
Total Solids (TSS+TDS)	mg/L	50,000		454	99.09	98.00	99.98
Oils and Fats	mg/L	5,000	<	10	99.80	99.00	>99.99
Mineral Oil	mg/L	500	<	10	98.00	99.00	99.98
pH		0.1-14		Neutral	N/A	N/A	N/A
Chlorides	mg/L	10,000		41	99.59	98.00	99.99
Potassium	mg/L	690		23.9	96.54	99.00	99.97
Fluoride	mg/L	900		ND	ND	ND	ND
Boron	mg/L	300	<	0.2	99.93	99.00	>99.99
Sulfates	mg/L	10,000		107	98.93	98.00	99.98
Sulfides	mg/L	450		10	97.78	98.00	99.96
Metals Screening - ICP:							
Arsenic	mg/L	150	<	0.025	99.98	99.00	>99.99
Zinc	mg/L	12,000		0.04	100.00	99.00	>99.99
Tin	mg/L	4,000	<	0.025	100.00	99.00	>99.99
Aluminum	mg/L	5,000	<	1	99.98	99.00	>99.99
Free Chlorine	mg/L	ND		ND	ND	ND	ND
Silver	mg/L	ND	<	0.025	ND	ND	ND
Mercury	mg/L	120	<	0.025	99.98	99.00	>99.99
Chromuim 3	mg/L	180	<	0.025	99.99	99.00	>99.99
Chromium 6	mg/L	450	<	0.025	99.99	99.00	>99.99
Copper	mg/L	650		0.03	100.00	99.00	>99.99
Nickel	mg/L	210	<	0.025	99.99	99.00	>99.99
Molybdenum	mg/L	400		0.025	99.99	99.00	>99.99
Manganese	mg/L	390	<	0.025	99.99	99.00	>99.99
Lead	mg/L	900	<	0.025	100.00	99.00	>99.99
Cadmium	mg/L	340	<	0.025	99.99	99.00	>99.99
Cobalt	mg/L	420	<	0.025	99.99	99.00	>99.99
Cyanide	mg/L	ND		ND	ND	ND	ND

Notes:

1. Data is an average reflecting multiple types of waste streams treated at the existing facility.
2. For concentrations reported as less than (<), the value shown was used in the calculation.
3. ND = not detected

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SLUDGE

Material Safety Data Sheet

Material Name: **Mixed powders** **MSDS ID: ELCON-0004**

Section 1 - Product and Company Identification

Synonyms: Powder
Chemical name: Mixed salts and Metal oxids .
Chemical Family: Mixture.
Material Use: Operation of wastewater treatment, for salts crystallization and Metal oxids
Chemical Formula: NaCl, Na_2SO_4 ,$CaSO_4$, Fe_2O_3 .

Elcon Recycling Center (2003) LTD
Deshanim Industrial Park.
P.O. Box 1428, Haifa,
31013, Israel

Product Information: 972-4-8468470
MSDS information e-mail: avi@elconrecycling.com

Section 2 – Hazards Identification

HMIS Ratings: **Health**:1 **Fire**: 0 **Physical Hazard**: 0
Hazard Scale: 0=Minimal, 1= Slight, 2=Moderate, 3= Severe, 4= Chronic hazard
NFPA Ratings: Health:1, Fire:0 , Reactivity:1
Hazard Scale: 0=Minimal, 1= Slight, 2=Moderate, 3=Serious, 4= Severe
Emergency Overview
CAUTION: Product is thick slurry of salts and residues. This product may be irritating to the eyes, skin, and respiratory system.

Section 3 – Composition/ Information on Ingredients

CAS#	Components	Percent by Wt.
7732-18-5	Water	0-0.1
7647-14-5	Sodium Chloride	3-6
7757-82-6	Sodium Sulfate	2-5
127-09-34	Sodium acetate	0.05-0.1
141-53-7	Sodium formate	0.05-0.1
10101-41-4	$CaSO_4$	1 - 3
1332-37-2	Fe_2O_3	65 -75
	Heavy metals oxide	10 -15

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Section 4 – First Aid Measures

Similar to Other salts. Wash immediately with soap and water. Seek medical attention if symptoms develop or persist.

Section 5 – Fire Fighting Measures

General Fire Hazards: Not a fire hazard. Material is not flammable.
Explosion Hazards: Not an explosion hazard.
Hazardous combustion Products: May emit Carbon monoxide, Carbon dioxide, Nitrogen oxides when put into fire
Extinguishing Media: Use extinguishing media suitable to surrounding fire condition, e.g dry chemical, foam. Carbon dioxide, water fog or water spray.
Fire Fighting Equipment/Instructions: Firefighters should wear personal protective equipment, suitable for fire conditions and material burning.

Section 6 - Accidental Release Measures

Keep unnecessary personal away, Stop or reduce discharge if safe to do so, prevent from entry into waterways. Spill area may be washed down with water to a separated sewage collection system.

Section 7 – Handling and storage

Material is slowly corrosive to iron and carbon steels. Handle in properly designed and approved equipment systems. Use regular inspection routines for process vessels and piping. Avoid contact with skin and eyes. Always wash hands with water and soap, after handling the material.

Section 8 – Exposure Control

Always use personal safety equipment as gloves, eye goggles, Working clothes and shoes, and a full face shield in case of splashing.
Provide adequate ventilation.

Section 9 – Physical &Chemical Properties

Physical state: powder, dark brown color.
Odor: Very low odor to odorless.
pH: 6.5-9 (10% in water)
Vapor pressure and density: Non volatile at ambient conditions.
Boiling Point: no relevant.
Melting point: : no relevant
Solubility (H2O): 4-8%
Balk Density: 0.8-1 ton/m^3.
Auto ignition, Flash point, LEL, HEL: Non flammable, Non explosive.

P.O.B. 2049 Beer-Sheva, Israel ת.ד. 2049 באר שבע, 8412316, הורד 6 נאות חובב
972-8-6700950 🖷 972-8-6700933☎

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Section 10 – Stability and Reactivity:

This powder is stable under operational conditions up to 350 deg c in evaporation and drying conditions.
Conditions to avoid: Do not expose to open fire, Strong acids or strong oxidizing agents.
May be corrosive to metals at high temp and low pH.
Slow corrosion to carbon steels and iron.
Can be stored in HDPE, p.p vessels ambit temp.

Section 11 - Toxicological Information

This product has not been tested.
Please consider the toxicological properties of it's ingredients.
Workplace environment conditions testing showed all toxicological levels below the exposure limits under normal operation with no chronic toxicity or effects.

Section 12- Ecological Information

This product has not been tested. Please consider it as toxic to the aquatic and soil environment.

Section 13- Disposal Considerations

Material should be disposed in accordance to local industrial waste regulations.

Section 14 - Transportation Information

This material can be safety transported by trucks, sea or air. It is not classified according to the UN Hazard codes.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: N/A
Indication of Danger: Irritant
Risk phrases – R20, R25, R36.
Risk Statements: Irritating to eyes,

Safety phrases – S25, S26, S37,
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable gloves
UNITED STATES REGULATORY INFORMATION
SARA LISTED: N/A

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972-8-6700950 🖷 972-8-6700933☎

CANADA REGULATORY INFORMATION
WHMIS Classification: N/A
DSL: N/A
NDSL: N/A

Section 16 - Other Information

DISCLAIMER
For R&D use only.
NOT for human consumption or any food usage
NOT for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product.
Elcon recycling center Inc. shall not be held liable for any damage resulting from handling or from contact with the above product.

Last update : 16.2.17

Sign: _____

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972-8-6700950 🖷 ☎ 972-8-6700933

SALT

Material Safety Data Sheet

Material Name:**Salts Mixed powders** **MSDS ID: ELCON-0002**

Section 1 - Product and Company Identification

Synonyms: Powder
Chemical name: Mixed salts and Metal oxids .
Chemical Family: Mixture.
Material Use: Operation of wastewater treatment, for salts crystallization and Metal oxids
Chemical Formula: NaCl, Na_2SO_4 ,$CaSO_4$, Fe_2O_3 .

Elcon Recycling Center (2003) LTD
Deshanim Industrial Park.
P.O. Box 1428, Haifa,
31013, Israel

Product Information: 972-4-8468470
MSDS information e-mail: avi@elconrecycling.com

Section 2 – Hazards Identification

HMIS Ratings: Health:1 Fire: 0 Physical Hazard: 0
Hazard Scale: 0=Minimal, 1= Slight, 2=Moderate, 3= Severe, 4= Chronic hazard
NFPA Ratings: Health:1, Fire:0 , Reactivity:1
Hazard Scale: 0=Minimal, 1= Slight, 2=Moderate, 3=Serious, 4= Severe
Emergency Overview
CAUTION: Product is thick slurry of salts and residues. This product may be irritating to the eyes, skin, and respiratory system.

Section 3 – Composition/ Information on Ingredients

CAS#	Components	Percent by Wt.
7732-18-5	Water	5-15
7647-14-5	Sodium Chloride	40-45
7757-82-6	Sodium Sulfate	30-40
127-09-34	Sodium acetate	1-2
141-53-7	Sodium formate	1-2
10101-41-4	$CaSO_4$	5-10
1332-37-2	Fe_2O_3	3-4
	Organic carbon mixture	0.5-2

Section 4 – First Aid Measures

Similar to Other salts. Wash immediately with soap and water. Seek medical attention if symptoms develop or persist.

