GE Power Generation

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RECEIVED
HAZARDOUS WASTE
PROGRAM

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Subject: Consent Decree Requirement
Civil Action No. 87-1073-jb
General Electric, Albuquerque, N.M.

Attached are the responses to the EPA comments on the Draft Corrective Measures Study and a copy of the Final Corrective Measures Study.

Very truly yours,

Barry R. York

Barry R. York
Environmental Project Manager

abqfcms.wp
attach.

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RESPONSE TO GENERAL COMMENTS

Task VII.B

The basis for the corrective action objectives are the March 1985 Closure Plan submitted to the New Mexico Environmental Improvement Division (NMEID) and TSCA requirements for PCBs. The Closure Plan was prepared in 1985 and specifies the excavation and removal of soils containing PCE concentrations greater than 50 parts per million (ppm); the TSCA Polychlorinated Biphenyls Spill Cleanup Policy became a final rule in 1987 and required that soils shall be cleaned to 25 ppm for spills of PCBs in restricted areas. The Draft Corrective Measure Study recognized this difference of these cleanup levels and the corrective action objectives were stated as follows:

" • to clean PCBs to TSCA cleanup levels; and
- comply with the specifications for corrective action in the Closure Plan submitted to the New Mexico EID."

"These corrective measure objectives will require remediation of the following.

- The drywell structures, contained solidified material, connected drain lines, and associated soils exhibiting hazardous characteristics; and

- Soils containing PCBs above levels specified in 40 CFR 761.125 requirements for PCB spill cleanup."

Tetrachloroethylene with a total concentration of 1,100 ug/kg was found at Boring B-7 at a depth of 16-17 feet. A solid waste exhibits hazardous characteristics if, using the Toxicity Characteristic Leaching Procedure (TCLP), the extract from a representative sample contains the contaminant at a concentration at or greater than the toxicity characteristic regulatory level. For tetrachloroethylene, TCLP specifies adding an amount of extraction fluid equal to 20 times the weight of the solid phase sample and since the sample is essentially dry, it would be impossible for this material, with a total concentration of 1,100 ug/kg, to exhibit Hazardous Waste Characteristics (D039).

The Closure Plan does not propose to excavate an area 20 feet by 20 feet by 30 feet deep. These dimensions were specified, without the benefit of sampling, to establish an estimated waste inventory. The Closure Plan proposes, "Any free liquids and pumpable sludges contained within the dry well structure(s) will be removed to appropriate EPA permitted treatment or disposal based on their waste characteristics. The dry well structure(s), contained solidified material, and connected drain lines will be excavated and removed to appropriate qualified disposal based on their waste characteristics. Soils containing PCB concentrations equal to or greater than 50 ppm or exhibiting RCRA Hazardous Waste Characteristics will be excavated and removed to appropriate qualified disposal. The waste characteristics will have been determined in the exploratory work, using sampling and analytical procedures described in the 'Contamination Evaluation' section." The proposed remedial activities specified in the Closure Plan, with PCB cleanup levels reduced by subsequent TSCA requirements, are the same as those specified in the Draft Corrective Measures Study.

Task VIIIA.

GE generally agrees that Infrared Incineration is not a practical option for remediation of quantities of less than 150 tons of contaminated soils. On-site incineration would be effective and implementable from a logistics standpoint and the technology has been demonstrated in treating soils contaminated with chlorinated organic compounds. However, factors which limit the practical implementation of this technology include requirements for permitting and limited availability of mobile infrared incineration units.

Mr. George Hay of O.H. Materials was contacted as to the cost and implementability of the onsite incineration of the soils. O.H. Materials expressed interest in performing the work at the prices estimated in Table 3 of the CMS. As indicated on the table, the cost for mobilization is estimated to be approximately $800,000. This cost is approximately 4 to 8 times more expensive as the other alternatives. This remedial alternative was included for a comparison basis of different technically feasible, reliable, and implementable treatment methodologies that have been widely used regardless of cost as the determining factor.

RISK ASSESSMENT (APPENDIX A)

Elevated respiration rates for activities to depths of 15 feet have been used in quantifying exposures of utility and construction workers. Response to other general comments under the Risk Assessment (Appendix A) are addressed under the responses to Specific Comments.

Appendices B and C

Additional data used to perform the Time of Travel and SESOIL models has been provided in Appendices B and C. Specifically, a description of all parameters necessary to the calculations/models, parameter values and a source description are provided for Time of Travel on Table B-3 and for SESOIL on Table C-1.

Detailed calculation sheets for Time of Travel calculations are presented in Appendix B - Attachment B-1.

Xylene, a relatively mobile constituent, was the selected constituent for the SESOIL model as it was the only constituent present in sufficient quantity to potentially migrate to the ground water. The more mobile constituents detected at the site (ex. methylene chloride), were detected in quantities small enough that they would adsorb onto the shallow soil particles before they could migrate to the ground water.

