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DON'T SAY IT --- *Write It!*

DATE: March 3, 1993

TO: Dan Duncan EPA
Cathy Massimino EPA

FROM: Cliff Clark DOE-RL

Telephone: 509/376-9333

cc: R. C. Bowman WHC
J. L. Fields WHC
D. L. Flyckt WHC
S. M. Price WHC
D. E. Scully WHC

SUBJECT: WASTEWATER PILOT PLANT RD&D PERMIT

The attached information addresses the questions and/or comments included in the telefax you sent to Mr. Cliff Clark, Department of Energy - Richland Field Office on February 19, 1993.

The two-page memorandum from D. E. Scully to D. L. Flyckt, dated February 24, 1993 (Attachment 1), addresses the first bullet, identified as *Switches (Comments 21, 51, 52, 53, 56, 57, 59)*; the second bullet, identified as *1706-KE System/RO Scale-up (Comment 49)*; the third bullet, identified as *Pump Table; Figure 4-2 (Comments 22, 45)*; and the fourth bullet, identified as *UV System Calibration Procedures (Comment 29)*.

Attachment 2 addresses the fifth bullet, identified as *Figures 4-1 through 4-24 (Comments 36, 36)*. Included is the new Figure F4-1 showing the Waste Water Pilot Plant Floor Plan without tankers; the new Figure F4-23 showing the Waste Load/Unload Station at the 1706-KE Building; Figure F4-24 showing the Tank Trailer Configuration for Unloading at the 1706-KE Building (replaces Figure 4-23 in Rev. 1); Figure F4-25 showing the Tank Trailer Configuration for Loading at the 1706-KE Building (replaces Figure 4-24 in Rev. 1); and a new figure, F4-26, the Portable Berm Foundation Cross-Section.

Attachment 3 addresses the sixth bullet, *Page Changes; 4-31 and 3-1*, which replaces page 4-31 with revised text dated 3/1/93. The Page 3-1 revision has been approved and is not addressed in this memo.

Attachment 4 includes pages iii, 1-1, 3-2, 3-3 and 3-5 that incorporates new waste codes being added to the LERF dangerous waste Part A permit application. Please note that in addition to the F001 and F002 waste codes, F004 is included in these changes. It was recently discovered that this waste code is also applicable to Double-Shell Tank waste.

The seventh bullet, *Part A Permit Application (Comments 37, 39)* is not addressed in this memo.

The final bullet, *Automatic Shutoffs (Comment 58)*, was already answered and is not addressed in this memo.

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ATTACHMENT 1

To: D. L. Flyckt   Feb 24, 1993
From: D. E. Scully
Subj: Responses to EPA's 2/19/93 FAX

Responses to EPA's requests in the reference are provided below.

Ref: FAX, 2/19/93, to Cliff Clark (DOE-RL) and Bob King/Toby Michelena (Ecology), from Dan Duncan/Cathy Massimino (EPA, Region 10)

- Switches (Comments 21, 51, 52, 53, 56, 57, 59):

The following calibration methods are proposed for the equipment identified in the comments:

UV-ps

PURPOSE: This is a pressure switch that will shutdown the UV/Ox feed pump at pressures ≥ 15 psig.

CALIBRATE: Functional check using line pressure.

FREQUENCY: Every 6 months.

UV-pi

PURPOSE: This is a pressure gauge that indicates the UV/Ox feed pressure.

CALIBRATE: Use a multipoint check against a certified pressure gauge, OR, replace with a calibrated gauge.

FREQUENCY: Every 6 months.

UV-TK-1

PURPOSE: This is a temperature switch that will shutdown the UV lamps if the lamp enclosure temperature exceeds 150 deg F.

CALIBRATE: Functional check by immersing the sensor (capillary bulb) in a 150 deg F water bath.

FREQUENCY: Every 6 months.

UV-TK-2

PURPOSE: This is a temperature switch that will shutdown the UV lamps if the reactor water temperature exceeds 150 deg F.

CALIBRATE: Functional check by immersing the sensor (capillary bulb) in a 150 deg F water bath.

FREQUENCY: Every 6 months.

RO-pi-3,
-6,-12

PURPOSE: These pressure gauges are located immediately downstream of the reverse osmosis high pressure feed pumps.

CALIBRATE: Use a multipoint check against a certified pressure gauge for each gauge, OR, replace with calibrated gauge(s).

Frequency: Every 6 months.

- <u>1706-KE System/RO Scale-up (Comment 49):</u>

A 12 gpm feed rate for the reverse osmosis unit will not affect the 5000 gallon/week waste water throughput at the 1706-KE laboratory.