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Section 5 – Fire Fighting Measures

General Fire Hazards: Not a fire hazard. Material is not flammable.
Explosion Hazards: Not an explosion hazard.
Hazardous combustion Products: May emit Carbon monoxide, Carbon dioxide, Nitrogen oxides when put into fire
Extinguishing Media: Use extinguishing media suitable to surrounding fire condition, e.g dry chemical, foam. Carbon dioxide, water fog or water spray.
Fire Fighting Equipment/Instructions: Firefighters should wear personal protective equipment, suitable for fire conditions and material burning.

Section 6 - Accidental Release Measures

Keep unnecessary personal away, Stop or reduce discharge if safe to do so, prevent from entry into waterways. Spill area may be washed down with water to a separated sewage collection system.

Section 7 – Handling and storage

Material is slowly corrosive to iron and carbon steels. Handle in properly designed and approved equipment systems. Use regular inspection routines for process vessels and piping. Avoid contact with skin and eyes. Always wash hands with water and soap, after handling the material.

Section 8 – Exposure Control

Always use personal safety equipment as gloves, eye goggles, Working clothes and shoes, and a full face shield in case of splashing.
Provide adequate ventilation.

Section 9 – Physical &Chemical Properties

Physical state: powder, dark brown color.
Odor: Very low odor to odorless.
pH: 6.5-9 (10% in water)
Vapor pressure and density: Non volatile at ambient conditions.
Boiling Point: no relevant.
Melting point: : no relevant
Solubility (H2O): 10-20%
Density: 1.1-1.2gr/cc at 80 deg C.
Auto ignition, Flash point, LEL, HEL: Non flammable, Non explosive.

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Section 10 – Stability and Reactivity:

This powder is stable under operational conditions up to 350 deg c in evaporation and drying conditions.
Conditions to avoid: Do not expose to open fire, Strong acids or strong oxidizing agents.
May be corrosive to metals at high temp and low pH.
Slow corrosion to carbon steels and iron.
Can be stored in HDPE, p.p vessels ambit temp.

Section 11 - Toxicological Information

This product has not been tested.
Please consider the toxicological properties of it's ingredients.
Workplace environment conditions testing showed all toxicological levels below the exposure limits under normal operation with no chronic toxicity or effects.

Section 12- Ecological Information

This product has not been tested. Please consider it as toxic to the aquatic and soil environment.

Section 13- Disposal Considerations

Material should be disposed in accordance to local industrial waste regulations.

Section 14 - Transportation Information

T the best of our knowledge, this material can be safety transported by trucks or sea.
It is not classified according to the UN Hazard codes.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: N/A
Indication of Danger: Irritant
Risk phrases – R20, R25, R36.
Risk Statements: Irritating to eyes,

Safety phrases – S25, S26, S37,
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable gloves
UNITED STATES REGULATORY INFORMATION
SARA LISTED: N/A

Box 1428 Haifa 31013, Israel אתר דשנים וחומרים כימיים, א.ת. ק. אתא 31013 חיפה 1428 .ת.ד
972-4-8468467 972-4-8468470/2

CANADA REGULATORY INFORMATION
WHMIS Classification: N/A
DSL: N/A
NDSL: N/A

Section 16 - Other Information

DISCLAIMER
For R&D use only.
NOT for human consumption or any food usage
NOT for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product.
Elcon recycling center Inc. shall not be held liable for any damage resulting from handling or from contact with the above product.

Last update : 11.12.12

Sign: _____

ת.ד. 1428 חיפה 31013 אתר דשנים וחומרים כימיים, א.ת. ק. אתא Box 1428 Haifa 31013, Israel
972-4-8468470/2 ☎ 972-4-8468467 🖷

APPENDIX C-3

RADIATION PROTECTION ACTION AND MONITORING PLAN

1720 Walton Road, Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

RADIATION PROTECTION ACTION AND MONITORING PLAN

Prepared for:

ELCON RECYCLING SERVICES, LLC

FALLS TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA FACILITY

Prepared by:

IES ENGINEERS
BLUE BELL, PENNSYLVANIA

Endorsed by:

A. LaMastra

Anthony LaMastra, Certified Health Physicist

IES PROJECT NO. EV171065.01

FEBRUARY 2017

ENGINEERS

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1.0 EMERGENCY CONTACTS

Elcon Recycling Services Environmental Health & Safety Manager	(To Be Provided Upon Startup)
PA Department of Environmental Protection, Southeast Regional Office	484-250-5920 (24 hr emergency #) 484-250-5914 (Main Fax)
PA Department of Environmental Protection, Headquarters	717-783-2300
PA Department of Environmental Protection Eastern Region Emergency Response Program Mgr.	484-250-5942
State Police (Troop M Trevose)	215-942-3900
PADEP Area Health Physicist Southeast Region	484-250-5920
IES Engineers	610-828-3078

2.0 INTRODUCTION

The Pennsylvania Department of Environmental Protection (Department) has amended its regulations under 25 Pa Code Chapter 297.113 to require waste disposal, processing and transfer facilities to install radioactive material (RAM) monitoring systems and adopt action plans to safely and properly respond to the detection of RAM by these systems. This plan is developed in response to these requirements. The plan was developed by IES Engineers and reviewed for accuracy and completeness by Mr. Anthony LaMastra, Certified Health Physicist (CHP); a summary of his education and experience is presented in Section 12. Elcon Recycling Services, LLC (Elcon) has not yet selected an Environmental Health & Safety (EHS) Manager since the facility is still in the design phase. Elcon will hire an EHS Manager prior to the facility becoming operational. The EHS Manager will be responsible for the implementation and maintenance of this plan. The plan has been developed to anticipate alarm scenarios likely to occur at the Elcon facility which is to be constructed at 100 Dean Sievers Place in Falls Township, Bucks County, Pennsylvania. This Radiation Protection Action and Monitoring Plan will be reviewed periodically and any revision will be submitted to the Department for approval as indicated in Section 6.7 Revisions to the Plan.

Elcon will be situated on an approximate 33-acre parcel of land in Bucks County. The plant area is estimated to occupy approximately 110,000 square feet, and the site's footprint is located on a Brownfield site. Elcon is proposing to construct a commercial facility for treatment of hazardous and residual liquid waste streams.

The proposed facility models a successful treatment process being utilized in Israel for over a decade in which industrial wastewaters are treated. As this is a commercial facility, many different types of wastes are received by the facility from many different customers (hazardous and residual waste generators) which is then mixed according to the needs of the appropriately selected treatment process.

Elcon will accept many types of residual wastes. A list of the state –regulated residual waste codes is presented in Attachment 1.

The waste will arrive in trucks of various sizes and capacities. After the trucks are weighed, they travel to unloading areas where the contents of the truck are sampled to confirm contents and, upon verification, are offloaded. The radiation monitoring system will be located at the entrance of the facility at the truck scale. Inbound trucks will pass through the monitoring system as they enter the truck scale. Signs will be posted at the beginning of the scale alerting drivers of the procedures to be followed, including the requirement that speeds through the monitoring system not exceed 3 mph. All waste is received and weighed and all waste vehicles will be scanned for radiation using the installed monitoring system.

No vehicles are received in the absence of a scale operator. The radiation monitor controller is located at the at the security desk, with a visible and audible alarm signal located so that it is visible and audible at the scale. The system will only print alarm reports.

All materials are profiled and conditionally accepted prior to entering the Elcon facility. Upon entry to the facility, the truck will be screened for radioactivity. In addition, the truck load will undergo laboratory analysis before receiving approval to unload. Elcon will not accept radioactive waste above the background level and will outright reject all loads that cause an alarm. Vehicles hauling loads where radioactivity is confirmed above background will be directed to the "Survey/Holding Area" where a survey will be made. The vehicle will remain parked until an approved DOT SP-11406 form is received from the Department. Therefore, the potential for radiation exposure to workers and the public has been evaluated and found to be very limited. Past experience has shown that even during truck surveys, radiation exposure rates are typically well below 100 microrem (μrem) per hour and the surveys take only a few minutes to accomplish. Thus, the potential for significant external radiation dose is minimal and should be well below 2,000 μrem (2 millirem) in an hour or 100,000 μrem (100 millirem) in a year. Elcon will perform the initial external radiation surveys to determine if the source of radiation is from the driver or from the load, and if from the load, Elcon will reject the shipment.

Since the waste is monitored for radiation as it approaches the scale, the identity of the waste hauler, and the waste generator will be known.

All reports of detected radioactive material, alarm reports, truck and, radionuclide identifications, and the final disposition of the waste will be recorded in the plant's operational records as required by Title 25, Section 283.261. The annual operational report will contain a report of all detected radioactive material and its disposition.

Copies of this plan will be located in the Elcon's administrative office, the Scheduling/Receiving Supervisor, the EHS Manager's office, the Laboratory Manager's office, and at the Security desk.