Equations used for the Time of Travel calculations are presented in Table B-1. The significance of the monthly climatic data, as the data pertains to the Time of Travel, is discussed in Appendix B, page B-2, last paragraph. A discussion of the differences, and hence a variation in the results, between SESOIL and Time of Travel is presented in Appendix C, Section 4.0, page C-7.

Calibration (history matching) of the SESOIL model using a comparison of the model results with observed data would not be meaningful as the history of past releases is not adequately known to establish frequencies and concentrations.

RESPONSE TO SPECIFIC COMMENTS

COMMENT:

Section 1.3, Page 5, Paragraph 2; Section 1.3.1.1, page 6, Paragraph 2

The proposed Subpart S Rule action levels for volatile and semi-volatile organic compounds are not applicable to the corrective action objectives. Any reference to the proposed Subpart S Rule regarding corrective action levels must be deleted from the CMS report.

Response:

A risk assessment was performed for site-specific constituents as part of the development of corrective action objectives. The findings of this assessment show that the concentration of constituents detected in the soils at the site do not present an unacceptable risk. Subpart S action levels were proposed by EPA (July 1990). These action levels reflect health-based criteria using methodology described by EPA guidance documents. When compared with the results of the risk assessment, these action levels were found to confirm their findings. As the Subpart S action levels were not the basis for establishing the corrective action objectives, but were considered only to support the findings of the risk assessment, GE does not propose to delete the reference to Subpart S from the CMS report.

COMMENT:

Section 1.3.1.2, Page 7, Paragraph 1

A reference should be made to Appendix B and C.

Based on the information presented in Appendix C, the model does not adequately demonstrate that the contaminants will not migrate to the ground water. Information was not presented which demonstrated that the clay layer in the site soil profile would prevent or impede downward migration of the contaminants. Also, documentation was not presented for the proposed decrease in ground water flux with depth or the applicable rate of contaminant adsorption for the soil.

Response:

Reference has been made to Appendix B and C (see Section 1.3.1.2, Page 7, Paragraph 1).

It was never stated in the CMS that contaminants would not migrate to the ground water. The modeling indicates the constituents would take hundreds to thousands of years to migrate to ground water. Additional modeling of the clay has been performed and the results are discussed in Appendix C (pages C-5 and C-6).

SESOIL output does not provide specific data regarding ground-water flux, the decrease in ground-water flux is considered the most likely explanation for the decrease in contaminant migration rate with depth. The rate of contaminant adsorption is calculated by the SESOIL model using the input parameters TOC and KOC.

COMMENT:

<u>Section 1.3.2, Page 8, Paragraph , first and second bullets</u>

The numeric value of 25 ppm for the TSCA cleanup level must be stated. The date of the Closure Plan submitted to NMEID should also be stated. It is assumed that the reference is to the Closure Plan dated March 1985.

Response:

The numeric value of 10 ppm for the TSCA cleanup level has been stated (Section 1.3.2, page 8, Paragraph 1). The date of the referenced Closure Plan is March 1985.

COMMENT:

<u>Section 1.4.1.3, Page 11, Paragraph 1</u>

The reference to in-situ vitrification in the last sentence should be deleted and replaced with in-situ stabilization/solidification. In-situ vitrification was discussed in Section 1.4.1.1.

Response:

In-situ vitrification has been deleted and replaced with in-situ stabilization/solidification (Section 1.4.1.3, Page 11).

COMMENT:

Section 1.4.2.1, Page 12, Paragraph 1

The reference to Section 1.4.1.1 is incorrect and should be changed to Section 1.4.1.2.

Response:

Section 1.4.1.1 has been changed to Section 1.4.1.2 (Section 1.4.2.1, Page 12).

COMMENT:

Section 2.0, Page 15, Paragraph 2

The third sentence states that the volume of material to be excavated is described in Section 1.3.2, but this is not the case. Section 1.3.2 describes the cleanup goals, but it does not describe how the volume of material to be excavated was determined.

Response:

The third sentence of Section 2.0, page 15, paragraph 2 provides a reference to Section 1.3.2 only for a description of the materials to be remediated. The estimate of volume to be excavated, 80 tons, is derived from the presentation on Figure 5. As stated in Section 2.0, page 16, paragraph 1, second sentence, this volume may increase or decrease depending on actual conditions encountered during field remedial activities.

COMMENT:

Section 2.2.1, Page 19, Paragraph 1

GE must specify the name and location of the landfill that will receive the incinerator ash.

Response:

The site for landfilling the incinerator ash would be selected based upon the treatment levels determined prior to remediation. If the incinerator ash were treated to a level that would no longer pose a threat to human health or the environment, onsite landfilling may be a viable alternative. If the treatment process increases the leachability of the metals, stabilization and landfilling at a hazardous waste landfill may be required. The determination of the landfill site would be based upon the analytical results and current market prices.

COMMENT:

Section 2.2.2.3, Page 21, Paragraph 1

GE should provide the names and phone numbers of mobile incinerator operators that have been contacted to obtain availability and cost information. While incineration is a sound technology, implementation of this technology is questionable since most permitted mobile incinerators are designed for projects with 150 tons or more of contaminated soil.