- <u>Pump Table: Figure 4-2 (Comments 22, 45):</u>

For the intermediate storage tanks, change the level switch (LS) pump interlock designation from "PUMPS P-3,4,5,7 & 8" to "PUMPS P-3,4,5,6 & 7."

- <u>UV System Calibration Procedures (Comment 29):</u>

See the first bullet above on "Switches." This item is addressed there.

ATTACHMENT 2

NEW FIGURE
WITHOUT TANKERS

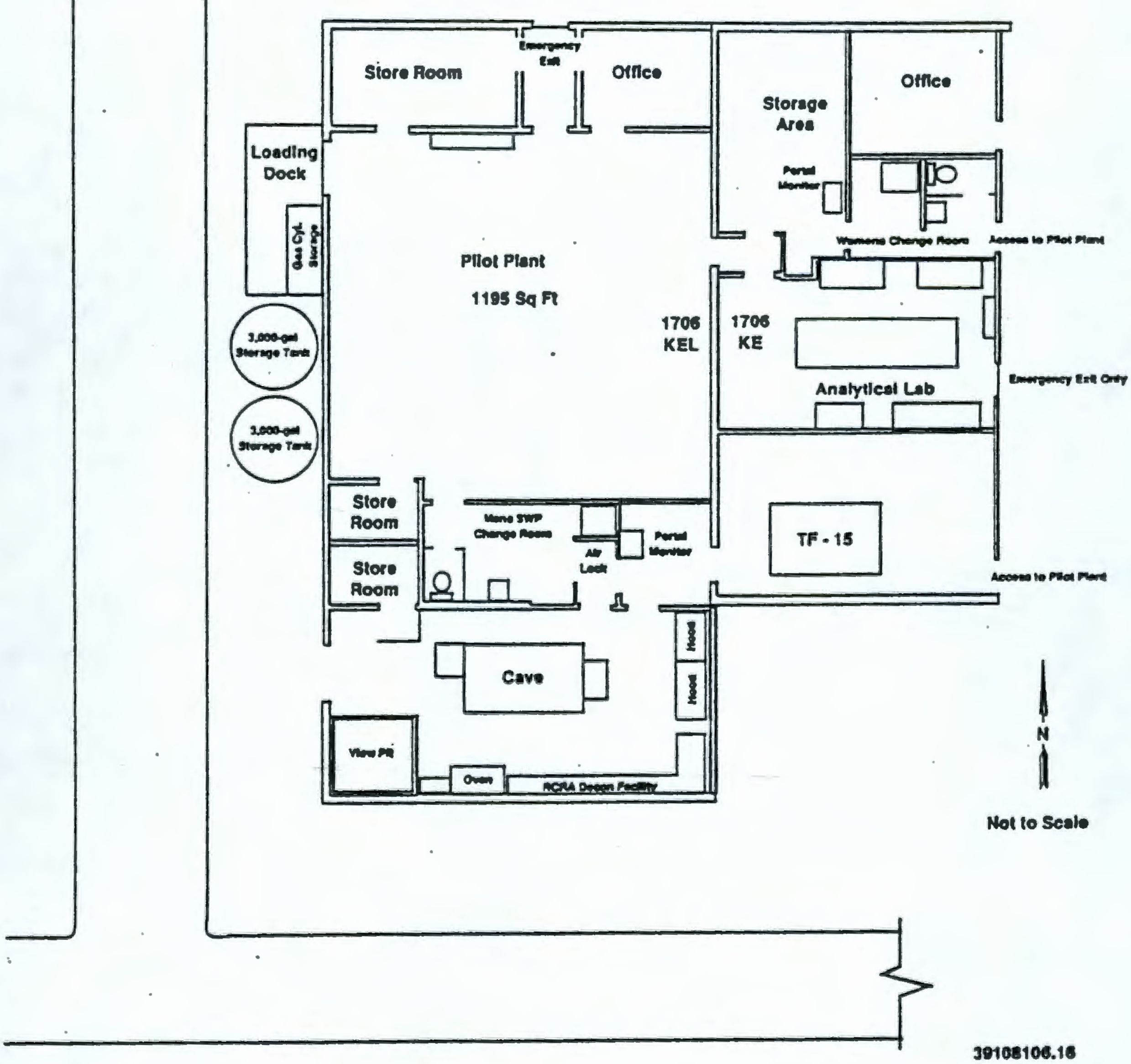

Figure 4-1. Waste Water Pilot Plant Floor Plan.