3.0 DESCRIPTION OF THE MONITORING SYSTEM

Elcon will install a Ludlum model 375P-1000 (or equivalent) at the entrance to the truck scale. The Ludlum model 375P-1000 (Model 375P-1000) is a computer-controlled portal type radiation monitoring system having approximately 1,000 cubic inches of plastic scintillation detector media contained in two detector enclosures, one on each side of the end of the scale. Each plastic detector slab is 48 inches by 5 inches by 2 inches thick; the detectors are oriented with the long axis in a vertical direction to provide adequate coverage of a wide height range of vehicles. The computer controller, which also contains the readout and the visual and audible signals in the event of an alarm, will be located at the security desk. All alarms will be recorded. In addition, the security manager will instruct the driver to park in the holding area, if necessary.

If the alarm set-point is exceeded, both an audible and visual signal on the controller cabinet is activated, thereby alerting the security desk. If an alarm is triggered, the scale operator through the security desk will instruct the driver to go through the detectors again to verify the initial alarm. In the event that radiation is detected above the maximum set by the Department (10μR/hr above background), the driver will be alerted by the scale operator through the security desk and directed to move the vehicle to the "Survey/Holding Area" where an initial survey of the vehicle will be made by the shift supervisor. The "Survey/Holding Area" is shown on the plot plan. The driver will also be instructed to not remain in the vehicle in order to keep radiation doses as low as reasonably achievable. The vehicle will remain in the staging area for the characterization of the waste and until an approved DOT SP-11406 permit is received from the Department. Elcon will not accept any radioactive waste. No vehicles will be accepted unless the scale Scheduling/Receiving Supervisor, or designee, is available to evaluate the load.

At the present time, the background at the proposed location for the scale is unknown; however, it will be located in the truck staging area within the hazardous waste facility boundary. When the scale is constructed, prior to operation, Elcon's designee will measure the background radiation levels through direct measurement and should the background exceed 10 μR/hr, shielding will be used to lower the background below 10 μR/hr. After the background level is known, the detection system will be set to alarm at an exposure rate not exceeding 10 μR/hr above background.

4.0 DESCRIPTION OF PORTABLE SURVEY EQUIPMENT

Elcon will purchase portable survey equipment which will be used when a signal from the Ludlum model 375P-1000 portal monitor indicates the possible presence of radioactive material or when there is a visual observation of suspected radioactive material. The portable survey equipment and potential use is summarized below:

- RadComm Syclone Portable Gamma-Ray Spectrometer survey meter (or equivalent). Herein after referred to as "portable detector". Energy Range: 20keV – 3.4MeV; Dose Range: NaI Detector: 0μR/h – 4mR/h (0nSv/h – 40μSv/h); GM Detector: 4mR/h – 1R/h (40μSv/h – 10mSv/h) calibrated; Extended Range: 1R/h – 10R/h (10mSv/h – 100mSv/h) verified. This unit will be used to perform truck surveys as well as site surveys as part of routine monitoring for worker health and safety.

Appropriate check sources will be obtained and used to ensure proper operation of the scale radiation monitor each day and the survey equipment prior to each survey. Further specifications for the portable survey equipment are located in Attachment 2.

The scale radiation monitor and all portable survey instrumentation will be calibrated annually by a licensed calibration facility.

4.1 Additional Radiation Safety Supplies

Other supplies that will be maintained on site and be readily available in the event of an Action Level Response include: radiation warning signs (Caution-Radiation Area and Caution Radioactive Material), ropes, and cones.

5.0 RADIATION SAFETY TRAINING INFORMATION

Upon completion of construction activities and prior to operation, Elcon personnel will be trained in accordance with the Department's Final Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities (Document No. 250-3100-001, effective date January 2, 2004). Since it is unlikely that any member of Elcon personnel will exceed an annual radiation dose limit of 100 mrem, the staff will be considered a member of the public. A general training program will be presented to the EHS Manager, Laboratory Manager, shift supervisors, the scheduling/receiving supervisor (and designees), and security personnel. It is anticipated that the training will take approximately 8 hours. A 20 question test will be given at the end of each training course. The trainer will grade the tests. The written tests will be retained in Elcon's personnel and training files for Department review. Refresher training will be presented on at least a triennial frequency. New employees will be given the respective training prior to being permitted to perform the applicable duties. Below are outlines of the topics for both the General Radiation Safety Training Course and the Radionuclide Characterization Training Course.

5.1 General Radiation Safety Training Outline

The radiation safety training outline is presented in Attachment 3.

5.2 Radionuclide Characterization Training Outline

(This information is only given for staff familiarization of the characterization process. It is the intent that Elcon personnel will contact their consultant for the actual procedure.)

Introduction to the radiation physics of gamma emission: Physics of radioactive decay and the generation of gamma rays, decay schemes, and examples of MCA scan of radionuclides likely to be found in municipal and residual waste, concepts of distance and shielding, and their influence on radionuclide identification.

Multi-channel analyzers (MCA) and how they work.

- NaI and solid state detectors (including PMTs) – their operation and use, advantages and disadvantages.
- Set up and energy calibration of MCAs.
- Setting regions of interest.
- Operating technique.
- Interpreting MCA scans and energy peak identifications.

Demonstration of MCA operation.

Field use (by students) of MCA and identification of unknown radionuclides.

6.0 ACTION PLAN

6.1 Initial Response - Security

6.1.1 When an alarm occurs, the Ludlum 375P-1000 (or equivalent) will activate both audible and visible signals on the system controller at the security desk. Additionally, the system will print a report which provides the data on the alarm.

6.1.2 The scale operator will request the driver to drive through the monitoring system again.

6.1.2.1 If the vehicle fails to cause an alarm, have the vehicle drive through a third time.

6.1.2.1.1 If the vehicle causes an alarm on the third run, proceed with 6.1.3.

6.1.2.1.2 If the vehicle fails to cause an alarm on the second and third run, consider the initial alarm to be a false alarm and accept the load.

6.1.2.2 If the vehicle causes an alarm on the second scan, have the vehicle parked in the survey/holding area and proceed with 6.1.3. Request that the driver remain with the vehicle until the scheduling/receiving supervisor (or designee) has been notified.

6.1.3 The scale operator will notify scheduling/receiving supervisor (or designee) of the occurrence of confirmed detected radioactivity.

6.1.4 The Laboratory Manager (or designee) will obtain the RadComm Syclone (or equivalent) portable detector equipment found in the Laboratory Manager's office and standard safety equipment required by Elcon. Check the instrument calibration stickers to make sure the calibration due date has not passed. Make sure the instrument is operating properly by holding the detector against the check source and noting the response.

6.1.5 Using the Syclone (or equivalent) portable detector, make background measurements several feet from the vehicle and record the average reading on the Truck Survey Form.

6.1.6 Survey the driver to make sure the alarm was not caused by the driver. Record the driver survey results in μR/hr on the Truck Survey Form.

6.1.6.1 If the driver is found to be radioactive, ask the driver to move at least 100 feet away from the scale area and if he has had a medical treatment in the

past month. If yes, record any information he can provide on the Truck Survey Form.

6.1.6.2 Have the vehicle driven through the monitoring system with a new driver.

6.1.6.2.1 If the vehicle causes an alarm, proceed with 6.1.7. Ask the driver to move away from the vehicle while continuing with the survey.

6.1.6.2.2 If the vehicle fails to cause an alarm, consider the initial alarm to be due to the driver and accept the load.

6.1.7 Procedures for Truck Survey:

- **Approach the vehicle with the Syclone (or equivalent) Portable Detector** - while listening to the audio output from the survey meter. Elcon will be able to detect an increase in the exposure rate from the audio response faster than from the meter display. If a possible increase is noted, resurvey the same area several times to make sure it is coming from the vehicle and is not a random increase due to fluctuations in natural background.
- **Mark all areas on the vehicle showing increased radiation.** Closely recheck all areas that show elevated measurements.
- **Survey the cab and completely around the vehicle.** Make sure to keep the survey meter at each spot for at least 10 to 15 seconds.
- **Make sure you survey under the vehicle and the full height of the cargo area.**
- **Record the maximum reading noted for each measurement location on the** Daily Operational Form.
- **Make sure you record surveyors name, the date and time of the form, the model and serial number of the survey meter, the date of calibration of the survey meter and a sketch of the vehicle showing the approximate location of the maximum reading, a description of the vehicle (including the identity of the owner, driver, license plate number and truck number), and the reading(s) on the Daily Operational Form.**

6.1.7.1 If the highest reading **does not exceed 2 mR/hr in the cab or 50 mR/hr anywhere else against the truck,** the alarm requires an **Action Level 1** response (Section 6. 2).

6.1.7.2 If the highest reading **exceeds 2 mR/hr in the cab or 50 mR/hr anywhere else against the truck,** the alarm requires an **Action Level 2** response (Section 6.3). **Do not attempt to make a contamination wipe.**

6.1.8 Procedures for Truck Survey: Procedure for Fixed or Removable Contamination

- See Attachment 4

6.2 Action Level 1 - Elcon Initial Response

6.2.1 Action Level 1 is defined as a radiation level exceeding natural background by 10 microroentgens per hour (μR/hr) [0.01 mR/hr], but less than 2000 μR/hr [2 mR/hr] in the cab or 50,000 μR/hr [50 mR/hr] at 5 cm (about 2 inches) from exterior wall of the vehicle, and having no detectable removable contamination outside the cargo area of the vehicle. The important actions for Action Level 1 are maintaining control of the vehicle, confirming radiation levels, determining the nature of the radioactive material, andlimiting radiation exposure to people.