Response:

Mr.George Hay ((800)587-9540) of O.H. Materials in Finlay, Ohio, was contacted regarding infra-red incineration. Mr. Hay indicated I-R incineration units could be made available for treating limited quantities of contaminated soils, such as is anticipated at this site, but that the technology would not be cost effective.

COMMENT:

Section 2.3.2.3, Page 23

GE should provide the names and phone numbers and locations of off-site incineration facilities that have been contacted to obtain availability and cost information.

Response:

Mr. Gary Fracano ((316)251-6380) of Aptus in Coffeyville, Kansas was contacted as to the capacity and acceptability of waste.

RISK ASSESSMENT (APPENDIX A)

COMMENT:

Section 1.0, Page 2, Paragraph 2

Eight feet below ground surface may not be deep enough to encompass all construction activities. The depth must be increased to 15 feet. Also, it might be helpful to state in this section the depth of the maximum constituent concentrations detected in the soil.

Response:

Risk has been evaluated considering the maximum constituent concentrations detected in soils to a depth of 15 feet. This consideration did not significantly impact the results of the risk assessment (Appendix A). Table A-1 presents the depths of the maximum constituent concentrations used in the risk assessment.

COMMENT:

Section 3.0, Page 3, Paragraph 4

PCBs should be reinstated into the risk assessment.

Response:

Reference is made to Appendix D of the Corrective Measures Study Report (Evaluation of Health Risk of Residual PCBs).

COMMENT:

Section 3.2, Page 5, Paragraph 1

Increased respiration rates should be used for utility and construction workers.

Response:

Respiration rates for utility and construction workers have been increased to 3 cubic meters per hour. See Appendix C, Attachment C-1, Page 7. This increase did not significantly impact the results of the risk assessment.

COMMENT:

Table 1

The toxicity criteria for toluene, 1,2,4-trichlorobenzene and the inhalation cancer slope factor for tetrachloroethylene appear to be outdated. IRIS or HEAST should be consulted for current toxicity criteria.

Response:

The toxicity criteria for toluene, 1.2,4-trichlorobenzene and the inhalation cancer slope factor for tetrachloroethylene have been updated using HEAST (1991). See Appendix A - Table 1. The updated data did not significantly impact the results of the risk assessment.

COMMENT:

Table 2 through Table 5.

It would be helpful to show toxicity criteria on these tables so that it is clear to the reader how the excess cancer risk and hazard indicators are calculated.

Response:

The toxicity criteria have been added to Tables 2 through 5.

COMMENT:

Attachment 1, Page 2.

The carcinogens intake should be CS x 5.6×10^{-10} day^{-1} rather than CS x 5.5×10^{-10} day^{-1}.

Response:

The carcinogens intake has been changed from CS x 5.5×10^{-10} day $^{-1}$ to CS x 5.6×10^{-10} day-^{1}.

COMMENT:

Attachment 1, Page 4

Although the formula is correct for chronic dermal absorption of chemicals in soil by on-site employees, the final intake was calculated incorrectly. The carcinogenic intake should be CS x 1.14 x 10^{-5} day^{-1} and the non-carcinogenic intake should be CS x 2.66 x 10^{-5} day^{-1}.

Response:

The final intake for chronic dermal absorption has been re-calculated. The corrected values are presented in Appendix A, Attachment 1, Page 4.

TIME OF TRAVEL CALCULATION (APPENDIX B)

COMMENT:

Page 1, Paragraph 2

The distribution coefficients for each contaminant of concern should be provided along with an example calculation.

Response:

Input parameters and calculations are included in the revised CMS Report (Appendix B Attachment B-1).

COMMENT:

Table 1.

The significance of the climatic data should be discussed. Are these data used in the travel time calculation?

Response:

Climatic data were used to estimate the infiltration rate. This infiltration rate was then used in the calculation.

COMMENT:

Table 2

The results presented in this table should be compared to the results from the SESOIL model (Appendix C).

Response:

Table 2 is now Table B-4. A comparison of SESOIL to Time-of-Travel is presented in Appendix C, Section 4.0.

COMMENT:

Figure 1

The site soil profile used in Appendices B and C (Figures B-1 and C-1) does not match the hydrogeologic cross section presented in Figure 14 of the RFI report. The site soil profile should be revised or justification provided as to why this is the most conservative profile for modeling purposes. The values of effective porosity used for each layer should be shown along with the hydraulic conductivity.

Response:

The boring logs for the site show that individual layers in the subsurface are laterally discontinuous. Because the model does not allow for these inhomogeneities, the soil profile presented in Figure B-1 and C-1 is a composite of site subsurface conditions. Effective porosity is not shown on the figure because it is not an input parameter but is calculated in the model. The calculation is shown on Table B-1 in Appendix B of the revised CMS Reports.