NEW FIGURE

SHOWS LOAD/UNLOAD AREA

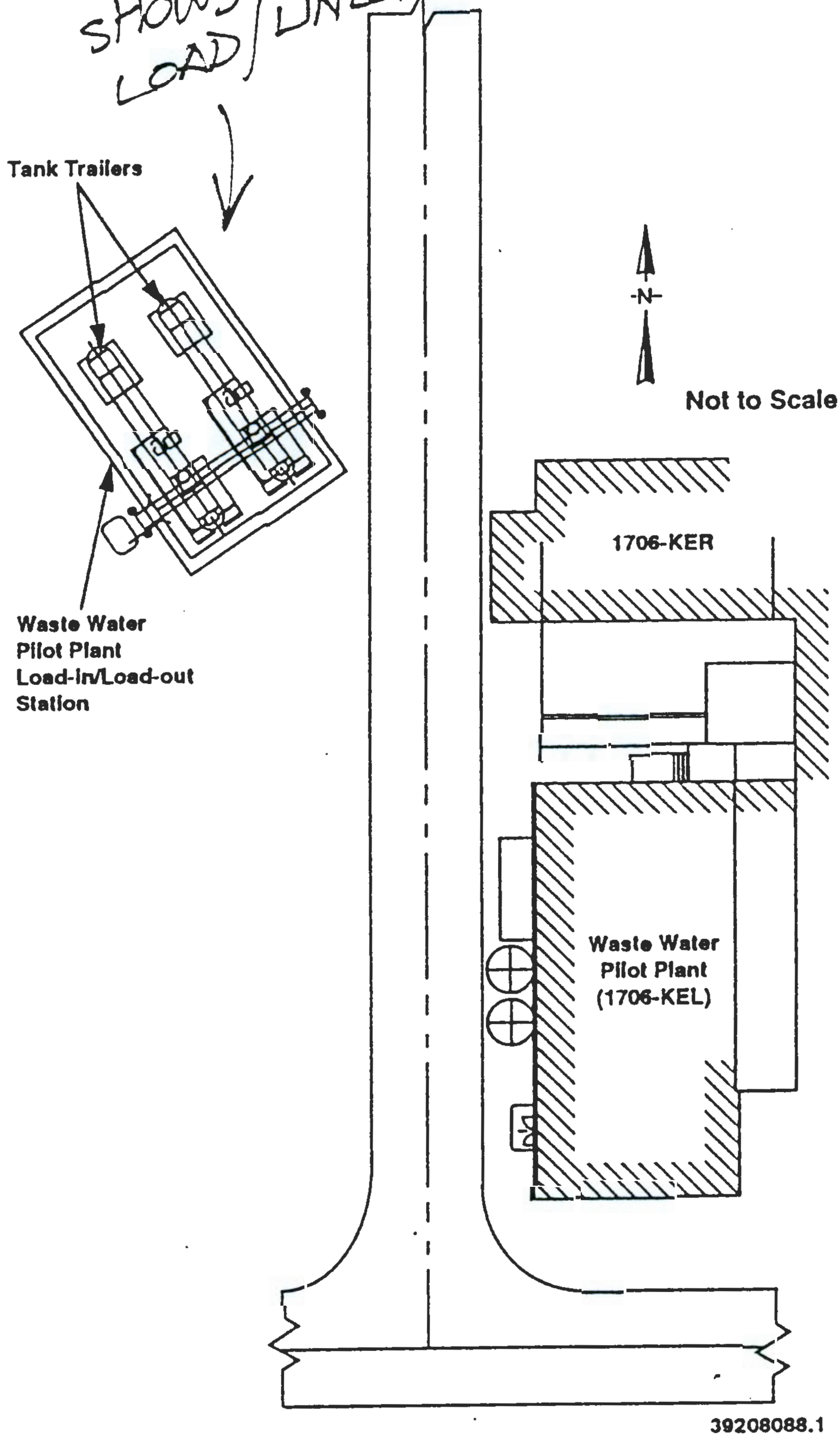

Figure 4-23. Waste Load/Unload Station at the 1706-KE Building.