6.2.1.1 The driver should not remain in the vehicle so that radiation doses are kept "as low as reasonably achievable."

6.2.1.2 If the radiation measurements external to the vehicle exceed 100 μR/hr at 3 feet from the vehicle, set up cones completely around the vehicle, and post the area with "Caution – Radioactive Material" warning signs. If the radiation measurements do not exceed 100 μR/hr at 3 feet from the vehicle, it is not necessary to place the cones or post with radiation warning signs, but you may do so. Record all measurements on the Daily Operational Form.

6.2.1.3 Notify the Laboratory Manager, or designee, that a vehicle requiring an Action Level 1 response has been parked in the staging area.

6.2.1.3.1 The Laboratory Manager, or designee, will either contact Elcon's radiation consultant to identify the radionuclide or perform their own identification as in 6.4.2.

6.2.2 Perform a contamination wipe of the exterior of the vehicle, as described in Attachment 4. Be sure to record results on the Daily Operational Form

6.2.2.2 If contamination is not found, record this result on the Daily Operational Form

6.2.2.1.3 Check the surveyor for contamination after making the survey.

6.3 Action Level 2 - Elcon Response

6.3.1 Action Level 2 is defined as a radiation level exceeding 2 mR/hr in the cab or 50 mR/hr at 5 cm (2 inches) from any exterior wall of the vehicle or having detectable

removable contamination outside the cargo area of the vehicle. Action Level 2 requires immediate notification to the Department Area Health Physicist Southeast Region. The important actions for Action Level 2 are to maintain control of the vehicle, proper posting of signs, limiting radiation exposure to people, and notification to the Department and owner of the vehicle.

6.3.1.1 The driver should not remain in the vehicle so that radiation doses are kept "as low as reasonably achievable."

6.3.1.2 Set up cones completely around the vehicle at an exposure rate not exceeding 500 μR/hr (0.5 mR/hr). This may extend several feet from the vehicle. Post the area with "Caution – Radioactive Material" warning signs. Record all measurements on the Daily Operational Form.

6.3.1.3 Notify the Laboratory Manager that a vehicle requiring an Action Level 2 response has been parked in the staging area.

6.3.1.3.1 The Laboratory Manager or designee will immediately contact the Department.

6.3.1.3.2 The Laboratory Manager or designee will contact the owner of the vehicle and notify them of the existence of an Action Level 2 alarm.

6.3.1.3.3 The Laboratory Manager or designee will also provide the Action Level 2 Information Form to the driver.

6.3.1.4 In order to maintain exposure to radiation as-low-as-reasonably-achievable (ALARA), no contamination wipes or further characterization will occur until the Department Health Physicist has been contacted Elcon should also contact their radiation consulting firm at this point.

6.4 Characterization of the Waste and Radionuclide Identification

6.4.1 Once the "hot spot" is located, select "Identify" on the Syclone and take a reading for at least 60 seconds. The Syclone will automatically search its library for known radionuclides and display the radionuclide. Print out a copy of the identification report for filing. If the Syclone fails to identify the radionuclide, contact the radiation consulting firm for guidance in using the instrument in its manual mode.

6.4.2 If the radionuclide is a short-lived medical radionuclide (< 65 days half-life) or potassium 40, complete a DOT SP-11406 and follow the procedures in 6.5.1.

6.4.3 If the radionuclide is not a short-lived medical radionuclide (< 65 days half-life) or potassium 40, notify the DEP for guidance.

6.4.4 Alternatively, Elcon may choose to contact their radiation consulting firm to identify the radionuclide.

6.5 DOT Exemption

6.5.1 All waste will be stored in the vehicle while awaiting a DOT SP-11406 exemption permit. The vehicle will remain in the survey/holding area until an approved DOT SP-11406 exemption permit is received.

6.5.1.1 If the exposure rate does not exceed 100 μR/hr at 3 feet from the vehicle, there is no need to post the vehicle with "Caution – Radioactive Material" signs. If the exposure rate exceeds 100 μR/hr at 3 feet from the vehicle, establish a restricted area around the vehicle and post with "Caution – Radioactive Material" signs.

6.5.1.2 If the Holding area is close to the permit boundary, the exposure rate at 3 feet from the vehicle should not exceed 50 μR/hr.

6.5.1.3 Complete the DOT SP-11406 exemption form and FAX it to the Department. The waste cannot leave the site until a signed form is received from the Department.

6.5.1.4 Once an approved DOT SP-11406 exemption permit is received from the Department, the vehicle may be released.

6.5.1.4.1 The Laboratory Manager or designee will notify the waste owner and forward a copy of the DOT SP-11406exemption permit.

6.5.2 If Driver leaves site without approved DOT SP-11406 permit

6.5.2.1 In the event a driver attempts or succeeds in driving a contaminated vehicle or vehicle containing contamination off site without Department authorization and an approved DOT SP-11406 form, notify the Pennsylvania State Police and the Department.

6.5.2.2 Advise the State Police and the Department of the following:

- Nature of event
- Description (make, model, color, name) and license number of the truck
- Time vehicle left site, direction of travel, and destination if known

6.6 Disposition of Waste

After further characterization and radionuclide identification and in consultation with the Department Area Health Physicist, Elcon may choose to:

6.6.1 Accept the waste if it is low level NORM (naturally occurring radioactive material) containing potassium compounds

6.6.2 If the load is to be rejected, complete the DOT Exemption Form in Attachment 5.

6.7 Revisions to the Plan

6.7.1 The Action Plan will be reviewed by the EHS Manager or designee when any of the following occur, and appropriate changes will be made and submitted to the Department for approval.

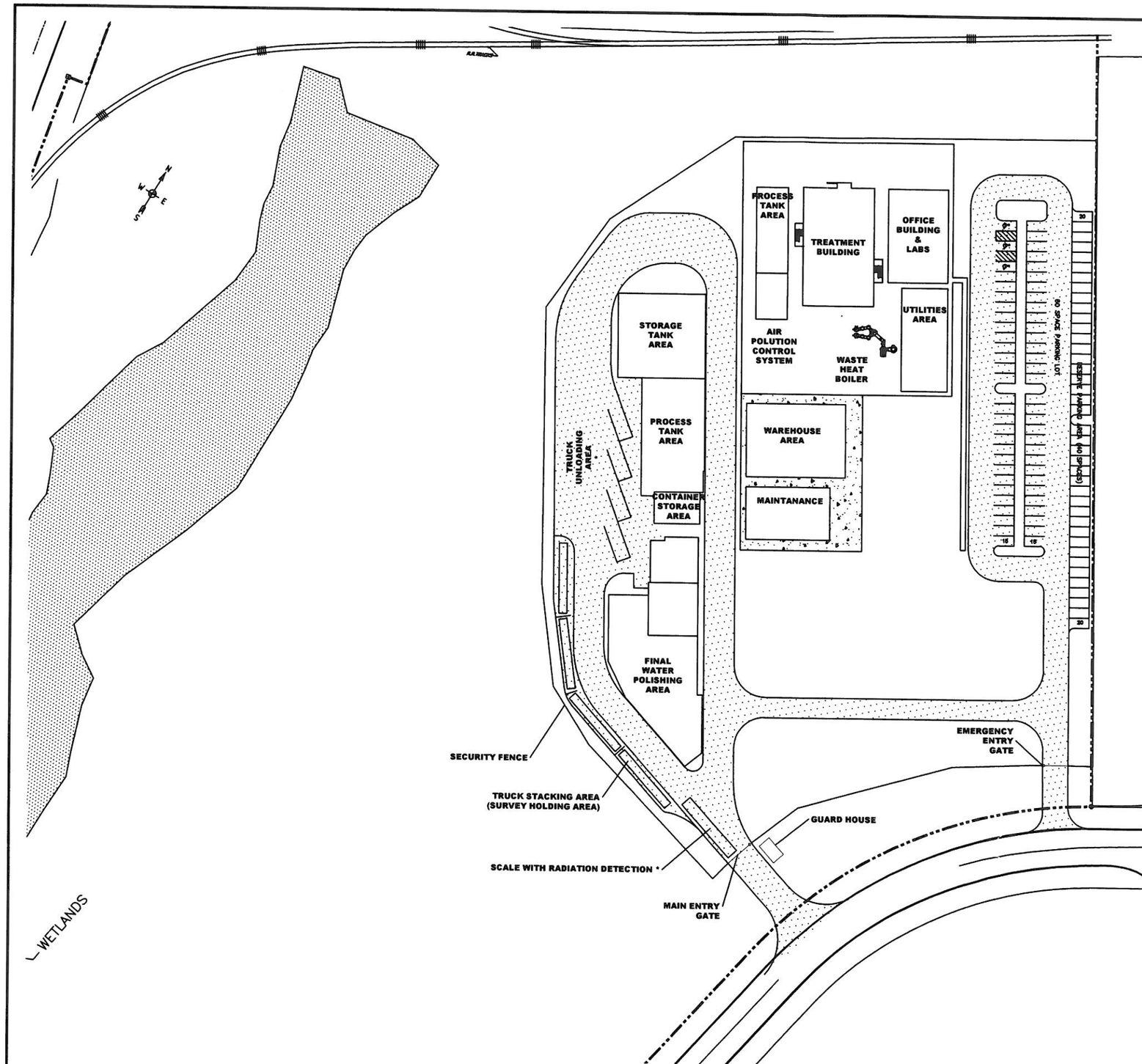
- Applicable Department regulations or policies are revised.
- The Action Plan fails during an incident.
- The facility operation changes in a manner that would interfere with the implementation of the Action Plan.
- The individual responsible for implementing the plan changes.
- The monitoring equipment is changed.
- The designated staging area for vehicles in which radioactive material has been detected changes.
- As otherwise required by the Department.