SESOIL CONTAMINANT TRANSPORT MODELING (APPENDIX C)

COMMENT:

Section 2.0, Page C-3, Paragraph 2

The application of mean monthly climatic data is questioned for the following reason:

A rain-gutter downspout from the shop building roof discharges rain water onto the ground in the immediate vicinity of Drywell No. 1. Furthermore, after boring B-1 was performed in April 1986, Drywell No. 1 was left as a 1 to 2 foot depression that would tend to collect

the rain water discharged from the downspout. Therefore, the volume of rainfall infiltrating in the immediate vicinity of Drywell No. 1 significantly altered by site specific conditions.

Response:

The SESOIL model was run to predict future migration of contaminants. During remediation, the downspout will be re-routed, and the area will be graded to remove the depression and prevent accumulation of water. Therefore, additional infiltration will not occur in the future.

COMMENT:

Section 2.0, Page C-4, Paragraph 4.

The volume of the contaminant applied to the one-time spill was estimated from laboratory analyses of soil samples collected from the drywell area. However, the amended Closure Plan submitted to EPA as a requirement of the Consent Decree provides an estimate volume of solvents used by GE on a yearly basis. Assuming the solvents were ultimately disposed in one of the two drywells after usage, GE should justify which method of calculating the volume of contaminant applied to the spill is the most representative of actual conditions.

What was the start date for the one-time spill as it relates to the operational history of the drywell (i.e. 1969, 1970, 1971...1983).

The rationale for modeling the site based on a one-time spill is questioned for the following reason:

The drywell(s) operated from 1969 until 1983 and routinely received wastewater. Therefore, the vertical contaminant migration during that period would be due to the rate of water introduced into the subsurface and was not due to climatic factors. GE should provide justification that the use of a one-time spill event is the most conservative approach for the purpose of modeling vertical migration.

Response:

The model did not use past releases at the site because the history of releases is not adequately known to make any meaningful simulations. The usage quantities of solvents estimated in the Closure Report were mixed with varnishes and paints, discarded in waste materials, consumed as fuels, dispersed through evaporation, and discharged into the drywells. The quantities of solvents discharged were intermittent, uncontrolled, and undeterminable.

The one time spill or one time application is based on laboratory analyses performed on soil samples collected from the drywell area. The samples were obtained and analyzed in 1990 as part of the RFI activities. A worst-case scenario for volume of contaminant was calculated by assuming that the highest detected concentration was uniform over the estimated area of contamination.

The historical operation of the drywell(s) from 1969 until 1983 is irrelevant to the purpose of this model. The model was not performed to approximate past migration but was performed to project the migration of the contaminants in the future.

LAW ENVIRONMENTAL

CORRECTIVE MEASURES STUDY REPORT

GENERAL ELECTRIC COMPANY

APPARATUS SERVICE SHOP

ALBUQUERQUE, NEW MEXICO

SUBMITTED APRIL, 1991

REVISED APRIL, 1992

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1.0 IDENTIFICATION AND DEVELOPMENT OF CORRECTIVE MEASURE ALTERNATIVES

1.1 Introduction

The purpose of the Corrective Measure Study (CMS) is to develop corrective measures objectives with which to identify, evaluate and recommend corrective measure alternative(s) most appropriate for site specific conditions at the General Electric Service Shop in Albuquerque, New Mexico.

1.2 Description of Current Conditions

1.2.1 Site Description

General Electric's Apparatus Shop is located at 4420 McLeod Road, NE, in Albuquerque, New Mexico, on a 2-acre site in a light industrial park. The facility is approximately 4 miles northeast of downtown Albuquerque and approximately 4.5 miles east of the Rio Grande (Figure 1). The service shop building is located in the northeastern quadrant of the subject property. An enclosure used for steam cleaning parts and for storage is located at the rear of the building. The south end of the enclosure is open and a concrete slab extends approximately 20 feet beyond the enclosure. Asphaltic pavement covers the area immediately north and northeast of the building. The remainder of the area to the east and the area to the south has a gravel cover. The area to the south of the building is presently being used to store miscellaneous equipment. The southern 133± feet of the parcel has been fenced and is being leased by Miller Metal Company for vehicle parking. The remainder of the site, except for the northern 80± feet, is fenced. These site features are shown on Figure 2.

1.2.2 Contaminant Characterization

The GE Service Shop was constructed in 1969 for the repair of industrial equipment, primarily electrical motors. Transformers filled with askarels and insulating oils containing PCBs were also repaired at the shop. Until 1983, waste water from steam cleaning operations was disposed of in two on-site drywells.

A RCRA Facility Investigation (RFI) was performed to obtain information and data necessary to characterize the facility and sources of contamination, to determine the nature and extent of previously identified areas of releases and to identify actual or potential receptors. A report describing the results of the RFI was submitted to EPA Region VI in November, 1990.

Three areas of identified releases were investigated during the RFI: 1) the former drywell area; 2) the former waste storage area; and 3) the former drum rack area. Results of analyses of soil samples collected from the former waste storage area and from the former drum rack area indicated no evidence of significant spills or releases of the analyzed constituents. Additionally, a systematic pattern of near surface soil sampling and analysis was performed to explore for previously undetected sources. None were identified.