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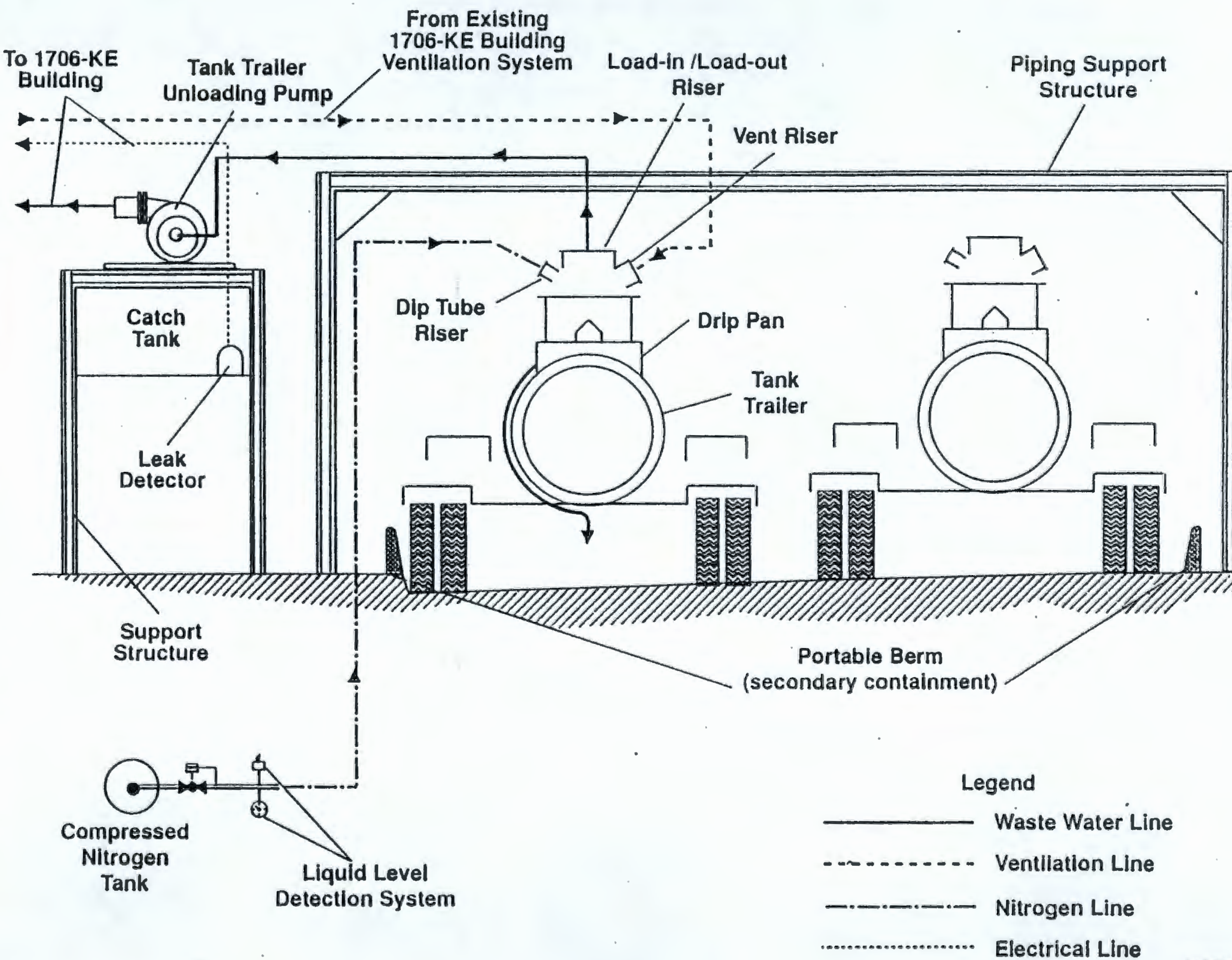

— NEW FIGURE
— REPLACES 4-23
IN REV 1

Figure 4-24. Tank Trailer Configuration for Unloading at the 1706-KE Building.