Plan Review and Amendment Table

Date	Facility Reviewer	Activity (i.e. Scheduled Review, Plan Amendment)	Comments

7.0 FACILITY DIAGRAM

Figure 1 is a diagram of the facility, showing the location of the monitoring systems and the vehicle survey/holding areas.



NOTES:

1. A PORTABLE DETECTOR WILL BE STORED IN THE LABORATORY MANAGER'S OFFICE.

ENGINEERS
ENGINEERING FOR INDUSTRY
1720 WALTON ROAD, PA 19422
PHONE: (610) 828-3078
BLUE BELL, PA 19422
FAX: (610) 828-7842

FACILITY DIAGRAM

ELCON RECYCLING FACILITY
FALLS TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

Date:	File:	Drg. No.	Revision:
12-16-16	EV161065.01	FIGURE 1	—

8.0 SAMPLE FORMS

The following sample forms are attached to this document:

- Truck Survey Form
- Daily System Check Form
- DOT SP-11406 Exemption Form
- Action Level 2 Informational Form for Driver
- Daily Operational Record

9.0 CALIBRATION PROCEDURES FOR FIXED RADIATION MONITORS

ELCON WILL CALIBRATE ITS RADIATION MONITORING SYSTEM ANNUALLY.

The Ludlum model 375P-1000 (or equivalent) will be initially set up by the manufacturer (or designated representative) to comply with the Department's requirement of alarming at 10 μR/hr above background. The system will be allowed to operate and the two detector high voltages will be adjusted until each detector has a similar count rate. The average background will then be determined for both detectors. A calibrated cesium 137 source having known exposure rates at fixed distances will be used to expose each detector to 10 μR/hr above background and the sigma above background adjusted until each detector reliably alarms at 10μR/hr above background. Once the system is set, the system parameters will be recorded. The model 375P-1000 has an internal system diagnostic program that checks the parameters to make sure they remain the same. The computer display will show system failures. Otherwise the system will be recalibrated annually.

10.0 CALIBRATION PROCEDURES FOR PORTABLE RADIATION SURVEY INSTRUMENTS

Portable survey instruments used by Elcon will be calibrated by a facility licensed to perform such services. The Syclone is energy calibrated and the exposure rate calibration is checked each time the instrument is turned on by placing the cesium 137 check source against the detector and allowing the instrument to "stabilize." This adjusts the gain and high voltage of the internal MCA so that the cesium 137 gamma peak at 662 keV is in the proper channel. Successful stabilization also assures that the dose rate is consistent with the last calibration. Attachment 10 contains a copy of the dose rate calibration procedures used by Health Physics Associates, Inc.

11.0 CALIBRATION PROCEDURES

To calibrate the fixed monitor, Elcon will utilize licensed and approved companies familiar with the calibration of radiation detection equipment to assure that it alarms at a rate not to exceed 10 uR/hr above background.

Attachment 10 contains the calibration procedures used by Health Physics Associates, Inc.

12.0 QUALIFICATIONS OF PERSONS PREPARING AND IMPLEMENTING THE ACTION PLAN

A summary of the experience of the person preparing this Action Plan is included below for review. Once Elcon has selected an EHS Manager or designee, a summary of their experience will be provided to the Department for review.

Mr. Anthony LaMastra is a Certified Health Physicist and the principal of Health Physics Associates, Inc. He has a Master of Public Health from the University of Minnesota (1970). From September 1969 through January 1972 he was employed by the Pennsylvania Department of Environmental Resources, responsible for the radiation safety program in the eastern third of Pennsylvania. From February 1972 through October 1984 he was employed by Bethlehem Steel Corporation (Bethlehem) as the Corporate Senior Health Physicist and was responsible for Bethlehem's radiation control program. In January 1985, Mr. LaMastra started Health Physics Associates, Inc., a radiation protection consulting company that focuses on industrial clients. Following the discovery that a radioactive source had been melted in a steelmaking furnace in New York State, Mr. LaMastra worked with the steel industry and radiation detection manufacturing companies to develop scrap monitoring systems. In 1995 and 1996, Health Physics Associates conducted tests of scrap monitoring systems for the Steel Manufacturers Association. When the Pennsylvania Department of Environmental Protection instituted their requirements that waste disposal facilities install radiation detection systems and develop plans to respond to alarms if radiation is detected, Mr. LaMastra began assisting waste disposal facilities in specifying detection systems, developing their action plans, and responding to alarms. Mr. LaMastra is the author of papers presented to governmental agencies and professional societies on radiation monitoring and response at waste facilities. His clients include some of the largest companies in this field.

ATTACHMENT 1

PROPOSED RESIDUAL WASTE CODES

PART A SITE INFORMATION FORM ITEM 11.B.
WASTE CODES FOR STATE-REGULATED RESIDUAL WASTES
ELCON, FALLS TOWNSHIP, PENNSYLVANIA

Code[1]	Description
111	Lubricating Soaps
201	Water Treatment Plant Sludge/Sediment
203	Industrial Wastewater Treatment Sludge/Sediment Including Acid Mine Drainage Sludge
204	Metallurgical Sludge
205	Food Processing Sludge
206	Paint, Coating Sludge and Scale
207	Tank Bottoms
208	Still Bottoms
209	Oily Sludge, Petroleum Derived
213	Lime-Stabilized Spent Pickle Liquor
214	Cooling Tower Sediment/Sludge
301	Acidic Chemicals (pH<6)
302	Basic Chemicals (pH>8)
303	Combustible Chemicals, Non-Haz
304	Chemical Salts
308	Spent Dyes
310	Detergents, Cleaning Agents
311	Off-Spec Products, Intermediates
312	Pharmaceutical, Biological (Mfg and Lab Wastes)
313	Wax, Paraffin
314	Alcohols (Non-Haz)
315	Solvents (Non-Aqueous, Non-Haz)
316	Solvents (Aqueous, Non-Haz)
317	Glycols/Antifreeze, Machine Coolants
318	Photographic Chemicals (Non-Haz)
320	Spent Plating Baths (Non-Haz)
399	Other Chemical Wastes
401	Leather Wastes
411	Agricultural Wastes (Fertilizers, Pesticides, Feed, Feed Supplements)
420	Process Wastewaters (Non-Haz)
421	Contaminated Non-Contact Cooling Waters
422	Oil/Water Emulsions, Oily Wastewaters
423	Landfill Leachate
430	Food Wastes (Excluding Wastewater Treatment Sludge)
440	Resins
503	Oil Containing Waste (absorbent, rags)
504	Paints (Liquid)
509	Waste Oil That is Not Hazardous Waste Oil (automotive, machining, cutting, etc.)
801	Non-oil and Gas Well Drilling Waste -includes drilling fluids, residuals, and drill

Code[1]	Description
	cuttings from monitoring well and drinking water well construction
802[2]	Produced Fluid – includes flow-back[2], brine and any other formation fluids recovered from the wellbore. Flow-back is defined as fracturing/stimulation fluids, including fracturing sand recovered from the wellbore after injection into the wellbore.
803	Drilling Fluid Waste – oil and gas drilling mud, other drilling fluids other than fracturing fluid and spent lubricant.
804	Wastewater Treatment Sludge – sludge generated during the processing of any oil and gas-related wastewater including any sediment generated during storage of oil and gas-related wastewater. Mixed loads of wastewater treatment sludge with other waste for disposal purposes, such as filter socks (RWC 812), will be coded as RWC 804.
808	Servicing Fluid – oil and gas production well maintenance/work over fluids, oil/water-based mud and foam and well cellar cleanout waste after drilling operations have been completed. Does not include well cellular cleanout waste covered under existing RWCs, well cellular fluids that are recycled/reused, or rainwater that is collected in a well cellular that has not been mixed with a residual waste.
809	Spent Lubricant Waste (spent oil and gas drilling lubricants, spent plug drilling lubricants)
899	Other Oil and Gas Wastes – all remaining oil and gas wastes other than those already covered under existing RWCs. Includes containment water. Does not include rainwater that is collected in a containment area that has not been mixed with residual waste.
902	Non-Hazardous Residue from Treatment of Hazardous Waste (other than 203)
999	Other

[1] Residual Waste Codes are from 2540-PM-BWM0404, revised May 2016. The Department appears to be updating this list again but final is not yet available. Elcon is proposing to accept non-fracking drilling fluids.

[2] Elcon will not accept flowback wastes as this is related to fracking. Elcon will accept brine and other formation liquids generated by non-fracking drilling methods.

Note

Elcon will not accept liquid waste related to fracking. Pennsylvania Residual Waste Code 805, Unused Fracturing Fluid Waste (oil and gas fracturing/stimulation fluid waste and fracturing sand waste that has not been injected into a wellbore), has not been included in the list above.