Six soil test borings were advanced in the area of the identified drywell (Figure 3) from which soil samples were collected and analyzed. Field GC screening of one of these borings

(B-5) showed the presence of indicator constituents, so an additional boring (B-7) was made and samples obtained. It was determined that B-7 had likely encountered a suspected previously used drywell. Four borings were advanced in the vicinity of B-7 to determine the limits of the suspected drywell; no samples were obtained from these borings. Three additional borings (B-12, B-13, and B-14) were then drilled and samples obtained. An expanded list of laboratory analyses was assigned to the samples collected from borings B-7, B-12, B-13, and B-14. The identity and concentration of constituents in soil were determined, as were the general limits of migration of constituents both laterally and vertically away from the drywells.

General Electric prepared a Work Plan to perform additional investigation of migration in the Drywell No. 2 area. The Work Plan was originally submitted in January 1991. The Work Plan was revised and resubmitted in February 1991. The additional investigation described in the revised Work Plan was performed between April 25 and May 2, 1991. A report describing the results of the Supplemental Soil Assessment was submitted to EPA Region VI in July 1991. The additional investigation consisted of drilling seven soil borings (7B-A and 7B-1 through 7B-6) to further define the vertical limits of the detected constituents in the area of Drywell No. 2 (Figure 3). Soil samples were collected and analyzed for constituents of interest. The results of the sampling and analyses indicate the migration of constituents in the soils has generally been limited vertically to no deeper than 25 feet and horizontally to the approximate limits of the area evaluated by the supplemental perimeter drywell borings. Limited constituent migration appears to have been in a generally southwesterly direction from Drywell No. 2.

Relatively low concentrations of PCBs (Table 15 of the RFI) and volatile organic compounds (Table 16 of the RFI) of which xylenes and, to a lesser degree, ethylbenzene and toluene predominate were detected in the analyses of the soil samples collected from the drywell area. Minor concentrations of chlorinated organic compounds were also detected. In addition, concentrations of semi-volatile organic compounds (summarized on Table 17 of the RFI) consisting primarily of 1,2,4-trichlorobenzene and, to a lesser degree, di-n-butylphthalate, di-u-octylphthalate and 4,6-dinitro-2-methylphenol were detected in some drywell area samples.

The depth to, and direction of flow of, ground water beneath the site was determined by data collected from piezometers installed at the four corners of the site. Four monitoring wells were then installed at locations both up and downgradient from the drywells. No constituents associated with any releases from the drywells were detected in analyses of samples from these monitoring wells.

1.2.3 Potential Receptors

The RFI included studies of the potential pathways of migration of constituents (via ground water, surface water, air and soil) and of potential human and environmental receptors. It was concluded that potential exposure by humans to constituents detected in the soils at the facility is limited to dermal contact and ingestion by employees or personnel authorized to be on site. Due to the nature of the development in the service shop vicinity and population distribution discussed in the RFI, it is considered unlikely that potential environmental receptors would be impacted by site-specific constituents detected in on-site soils at the service shop.

Although dermal or incidental ingestion of site-specific compounds by employees or personnel authorized to be on site is possible, the potential exposure is limited by the locations, depths and concentrations of the constituents in the soil.

1.2.4 Interim Measures

The interior surfaces and equipment in the facility were cleaned in February 1990, as described in the RFI Task I. A report on the cleaning activities and results was submitted in April 1990.

1.3 Establishment of Corrective Action Objectives

Site-specific corrective action objectives have been established with which to identify, screen and develop remediation alternatives for the site. The establishment of these objectives is based on public health and environmental criteria, information gathered during the RFI, EPA guidance and the requirements of applicable Federal and/or State statutes. Specifically, the corrective action objectives established for the GE facility were based on: 1) health-based risk evaluation for site-specific constituents; 2) TSCA requirements for

PCBs; and 3) the specifications for corrective action as described in the March, 1985 Closure Plan as modified by the New Mexico Environmental Improvement Division (EID).

1.3.1 Site Risk Characterization

RFI data shows that the primary potential exposure pathways at the GE site are associated with ingestion or dermal contact with "shallow" soil contaminants and with the potential future use of ground water which might ultimately be impacted by the constituents detected in soils in the area of the drywells.

1.3.1.1 Soils

Two exposure scenarios were developed to evaluate the risk as a result of exposure to on-site soils by facility employees and utility/construction workers. The estimates of exposure and risk are conservatively based on the maximum soil concentrations of constituents reported for depths below ground surface between zero and 15 feet. Volatile organic compounds and semi-volatile compounds were detected in soil samples collected within this depth range in the drywell area. The potential risk associated with the presence of these constituents was considered relative to applicable regulations and by a risk assessment using the described site-specific exposure conditions. The details of this risk assessment are presented in Appendix A.

An evaluation of the health risk of residual PCB's at the GE facility was prepared and is presented as Appendix C. GE compared its site with scenarios for unrestricted access areas and for industrial and other restricted access (non-substation) areas to determine whether the PCBs remaining there after a cleanup to below 10 ppm would pose an unreasonable risk to human health. The findings of the assessment confirm that the constituents present within the potential exposure depth do not present an unacceptable risk.