DOE/RL-91-39, REV. 1A
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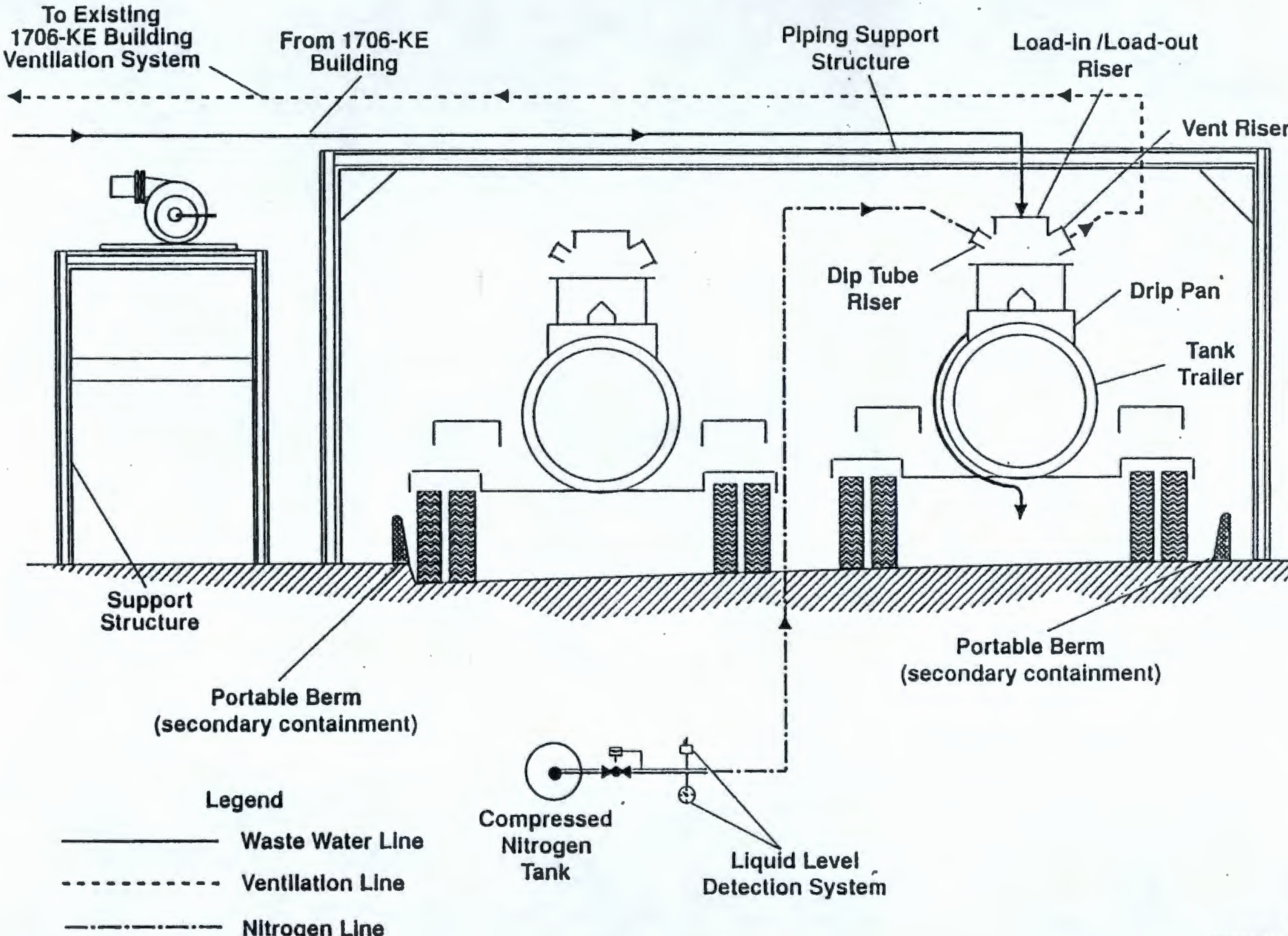

Figure 4-25. Tank Trailer Configuration for Loading at the 1706-KE Building.

NEW FIGURE REPLACES 4-24 IN REV 1

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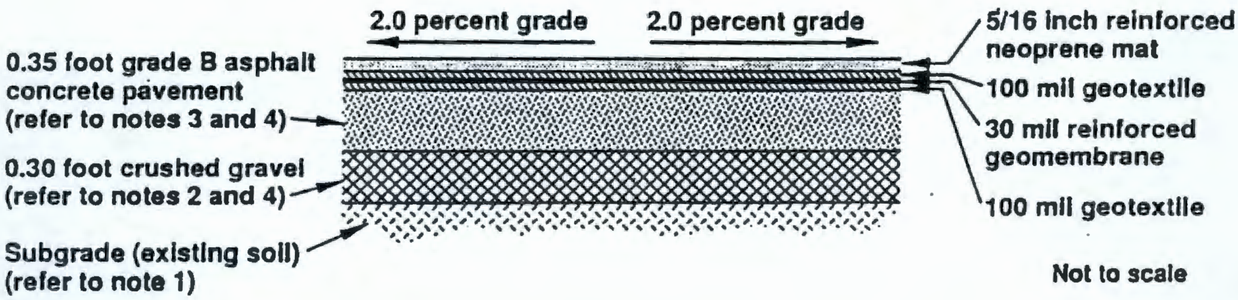
DOE/RL-91-39, REV. 1A
12/18/92

NEW FIGURE



Notes:

1. Prepare the subgrade per Washington State Department of Transportation (WSDOT) (ref. 1) Section 2-06.3(1).
2. Crushed surfacing will conform to WSDOT (ref. 1) Section 9-03.9.3 base course. Place and compact in accordance with Section 4-04.3(4) and 4-04.3(5).
3. The asphalt concrete pavement will be spread and finished in accordance with WSDOT (ref. 1) Sections 5-04.3(9) and 5-04.3(10).
4. Crushed surfacing and asphalt concrete pavement thicknesses meet the minimum required thicknesses for truck parking per reference 2.