ATTACHMENT 2

SURVEY INSTRUMENT SPECIFICATIONS

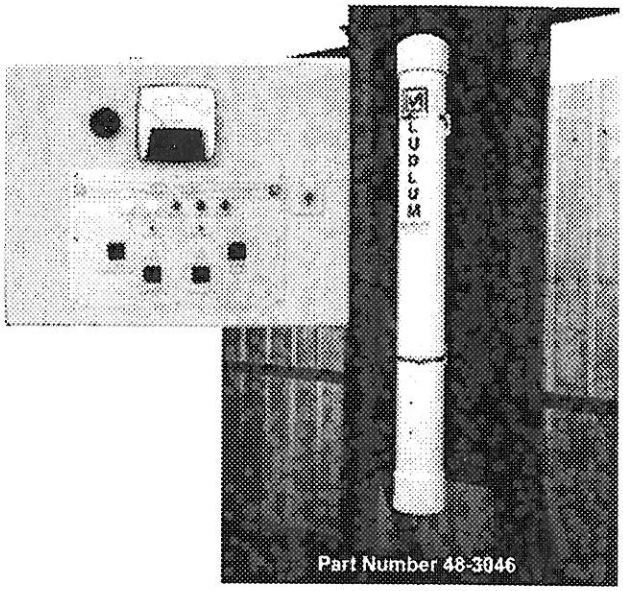
Model 3500-1000
Vehicle Gateway Monitor

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Features

- **Weatherproof Plastic Scintillation Detectors**
- **Infrared Vehicle Approach Sensors**
- **User-Adjustable Alarms**
- **RS-232 Interface**
- **Check Source**
- **Microprocessor Based Electronics**



Part Number 48-3046

Introduction

The Model 3500-1000 Vehicle Gateway Monitor is designed to detect low levels of gamma radiation. The system continuously monitors background radiation until infrared sensors detect an object within range. It then automatically switches to checking for radiation caused by contamination until the object clears the sensors. The system will then return to monitoring background levels.

Two scintillation detectors, each with approximately 7866 cm^3 (480 in^3) of plastic detector material (PVT), provide coverage on both sides of a vehicle. The detectors are contained in weather tight PVC pipe. Their large size, 122 x 12.7 x 5 cm (48 x 5 x 2 in.) (H x W x D), provides a large area for the capture of gamma radiation.

The monitor is very easy to use, requiring minimal operator interaction. Upon power-up, the monitor requires approximately 15 seconds to measure background readings prior to operation. Diagnostic routines, with indicators that warn of possible detector failure, provide assurance that the system is operating correctly. Meter override buttons check the count from each detector.

The microprocessor-based electronics are housed in a NEMA 12 steel box. This unit provides automatic background compensation and automatic alarm point setting above the current background reading. Each system is also equipped with infrared sensors to detect vehicle presence, which signals the controller to begin monitoring. Each detector has its own high-voltage power supply to minimize the risk of total system failure.

The internal, user settable alarms allow for tamper-resistant operation of the system. A digital RS-232 output provides a connection for a computer or printer. An alarm relay output is also provided to drive additional beacons or sirens. A Date/Time Printer is included with each system.

Specifications

DETECTORS: (2) 7866 cm^3 (480 in^3) plastic scintillation detectors with 0.32 cm (0.13 in.) lead shielding in weather tight PVC housings

ELECTRONICS:

- METER: 15.2 cm (6 in.) arc 1 mA analog type
- DIAL: 0-25 kcps
- CHANNEL 1: checks the count rate on channel 1
- CHANNEL 2: checks the count rate on channel 2
- CHECKING: (green LED) vehicle is passing through system
- SYSTEM OK: (green LED) system is functioning properly
- FAIL 1: (yellow LED) signal not received from detector 1
- FAIL 2: (yellow LED) signal not received from detector 2
- ALARM: red LEDs, red flashing lamp, and audible tone
- AUDIO: unimorph-type speaker (> 68 dB at 61 cm [24 in.])
- AUDIO ACKNOWLEDGE: silences the audio after an alarm
- ALARM RESET: resets the alarm

ELECTRONICS CONSTRUCTION: steel NEMA 12 enclosure

RS-232: 9-pin to connect data-logging computer

CONTROLS: 5-pin to connect infrared sensors

RELAYS: 3-pin to connect optional red alarm strobe or other external alarm indicators

POWER: 95-135 Vac (178-240 Vac available on request), 50-60 Hz single phase

TEMPERATURE RANGE: -15 to 50 °C (5 to 122 °F)

SIZE: detectors (ea.): 20.3 cm x 183 cm (8 x 72 in.) (Dia x L)
electronics: 38.1 x 30.5 x 16.5 cm (15 x 12 x 6.5 in.)

WEIGHT: detectors (ea.): 29.5 kg (65 lb)
electronics: 8.2 kg (18 lb)

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

ATTACHMENT 3

RADIATION TRAINING OUTLINE

Attachment 3

Outline of Radiation Training for Elcon Staff

1. **Introduction to Radiation**

   What is radiation? Where does it come from?

   What is radioactive material?

   Types of radiations (Alpha, beta, gamma)

   Our exposure to radiation (background, medical, occupational, consumer products)

2. **How we measure radiation**

   Units of radiation dose and exposure

   Measurement of quantity of radioactive material (cpm; dpm; curie; becquerel)

3. **Identifying and detecting radiation**

   Radiation Symbol

   Radiation Detecting Instruments (description, how they operate, when to use, what type of radiation they detect)
   - GM tubes or gas filled detectors
   - Sodium iodide or scintillator detectors

   Hand held radiation survey instruments

   Stationary portal-type radiation monitoring system

   Specialized multi-channel analyzers

4. **Radiation Protection**

   Using time, distance, and shielding

   What is contamination?

   Controlling radioactive contamination

   Protecting yourself and others and controlling the spread of radioactivity:

Applying the concepts of time, distance, shielding
Use of protective clothing
Equipment contamination
Personnel clean-up
Monitoring

5. **Basics of biological effects of radiation exposure**

What we know about radiation damage and how we know it

Some acute and chronic biological effects

Other waste hazards (biological and chemical)

Putting all into perspective (risk)

6. **Federal and State Radiation Protection Standards**

Controlling radiation exposure to the public

Controlling radiation exposure to workers

Your radiation exposure

7. **Elcon Recycling Facility Radiation Protection Action Plan**

Action Level 1
- Initial Response of Scale Operator
- Interacting with the Driver
- Follow-up Truck Survey
- Performing a Contamination wipe

Action Level 2
- Isolating the Vehicle
- Securing and Posting the area
- Interacting with the Driver

8. **Hands-on Training**

Portable Radiation Survey Equipment

Turning on equipment; testing operation; selecting proper scale; reading the meter
Checking calibration date

- Properly using the probe
- Detecting various types of radiation (beta, gamma)
- Using distance and shielding to reduce radiation exposure

Visiting the Entrance Portal Monitor
- Operation of the portal monitor
- How alarm set-point is established
- Alarm procedure
- Records

Facility Walk-through
- Storage of safety equipment
- Location of radiation survey equipment
- Vehicle monitoring area
- Survey/Holding Area

Truck Survey
- Preparing to use the Portable Detector
- Proper Truck Survey Procedure
- Completing Truck Survey Form (Daily Operational Form)
- Posting Area
- Notification to EHS Manager

Procedure for Contamination Detection
- Procedure for Removable Contamination Detection
- Procedure for Fixed Contamination Detection

Identifying Potential Radioactive Material
- Visual identification
- Handling object
- Isolation of object/material

(TRAINING PROVIDED TO SUPERVISORY AND MANAGEMENT LEVEL PERSONNEL)
- Notification requirements to the Department
- Characterization of Waste
- Completing DOT Exemption SP-11406
- When to notify PA State Police

ATTACHMENT 4

PROCEDURE FOR CONTAMINATION DETECTION

Attachment 4

Elcon Recycling Facility
Procedure for Detection of Fixed or Removable Contamination

1. Purpose

- The purpose of this procedure is to standardize the method for removable contamination detection.

2. Precautions

- Appropriate personal protective equipment (gloves, safety glasses) must be worn when this procedure is implemented

3. Equipment

- Suitable wipe such as a tissue, piece of paper towel, or wipe provided with safety equipment
- Heavy duty plastic wrap for contaminated objects
- Latex or similar gloves
- Acceptable radiation detector equivalent
- Truck Survey Form

4. Procedure to Determine Removable Radiation Contamination

- Turn on radiation survey meter you will be using and record the background radiation.
- On the Contamination Survey Form, identify the survey instrument information and the location you will be wiping.
- Wear Latex gloves
- With a dry tissue or paper towel wipe an area on the exterior of the vehicle of about 2 in by 18 in in an "S" figure using medium pressure.

- With the "dirty" side of the paper face up, place the probe of the radiation survey meter 1/4 inch above the paper for 15 seconds.
- Record your result. Any reading which is twice background or greater should be considered contaminated. If your result is less than twice background, the paper is not contaminated.
- Place the wipes in an envelope and save for EHS Manager.
- Remove gloves and save for EHS Manager

5. **Common mistakes made during the survey:**

   Do not hold the probe too far from the surface. It should be 1/4" inch away.