1.3.1.2 Ground Water

Data obtained and evaluated during the RFI indicates ground water beneath the GE site has not been impacted by the release of constituents at this site. However, an assessment of potential future impacts to ground water associated with the chemicals remaining in soils in the drywell areas was required. Daniel B. Stephens and Associates, Inc. of Albuquerque, New Mexico, was retained to model contaminant transport. The details of the modeling, input data, results etc., are presented in Appendix B. The result of the modeling effort indicate that the leaching of chemicals from the vadose zone will not cause concentrations in ground water to exceed drinking water standards at the point of regulatory compliance (the GE property boundary).

1.3.2 Corrective Measures Objective

As discussed above, the presence of detected volatile and semi-volatile organic constituents in site soils does not present an unacceptable health risk to employees or personnel authorized to be on site. In addition, ground water does not presently pose a risk to human health or the environment and studies of potential constituent migration through the vadose zone show that ground water will not present a risk to human health or the environment.

Therefore based on RFI information, public health and environmental criteria, EPA guidance, applicable state and federal statutes the proposed corrective measures objectives are:

- o to clean PCBs to TSCA cleanup levels (10 ppm); and
- o comply with the specifications for corrective action in the March, 1985 Closure Plan submitted to the New Mexico EID.

These corrective measure objectives will require remediation of the following:

- o The drywell structures, contained solidified material, connected drain lines, and associated surrounding soils exhibiting hazardous characteristics; and
- o Soils containing PCBs above levels specified in 40 CFR 761.125 requirements for PCB spill cleanup.

1.4 Screening of Corrective Measure Technologies

The following section identifies, evaluates and screens corrective measure alternatives which may be applicable at the Albuquerque facility. As discussed in Section 1.3, the established corrective action objectives are to remediate soils contaminated with PCBs to TSCA cleanup levels and to comply with the specifications for corrective action as detailed in the Closure Plan. The requirements of the Closure Plan specify removal (by excavation) of the drywell structures, contained solidified material, connected drain lines and associated soils exhibiting RCRA Hazardous Waste characteristics.

The following criteria were used to evaluate and screen corrective measure alternatives relative to their suitability for containing, removing or destroying PCBs in unsaturated on-site soils:

- o Site compatibility - is the technology applicable to existing site characteristics (eg. deep ground water, soil type, etc.)?
- o Chemical compatibility - is the technology effective when applied to the specific chemical constituents of concern?
- o Environmental/Health Protection - is the technology effective and reliable in protecting public health and the environment?
- o Implementability and Reliability of Technology - can the technology be readily implemented? Has it been proven to perform satisfactorily and reliably? Has it been fully demonstrated at a large scale?

Table 1 summarizes the evaluation and screening of identified corrective measure technologies and provides an overall assessment of each technology. Three general categories of treatment technologies are identified: 1) In-situ treatment; 2) excavation and treatment; and 3) excavation and landfilling. These general categories, where applicable, are further divided to consider various technologies.

1.4.1 In-Situ Treatment

Several technologies were evaluated under the category of in-situ treatment. These technologies are:

1.4.1.1 In-Situ Vitrification

The process of in-situ vitrification incorporates the in-place melting of wastes and soil to bind the waste in a glassy, stable matrix resistant to leaching. Electrodes are inserted into the soil to the desired depth of treatment. Melting of wastes and soils occur as a current is passed between the electrodes. Melt temperatures are in the range of 1600 to 2000°C and off-gassing of volatile organic compounds within the soil occurs. This process has a high energy demand and requires specialized equipment and highly trained personnel. Small scale in-situ field tests are usually performed to confirm feasibility with site-specific conditions. In-situ vitrification of PCB materials is still in the evaluation phase and, therefore, this technique will not be considered further in this study.

1.4.1.2 In-Situ Bioremediation

In-situ bioremediation incorporates the introduction or enhancement of microbial bacteria to degrade organic compounds in soils. Successful bioremediation requires thorough contact between the introduced nutrients and micro-organisms with the PCBs. The environment must be controlled with limited ranges of oxygen and moisture content.

Bioremediation of soils containing PCBs remains in the developmental stage and detailed treatment studies are required to ensure that the specific PCB congeners present will be degraded. Additionally, the conditions at the site where PCBs exist below the ground surface in the unsaturated soils would significantly limit the successful application and adequate contact of the introduced nutrients, moisture and/or micro-organisms to the affected zones. Therefore, in-situ bioremediation will not be considered further in this study.

1.4.1.3 In-Situ Stabilization/Solidification

Stabilization/solidification technology binds waste into a solid matrix through direct application of a stabilizing agent. This technology has been most successful when applied to inorganic wastes. Extensive testing is required to select the proper additives and their ratios and to determine the curing time to set the wastes adequately. Leaching and compressive strength tests are required to determine the integrity of the solid end product. The presence of volatile organics and/or oily wastes may inhibit the binding and long term protection against leaching. This process may be effective if confirmed by extensive bench-scale studies. In-situ stabilization/solidification of PCB materials is still in the evaluation phase. This technology will not be considered further in this study.