References:

1. WSDOT 1991, "Standards and Specifications for Road Bridge and Municipal Construction", M41-10.
2. WSDOT 1988, "Design Manual", M22-01, June 1988. Appendix 1, Figure 326-3, p. 16.

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Figure 4-26. Portable Berm Foundation Cross-Section.

ATTACHMENT 3

Contaminated equipment or other secondary waste not returned to the LERF, which is destined for treatment and/or disposal will be placed in U.S. Department of Transportation-compliant containers. The containers will be labeled as necessary and will be maintained in a satellite accumulation area until the container is filled. When the container is filled, the waste generation date will be marked on the container and the container will be moved to a RCRA-compliant less-than-90-day storage area pending waste designation. Upon designation of the containerized waste, additional labeling will be placed on the container as necessary and the waste will be transferred to a Hanford Facility TSD unit in accordance with onsite procedures.

TEXT NEW 3/1/93

ATTACHMENT 4

EXECUTIVE SUMMARY

This permit application has been prepared to obtain a research, development, and demonstration permit to perform pilot-scale treatability testing on the 242-A Evaporator process condensate waste water effluent stream. This permit application provides the management framework, and controls all the testing conducted in the waste water pilot plant using dangerous waste. This permit application provides a waste acceptance envelope (upper limits for selected constituents) and details the safety and environmental protection requirements for waste water pilot plant testing. This permit application describes the overall approach to testing and the various components or requirements that are common to all tests. This permit application has been prepared at a sufficient level of detail to establish permit conditions for all waste water pilot plant tests to be conducted.

Two documents will be used to detail each test conducted in the waste water pilot plant and to report the data obtained from these tests. These two documents are test procedures and test reports. Copies of the test procedures and test reports will be submitted quarterly to the U.S. Environmental Protection Agency and the Washington State Department of Ecology for review. Additionally, a quality assurance project plan is included that ensures that testing activities are conducted in a manner that will provide accurate and complete data.

The waste to be tested in the waste water pilot plant is the 242-A Evaporator process condensate. This process condensate is considered a dangerous waste because the condensate was derived from a mixed waste (containing both radioactive and dangerous components) that is listed for F001, F002, F003, F004, and F005. The 242-A Evaporator process condensate typically contains trace levels of radionuclides and stable chemicals. Both organic and inorganic constituents can be present as suspended solids or as dissolved solids. The level of contamination in the 242-A Evaporator process condensate is very low. NEW

Regardless of the level of contamination, pilot-scale treatability testing of a waste water stream that is designated as a dangerous waste requires approval from the Washington State Department of Ecology and/or the U.S. Environmental Protection Agency. The research, development, and demonstration permit will satisfy this permitting requirement. While testing of synthetic and radioactive waste does not require a research, development, and demonstration permit, synthetic and radioactive waste is described in this permit application for informational purposes only to provide a complete discussion of the Hanford Facility waste water pilot plant testing program.

The 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility currently is being designed to treat the 242-A Evaporator process condensate and PUREX Plant nondangerous waste streams. Before the treatment system is constructed, the design of the system will need to be tested. This testing will demonstrate the technical feasibility and performance capability of innovative technologies or innovative treatment system configurations so that these technologies can be tailored to the needs of the Hanford Facility. This

1.0 INTRODUCTION

Waste waters have been generated as result of operations conducted at the Hanford Facility for over 40 years. These waste waters were previously discharged to cribs, ponds, or ditches. Examples of such waste waters include steam condensates and cooling waters that have not been in contact with dangerous or mixed waste and process condensates that might have been in contact with dangerous or mixed waste (containing both radioactive and dangerous components).

Many measures have been taken to reduce the amount of contamination being discharged in these effluents. However, some of these waste waters still require additional treatment before release to the environment. Systems are being designed and built to treat these waste waters along with any future waste waters resulting from remediation activities on the Hanford Facility.

The waste waters typically contain trace levels of radionuclides and stable chemicals. Both organic and inorganic constituents can be present as either suspended solids or dissolved solids. While there is a wide variety of contamination in the waste waters, the level of contamination is very low.