   Do not contaminate the probe by touching it to a surface.

   Be sure to check background radiation levels away from suspected radiation.

ATTACHMENT 5

DOT SP-11406 EXEMPTION FORM

Annex A

DOT-SP 11406 SHIPMENT APPROVAL FORM

Approval Number ____ ____ ____ _____ (Refer to SP 11406, paras. 8a-8b)

This shipment of waste contains unidentified radioactive material causing low levels of radiation outside the transport vehicle. Shipment is under Special permit DOT-SP 11406 without a determination of materials meeting or not meeting the regulatory definition of radioactive material. The shipment is a minor radiological concern based on considerations of the U.S. Department of Transportation and the state official signing this shipment approval document.

==========

DETAILS of DETECTION SITE, MATERIALS, and ORIGIN

Facility: Name _____ Type: _____

Address: _____

① Contact person: _____ Ph. _____ Fax. _____

☐ Highway or ☐ Rail Vehicle Type: _____ Id.No.: _____

Company: _____ Operator name: _____

② Contact person: _____ Ph. _____ Fax. _____

Description of waste and release risks: _____

_____

Radiation Measurement Date/time performed: _____

mrem/h (max) _____ location on vehicle _____

Inst.Mfgr./type/model _____ Bkg. mrem/h _____

Surveyor name: _____ Ph. _____

Shipment Origin Company: _____ Location: _____

Waste Origin: _____

③ Contact person: _____ Ph. _____ Fax. _____

==========

RADIATION CONTROL OFFICIALS (Detection, Origin, Transit, Destination States)

Detection State Official (receiving radiation detection info) Name: _____

④ Organization _____ Ph. _____ Fax. _____

Origin State Official (prior to detection) Name: _____

⑤ Organization _____ Ph. _____ Fax. _____

Transit State Official(s) (after detection) Name: _____

⑥ Organization _____ Ph. _____ Fax. _____

Destination State Official (after detection) Name: _____

⑦ Organization _____ Ph. _____ Fax. _____

==========

SP-11406 Approval Number ____ ____ ____ _____

Page 2

==========

DESTINATION for RADIOACTIVE MATERIAL IDENTIFICATION and DISPOSITION

If carrier and shipper to this location are different than ② and ③, show info in REMARKS

Company Name: _____ Location: _____

⑧ Contact person: _____ Ph. _____ Fax. _____

==========

APPROVAL of SHIPMENT and SPECIAL CONDITIONS Date: _____

Conditions: _____

_____

_____

⑨ Signature: _____ Ph. _____ Fax. _____

Title _____ Organization _____ Date _____

==========

IDENTIFICATION of RADIOACTIVE MATERIAL and DISPOSITION INFORMATION at DESTINATION

_____

_____

_____

⑩ Name: _____ Title: _____ Date: _____

Organization: _____ Ph. _____ Fax. _____

==========

RECORD of TRANSMITTALS (Shipment Approvals and identification/disposition)
(Circumstances may influence distribution)

Shipment Approvals (Sent by ④ or ⑨) to (Show date sent)

OED CRCPD_____ ① _____ , ② _____, ③ _____,

⑤ _____, ⑥ _____, ⑦ _____, ⑧ _____,

OTHER _____

Record of Identification and Disposition (Sent by ⑧, ⑩, or other ____) to

④ _____, ⑤ _____, ⑦_____, OED CRCPD _____

OTHER _____

==========

SP-11406 Approval Number ____ ____ ____ _____

REMARKS, OTHER INFORMATION

In case of an emergency, notify the National Response Center ((800)424-8802) and the (⑨) authorizing official and give the Special permit No. and Approval No.

ATTACHMENT 6

DAILY SYSTEM CHECK FOR PORTAL MONITORS

ELCON RECYC. ‹G SERVICES, LLC

ATTACHMENT 6 - DAILY SYSTEM CHECK FORM FOR PORTAL MONITORS

CHECK MADE BY	DATE	NO SYSTEM ERRORS	AUDIBLE ALARM	VISIBLE ALARM	RADIATION TEST	PORTAL ALARM SET POINT	BACKGROUND RADIATION LEVEL	COMMENTS
		☐	☐	☐	☐			
		☐	☐	☐	☐			
		☐	☐	☐	☐			
		☐	☐	☐	☐			
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		☐	☐	☐	☐			
		☐	☐	☐	☐			
		☐	☐	☐	☐			

Report any unacceptable observations to the EHS Manager or designee.

ATTACHMENT 7

ACTION LEVEL 2 INFORMATION FORM FOR DRIVERS

ELCON RECYCLING FACILITY
ACTION LEVEL 2 – DRIVER INFORMATION FORM

DATE:_____

This Waste load you are hauling has detectable radiation that meets the Pennsylvania Department of Environmental Protection's (Department) guideline for Action Level 2. This means that the radiation level in the truck cab may exceed 2,000 microrem (2 millirem) per hour or the radiation level anywhere else on the truck may exceed 50,000 microrem (50 millirem) per hour or radioactive contamination was found. This waste is not acceptable for treatment at this facility.

The radiation level in the cab was: _____μrem/hr

The maximum radiation level on other parts of the truck was: _____ μrem/hr

Detectable contamination was ❑ was not ❑ found.

The truck cannot leave the site until the Department issues an exemption permit. A copy will be given to you when it is received. A copy is also being forwarded to your office. You should contact your office to find out where the waste is to be taken once the exemption permit is issued.

Should you want to reduce your radiation dose, it is recommended that you not remain in the truck longer than is necessary.

If you have any questions about radiation, you may contact the Department's Bureau of Radiation Protection at: 484-250-5950 or 717-787-2480.

ATTACHMENT 8

DAILY OPERATIONAL FORM

DAILY OPERATIONAL FORM

Each person or municipality who operates a waste processing or disposal facility which has detected radioactive materials in any manner or radiation levels in excess of Action Level One to cause an alarm shall maintain records of each incident, containing the information set forth in section b, below, in the facility's daily operational record.

Date, time and location of occurrence: _____

_____

_____

Brief narrative description of occurrence: _____

_____

_____

_____

_____

_____

Origin of material: _____

_____

_____

Description of radioactive material: _____

_____

Name, address, telephone number of supplier, transporter or handler of ram and name of driver:

_____

_____

_____

_____

Final disposition of material: _____

_____

_____

Completed By: _____ Title: _____ Date: _____

ATTACHMENT 9

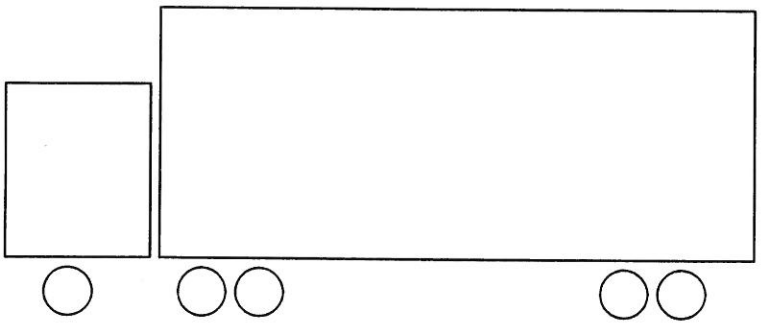
TRUCK SURVEY FORM

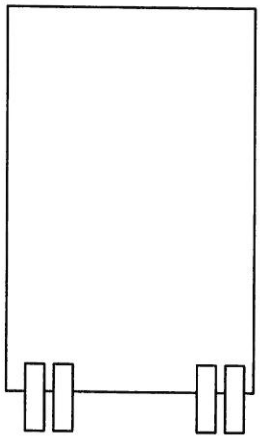
ELCON RECYCLING SERVICES, LLC - TRUCK SURVEY FORM

SURVEYOR			SURVEY DATE & TIME
ANUFACTURER / MODEL / SERIAL NUMBER OF SURVEY METER			CALIB. DATE
MANIFEST ID & DESCRIPTION OF WASTE			WASTE FORM
WASTE GENERATOR	ADDRESS		PHONE
WASTE GENERATOR CONTACT	TITLE		FAX
TRUCK OWNER	ADDRESS		PHONE
CONTACT	TRUCK LICENSE NO.	TRUCK ID NUMBER	FAX
TRUCK DRIVER	TIME OF ALARM		SYSTEM COUNT RATE
BACKGROUND (uR/HR)	LOCATION		
WIPE CONTAMINATION DETECTED YES ☐ NO ☐	DESCRIBE		

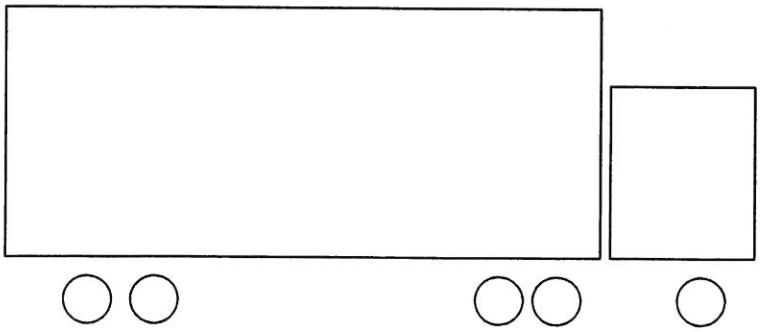
VEHICLE SURVEY

1. SHOW RADIATION MEASUREMENTS IN uR/hr
2. WIPE AT WASTE EXIT LOCATION AND SHOW ON FORM





REAR



ATTACHMENT 10

DETECTOR CALIBRATION PROCEDURES

Health Physics Associates, Inc.
Procedure for Calibrating Waste Facility Radiation Monitors (PA)
Revised - May 2007

The PA Department of Environmental Protection has instituted regulations requiring that waste disposal facilities and transfer stations have radiation monitors in place to scan vehicles bringing solid waste to the facility to determine if the waste is acceptable for processing. The regulations require that the monitors be calibrated using a cesium 137 source, traceable to the National Institutes for Standards and Technology (NIST), so that they alarm at an exposure rate not to exceed 10 μR/hr above natural background, where the background itself does not exceed 10 μR/hr. The following procedures describe the calibration method used by Health Physics Associates, Inc. to calibrate these monitors.