1.4.2 Excavation and Treatment

Excavation incorporates the physical removal of contaminated materials (soils and elements of the drywells) from the ground. This can be accomplished using conventional equipment such as a backhoe or front-end loader. Technologies for treatment of the excavated soils for PCB contamination are discussed in the following paragraphs.

1.4.2.1 Bioremediation

As discussed in Section 1.4.1.2, the technology for bioremediation of soils containing PCBs remains in the developmental stage as questions remain concerning their effectiveness in treating specific PCB congeners. Therefore, bioremediation of the excavated soil is not considered further in this study.

1.4.2.2 Solidification/Stabilization

As previously described, solidification/stabilization is not considered a viable technology at this site as the process is still being evaluated. Although some inherent limitations associated with in-situ operations are eliminated by the ability to better control the batching and mixing of soils with stabilizing materials once they are excavated, the process is not yet proven and will not be considered further in this study.

1.4.2.3 Soil Washing/Extraction

This process involves a series of treatments which produce both solid and fluid wastes which may require further treatment prior to disposal. Treatability tests suggest some limitations to the contaminant reduction available with these processes (multiple extractions may be required) and note concerns regarding solvent volatilization and residues in soil.

Additionally, the extracts requires disposal by other methods. Considering these factors and the developmental nature of this technology, it will not be considered further in this study.

1.4.2.4 Rotary Kiln Incineration

Rotary kiln incineration involves the controlled combustion of organic wastes under net oxidizing conditions. Wastes are injected into the high end of the kiln and pass through the combustion zone as the kiln slowly rotates. Wastes are oxidized to gases and an inert ash. The effectiveness of this technology on treating soils containing PCBs and organics has been demonstrated and will be retained for further consideration.

1.4.2.5 Infrared Thermal Treatment

Infrared thermal treatment is similar in process to rotary kiln incineration except that infrared thermal treatment utilizes silicon carbide elements to generate thermal radiation beyond the red end of the visible spectrum. Residues resulting from this process include off-gases and ash. The effectiveness of infrared thermal treatment has been demonstrated and, therefore, is considered a feasible technology to be further considered in this study.

1.4.3 Excavation and Landfilling

As previously discussed, excavation incorporated the physical removal of contaminated soils from the ground. The following evaluates the feasibility of placing the excavated materials in a landfill. At the present time, placement of PCB contaminated soils at levels such as those detected at the Albuquerque facility can be placed in an appropriate landfill.

However, concentrations of other contaminants present in the soils may limit or eliminate the option of landfilling these materials without treatment by a technology such as those previously described. Analyses of the excavated materials will have to be performed prior to the determination of the appropriate disposal method. Excavation and landfilling is retained for further assessment in this study.

1.5 Identification of the Corrective Measures Alternatives

Based on the screening process described in Section 1.4, feasible corrective measure techniques for use in remediating PCB contaminated soils at the GE facility, and methods of disposal, if appropriate, were identified for further study. They are:

- Excavation and Landfilling
- Excavation and Treatment by
  - infrared thermal incineration
  - rotary kiln incineration

2.0 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

The corrective measure alternatives that passed the initial screening process, and which are summarized in Section 1.5, were further evaluated according to the following criteria:

- o Performance: Ability to perform the intended functions over the necessary period of time needed to maintain effectiveness.
- o Reliability: The demonstrated and/or expected ability to function properly without frequent and/or complex operating or maintenance activities.
- o Implementability: Technical and administrative feasibility of constructing and operating the corrective measure system including the time it takes to implement and the time required to achieve a given level of response.
- o Health and Safety: Ability to comply with all regulatory requirements to protect human health and minimize human exposure to contaminants.
- o Environmental: Effectiveness to mitigate potential impacts on the environment and ability to comply with all environmental standards and criteria.
- o Cost: Affordability of both capital, operational and maintenance costs.

Figure 4 is a flow diagram of the various corrective measure alternatives which passed the initial screening process. As illustrated on the flow diagram, all corrective measure alternatives considered for further evaluation incorporate excavation as the first step. The volume of material to be excavated, described in Section 1.3.2, is estimated to be 80 tons.

The specific areas identified for excavation and proposed initial excavation limits are shown on Figure 5. This volume may increase or decrease depending on actual conditions encountered during field remedial activities. The following sections discuss the further evaluation of the various corrective measure alternatives which incorporate excavation followed by either landfilling, infrared thermal incineration or rotary kiln incineration.

2.1 Corrective Measure Alternatives #1 (CMA #1) - Excavation and Landfilling

2.1.1 Description of CMA #1

Excavation incorporates the physical removal of contaminated materials (soils and elements of the drywells) from the ground. This can be accomplished using conventional equipment such as a backhoe or front-end loader and, in the case of the drywells, a caisson-type drill rig or clamshell excavator. The excavation will be backfilled with clean soil from an off-site source.