One of the first treatment systems to be constructed will be the 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility. This treatment unit will treat the process condensate from the 242-A Evaporator and PUREX Plant nondangerous waste streams. Until the PUREX Plant is restarted, the 242-A Evaporator process condensate is the only waste that will be treated in the 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility. The 242-A Evaporator concentrates various liquid waste generated on the Hanford Facility. The liquid waste is stored in underground double-shell tanks (DSTs). The liquid waste in the DSTs is piped to the 242-A Evaporator, concentrated through evaporation, and returned to the DSTs for storage until final disposal. The condensate derived from this evaporation process, called '242-A Evaporator process condensate', is the waste water that will be tested. The 242-A Evaporator process condensate will be stored at the Liquid Effluent Retention Facility (LERF) until a treatment unit is operational. This waste water is a dangerous waste as defined by Washington Administrative Code (WAC) Chapter 173-303. The waste is designated dangerous due to the presence of spent solvents (F001, F002, F003, F004, and F005) and the toxicity (WT02).

NEW

Before the 242-A Evaporator process condensate treatment system is constructed, the design of the system will need to be tested to verify that the treatment methods selected are effective. Usually this testing will be performed on a small scale and is termed 'pilot testing'. A portion of the 1706-KE Building (an existing structure in the 100 KE Area) has been selected as the site for most of the testing. Limited testing (filtration) also will be performed at the LERF. Testing usually will be performed in two phases; the first phase will use synthetic waste and the second phase will use actual waste that might be a dangerous or a mixed waste. Because pilot-scale testing

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242-A Evaporator process condensate are summarized in Table 3-1. The samples were collected between August 1985 and March 1989. It has not been possible to collect a 242-A Evaporator process condensate sample since April 1990, when the 242-A Evaporator was taken out of service. Table 3-1 shows the range of constituents that might be encountered in the waste stream. It should be emphasized that no one waste water sample contains all of the constituents listed in the table nor does any one waste water sample contain the maximum concentration of all of these constituents on a regular basis.

3.1.3 Waste Stream Designation

In accordance with requirements in WAC 173-303, the 242-A Evaporator process condensate is designated as (1) dangerous because the condensate is derived from a listed waste and (2) 'state-only' toxic dangerous waste because the equivalent concentration percent sum of all applicable constituents is greater than 0.001 percent. The waste designations for the 242-A Evaporator process condensate are contained in the LERF dangerous waste permit application (DOE/RL 1991c) and the 242-A Evaporator dangerous waste permit application (DOE/RL 1991a). Information on these waste designations is provided in the following paragraphs.

The waste is designated dangerous because the process condensate is derived from the DST waste - a 'listed waste'. The DST waste has been designated dangerous (listed waste) due to the presence of spent solvents, namely 1,1,1 trichloroethane (F001), methylene chloride (F002), acetone and methyl isobutyl ketone (F003), cresylic acid (F004), and methyl ethyl ketone (F005).

NEW

The 1,1,1 trichloroethane was not detected in the 34 samples of the 242-A Evaporator process condensate above a concentration of 0.005 parts per million (detection limit). The 1,1,1 trichloroethane was used as a solvent in decontamination activities at B Plant and has been discarded to the DSTs.

Methylene chloride was not detected in the 34 samples of the 242-A Evaporator process condensate. Methylene chloride was used as a solvent in decontamination activities at T Plant and has been discarded to the DSTs.

Acetone was detected in all 34 242-A Evaporator process condensate samples with an average concentration of 0.980 parts per million. The acetone was used in laboratories to dry glassware and could have been discarded through drains to the DSTs.

Methyl isobutyl ketone (hexone) was detected in 10 of the 34 samples at an average concentration of 0.011 parts per million. Methyl isobutyl ketone was used in the solvent extraction process [reduction-oxidation (REDOX) process] and was discarded to single-shell tanks as a spent solvent and eventually transferred to the DSTs.

Cresylic acid was not detected in the 34 samples of the 242-A Evaporator process condensate. Cresylic acid was used as a solvent in decontamination activities at T Plant and has been discarded to the DSTs.

NEW

Methyl ethyl ketone (2-butanone) was detected in 25 of the 34 samples at an average concentration of 0.051 parts per million. Methyl ethyl ketone was used in past chemical processing operations and has been determined to be a spent solvent.

NEW

The 1,1,1 trichloroethane methylene chloride, acetone, methyl isobutyl ketone, cresylic acid, and methyl ethyl ketone in the 242-A Evaporator process condensate are not known to be 'discarded chemical products' as defined by WAC 173-303-081.