Site and System Description

1. Obtain information describing the radiation monitoring system: manufacturer, model, serial number(s), distance between the detectors, distances of the detector media above the ground, square area and thickness of the detector media, detector material, number of photomultiplier tubes for each detector, system output (cps, cpm, μR/hr, etc.), present alarm set-point, location of alarm annunciators (both visible and audible), is the controller a true multiple channel response or a single channel with dual inputs, methods of physical protection of the detectors, location of the readout and proximity to the detectors, presence or lack of automatic speed control, is a printer attached to the console and does a report print for each alarm, does the system identify the alarming detector, how to adjust the alarm set-point, other information that may be important.
2. Describe the operation of the monitoring system.
3. Determine the natural gamma background at the detectors using a calibrated micro-R type instrument.
4. Determine the location of the thickness centerline of each detector and mark the outer detector cabinet.

Calibration Procedure

5. Determine the distances from the source to the centerline of the detectors that will produce 8 and 10 μR/hr. Determine if the facility desires to have the system alarm beginning at 10 μR/hr or is a lower alarm set-point desired.
6. Allow the system to count background and record the background count/count rate.
7. Set up the stand in front of the first detector at a height above the ground that approximates the center (top to bottom and right to left) of the first detector so that the arm can be swung to the 8 μR/hr distance.
8. If the system has proximity sensors and these are required to be covered, cover the first sensor pair (receiver **or** sender), cover the second sensor pair (receiver **or** sender) then place the source on the stand arm and quickly swing the arm to the 8 μR/hr distance from the detector. Determine the count/count rate and record if an alarm has occurred.

9. If the facility desires a lower alarm set-point and the system has alarmed, go to step (10). If the facility desires that the alarm set-point be at 10 μR/hr, go to step (11).
10. Remove the source from the arm, allow the system to return to background and repeat step (9). Record the count/count rate, remove the source and repeat this step and the alarm set-point.
11. If the system has alarmed at 8 μR/hr and the facility desires that the system alarm at 10 μR/hr, adjust the alarm set-point higher. Repeat steps 9 and 10 until it no longer alarms at 8 μR/hr.
12. Move the stand so that the arm will be positioned at a distance producing an exposure rate of 10 μR/hr at the center of the detector.
13. Place the source on the stand arm and quickly swing the arm to the 10 μR/hr distance from the detector. Record the count/count rate and record if an alarm has occurred. If an alarm has occurred, repeat this test two more times, allowing the system to return to background in between each test. Record the count/count rate and record if an alarm has occurred.
14. If an alarm has not occurred, adjust the alarm set-point to permit an alarm at a lower count/count rate and repeat step (13) until it does.
15. Once you obtain three successive alarms at 10 μR/hr, record the alarm set-point.
16. If the detector is greater than 24 inches in length or diameter, move the arm of the detector so that it is no closer than 8 inches from the bottom edge of the detector media. Repeat steps 13 to 16. If the detector is less than 24 inches length or diameter, go to step (17).
17. Repeat steps 7 to 16 for the remaining detectors.

System Certification

18. Place a calibration label on the system console showing the date the system was calibrated, the date recalibration is due and the initials of the person performing the calibration.
19. Using the data obtained in steps 1 through 17, prepare a written calibration report for the system and mail to the system owner.

HEALTH PHYSICS ASSOCIATES, INC.

CALIBRATION OF MICRO-R TYPE INSTRUMENT USED AT WASTE FACILITIES

1. Receipt

1.1 Unpack the instrument and record any missing or broken components, or unusual conditions on the Calibration Form.

2. Pre-calibration Checks

2.1 Check the voltage of all batteries in the instrument and replace those having less than the nominal battery voltage.

2.1.1 Bicron instruments using 9V batteries will operate down to about 7.5 V. It is not necessary to replace these batteries until they are below 8.0 V.

2.2 Position the center of the detector to a known radiation field of approximately mid-scale intensity on each scale. Expose the detector, observe the meter reading and record the results on the Calibration Record as the "Pre-Cal" readings if the readings are off by more than 25%. Close the shutter and relocate the detector for the next range. Repeat for each range.

THE OPEN RADIATION BEAM IS COLLIMATED TO ABOUT 30 DEGREES.
KEEP YOUR BODY OUT OF THE PRIMARY BEAM AS MUCH AS POSSIBLE.
AT 50 mR/hr THE BEAM DIAMETER IS ABOUT ONE FOOT.

3. Repairs

3.1 Should the instrument not properly respond to radiation, determine the cause and repair or replace all defective parts. Note all repairs and replacements on the Calibration Record. Proceed with calibration when the instrument is operating properly.

4. Calibration – Analog Range Switch Instruments

4.1 **EACH SCALE ON THE METER IS TO BE CALIBRATED AT 2 POINTS AS FOLLOWS:**

Scale Range	Calibrate At
0 to 2	0.5 and 1.5
0 to 2.5	0.5 and 2
0 to 5	1 and 4
0 to 10	2 and 8

4.2 For the most sensitive scale (up to 10 μR/hr) it will be necessary to place the detector in the shield, tape the calibrated Oxford cesium 137 source onto the detector and calibrate the instrument at 2.2 μR/hr. Other calibrations can be performed using the 100 mCi cesium 137 source, as follows.

4.3 Select the next lowest scale and position the center of the detector so that it is at the lower exposure rate for that scale as shown in 4.1 above. Make sure the detector is oriented in the direction that it is normally used.

4.4 Recheck the position of the detector. Unlock the calibrator and place the source in the exposed position. Observe the meter reading.

4.5 If the reading does not coincide with the true exposure rate, plus or minus 10%, place the source in the shielded position and adjust the calibrating potentiometer.

4.6 Recheck and repeat steps 4.4 and 4.5 until the meter reading coincides with the true exposure rate. Record the instrument reading on the calibration record.

4.7 Repeat steps 4.3 through 4.6 for the rest of the ranges.

4.8 On instruments having an "over-range" alarm, position the detector just beyond the maximum scale reading and expose the detector. The "over-range" alarm should sound. If it does not, refer to the manufacturer's instruction for making the proper adjustments.

4.9 Following the last scale calibration, place the source in its shieldedposition and lock the calibrator.

4.10 Complete all data on Calibration Record.

4.11 Repeat steps 4.3 through 4.10 for the remaining scales of the instrument.

4.12 Enter all data into the computer data base and print a calibration sticker. Attach the calibration sticker to the instrument.

4.13 Package the instrument in the shipping box and make sure all components are being returned. Check off the items being shipped on the shipping log. Include the calibration certificate.

5. Calibration – Digital Instruments

5.1 Digital instruments will be calibrated at the following points:

50 μR/hr	1000 μR/hr
100 μR/hr	2500 μR/hr
250 μR/hr	5000 μR/hr
500 μR/hr	50,000 μR/hr
1000 μR/hr	

5.2 Position the center of the detector so that it is at the desired exposure rate for that scale as shown in 5.1 above. Make sure the detector is oriented in the direction that it is normally used.

5.3 Recheck the position of the detector. Unlock the calibrator and place the source in the exposed position. Observe the meter reading over a period of time and average the readings. Record the reading.

5.4 Repeat steps 5.2 and 5.3 for the rest of the exposure rates in 5.1.

5.5 Enter all data into the computer data base and print a calibration sticker. Attach the calibration sticker to the instrument.

5.6 Package the instrument in the shipping box and make sure all components are being returned. Check off the items being shipped on the shipping log. Include the calibration certificate.

6. Radionuclide Identification Check – MCA Instruments

6.1 Place the instrument in its Identification Mode

Place one of the following sources against the detector and begin the Identification Cycle.

Cesium 137	Natural Uranium (U-238/U-235)
Cobalt 60	Natural Thorium 232
Americium 241	Radium 226 (in equilibrium with daughters

6.2 At the conclusion of the Identification Cycle, observe if the radionuclide was correctly identified and record. Note in comments section any problems with correct identification.

6.3 Enter all data into the computer data base and print a calibration sticker. Attach the calibration sticker to the instrument.

6.4 Package the instrument in the shipping box and make sure all components are being returned. Check off the items being shipped on the shipping log. Include the calibration certificate.