Two other 'listed' constituents were present in the 242-A Evaporator samples. In 30 of the 34 samples, 1-butanol (butyl alcohol) was detected at an average concentration of 9.8 parts per million. The 1-butanol is an impurity and degradation product from tributyl phosphate used at the PUREX Plant. Pyridine was detected in 1 of the 34 samples at a concentration of 0.55 parts per million. Pyridine was not used in chemical processing on the Hanford Site. Neither 1-butanol nor pyridine are known to be discarded chemical products or spent solvents as defined in WAC 173-303-081 and-082.

The 242-A Evaporator process condensate also is designated a toxic dangerous waste (WT02) by the procedure set forth in WAC 173-303-084(5) and -101. Because the equivalent concentration method of determining toxicity is not included in 40 CFR 261, the waste is considered to be a 'state only' dangerous waste.

The 242-A Evaporator process condensate is not a persistent dangerous waste because the concentrations of halogenated hydrocarbons and polycyclic aromatic hydrocarbons were below 0.01 and 1.0 percent, respectively (WAC 173-303-102).

Three constituents potentially present in the 242-A Evaporator process condensate were determined to be carcinogenic substances [cadmium chloride, nickel (II) hydroxide, and n-nitrosodimethylamine]. Because none of the compounds exceeded 0.01 percent and the sum was less than 1.0 percent of the waste quantity, the waste is not a carcinogenic dangerous waste per WAC 173-303-084(7) and -103(2).

The waste is not ignitable as defined by WAC 173-303-090(5) because, as a dilute aqueous waste, the concentration of oxidizer (e.g., nitrate) and the sum of concentrations of potentially ignitable contributors are too low to be an ignitable waste. Flash point testing was not performed on the process condensate. The nitrate in the waste is dilute (averaging 2.8 parts per million) and it is not expected to support the combustion of organic matter. Nitric acid is given an oxidizer hazard class when the concentration exceeds 40 weight percent (400,000 parts per million). The ignitability index was calculated for pure substances having a flash point of less than 140 °F (60 °C). The ignitability index calculated from these constituents is between 0.0002 and 0.008 percent. Samples with an ignitablity index of less than 1 percent were not considered ignitable (DOE-RL 1991a).

To be designated a corrosive dangerous waste per WAC 173-303-090(6), the waste must have a pH less than or equal to 2 or greater than or equal to 12.5.

potential (e.g., volatility and solubility) and process efficiency [e.g., susceptibility to ultraviolet oxidation (uv/ox) breakdown]. The makeup of the final chemical spike list is largely controlled by the needs of the individual tests. The definition of the individual tests are not considered to be within the scope of this permit application.

One additional criteria was applied to the spike list. The chemical could not be a Class A or B1 carcinogen, chlorinated dioxin or furan, herbicide, pesticide or polychlorinated biphenyl (PCB). This ensures that unconfirmed compounds that have a potential for significant health effects are not introduced into the waste water pilot plant.

The basis for the spike concentrations is the larger value of 10 times the minimum practical detection limit or 10 times the maximum concentration in Table 3-1 (except ammonia, 1-butanol, tributyl phosphate, and carbonate for which the maximum concentration value was used). These levels were chosen to ensure that process removal efficiencies up to 90 percent could be detected. At the same time, concentrations are low enough that the spiked feed will not pose a serious hazard to waste water pilot plant personnel.

The spike list shown in Table 3-2 is believed to accurately represent the contaminants potentially present in the waste water feed. Any waste water treatment plant that can successfully treat feed with this wide range of chemicals will have demonstrated a high degree of capability and robustness.

3.2.1 Chemical Constituents of Regulatory Concern

NEW

The chemical compounds of regulatory concern consist of four groups: (1) the F001, F002, F003, F004, and F005 chemicals; (2) the 40 CFR 261, Appendix VIII compounds (Appendix VIII constituents); (3) the Priority Pollutants as specified under 40 CFR 136, identified in the *Clean Water Act*; and (4) chemicals with health-based levels (EPA 1989).

The first group of chemicals included on the regulatory list are the five constituents that originally led to the designation of the 242-A Evaporator process condensate as listed: The 1,1,1 trichloroethane, methylene chloride, acetone, methyl ethyl ketone (2-butanone), cresylic acid, and methyl isobutyl ketone (hexone).

NEW

The second group of chemicals includes the full list of Appendix VIII constituents. These chemicals represent all of the specific chemicals that EPA regulates under the RCRA program.

The third group incorporates additional chemicals from the Priority Pollutant list that are not already duplicated in the first two groups of chemicals.

The fourth group incorporates additional chemicals used in the evaluation of delisting petitions that have health-based levels (EPA 1989).