Representative samples of the excavated materials will be analyzed to determine PCB concentrations and waste classification and to evaluate the suitability of the materials for landfilling. If the analyses indicates organic concentrations below Land Ban Limits, the materials would be acceptable in a RCRA landfill. Even if elevated organic concentrations are detected, landfilling may be permitted following treatment to reduce the leachability of the organics. The addition of activated carbon (carbon treatment) to "immobilize" volatile organic compounds in sludges and soils is provided by U.S. Pollution Control, Inc. at their landfill in Grassy Mountain, Utah. The treated material has reduced TCLP levels of F001 to F005 constituents. If reduced levels are below Land Ban Limits, the treated material may then be placed in a RCRA landfill.

2.1.2 Evaluation of CMA #1

This corrective measure alternative is evaluated in the following sections according to the six criteria discussed in Section 2.0.

2.1.2.1 Performance

The physical removal of the contaminated soils, followed by off-site landfilling, would effectively address the areas requiring remediation. It is anticipated that material excavation, testing, and disposal can be completed within six months.

2.1.2.2 Reliability

Excavation and landfilling is a one-time operation. Frequent and/or complex operating or maintenance activities are not required. Therefore, CMA #1 is considered a reliable alternative.

2.1.2.3 Implementability

Excavation and landfilling is a widely used corrective measure and has been demonstrated to be technically and administratively feasible. As this alternative is a one-time operation which removes the required materials. Little time is required to achieve the necessary level of response.

2.1.2.4 Health and Safety

Potential short term impacts during excavation and removal operations primarily involve exposure to air borne contaminants and organic vapors. Site access would be restricted to prevent potential public exposure. On-site personnel exposure would be minimized by the use of decontamination procedures, dust control, and personal protective equipment during remedial activities.

Potential exposure to the public due to accidental releases of contaminated soil, can be minimized by utilizing reputable transport companies, sealing transport containers, and decontamination of transport vehicles before movement off site.

The long-term impact to the public health would be minimal due to the removal of the contaminated soils and their replacement with clean soil.

2.1.2.5 Environmental

Although the materials to be excavated do not presently adversely impact the environment, as described in the RFI report, removal of these materials would eliminate the potential for future adverse environmental impacts.

2.1.2.6 Costs

The estimated cost to implement excavation and landfilling of the contaminated materials is $110,822. A summary of these costs is provided on Table 2. The total estimated volume of material to be addressed is approximately 80 tons. As this alternative is a one-time operation, only capital costs are provided.

2.2 Corrective Measures Alternative #2 (CMA #2) - Excavation and Infrared Thermal Incineration

2.2.1 Description of CMA #2

As previously described, excavation involves the physical removal of contaminated materials. Once excavated, appropriate laboratory testing of the excavated materials will be performed. If landfilling is eliminated by the results of the laboratory analysis, on-site infrared thermal incineration may be considered as a corrective measure alternative. Infrared thermal destruction incorporates a mobile thermal processing system that brings the waste to combustion temperatures. An emissions control system removes particulates and neutralizes any acid gases. The end product is an ash residue which is appropriately landfilled. Analytical testing to determine the effectiveness of the incineration process would be performed. Based upon the analytical results, a determination of either onsite disposal or landfilling as hazardous waste would be made. The location of the hazardous waste landfill would be made based upon disposal and transportation costs. The following is a list of the RCRA Landfills that may be contacted for the disposal of the treated soils:

Company	**Location**
CWM	Kettleman Hills, CA
CWM	Neward, CA
U.S. Ecology	Betty, NV
USPCI	Grassy Mountain, UT
USPCI	Lone Mountain, OK
Envirosafe Serv.	Mt. Home, ID

Depending on the volume of construction rubble excavated, it may be appropriate to separate and steam clean the rubble. Chip samples of the rubble (drywell masonry and/or cobbles) will be obtained and analyzed. The appropriate corrective measure (landfilling or incineration) will be selected based on the analytical results. The steam cleaning wastewater will also be analyzed to select the appropriate method of disposal or treatment.

2.2.2 Evaluation of CMA #2

This corrective measure alternative is evaluated in the following paragraphs according to the six criteria discussed in Section 2.0.

2.2.2.1 Performance

Infrared thermal incineration has been successfully demonstrated as effective regarding the destruction of PCBs, VOCs and semi-volatile organics to necessary levels. One potential limitation to the feasibility of the effectiveness of this process, however, is the particle size limitations. A non-uniform particle size of the material intended for incineration would require pretreatment, separation, followed by crushing and/or shredding of particles greater than 1 to 2 inches. Materials associated with the drywell structures, cobbles and masonry blocks, would require such pretreatment prior to infrared thermal incineration. The primary factors which will influence the time required to implement this alternative relate to mobile infrared incinerator availability and permitting requirements. It is estimated that a minimum of 12 months would be required to complete CMA #2.

2.2.2.2 Reliability

As excavation and infrared thermal incineration incorporate the removal of the areas of concern and destruction of contamination, operational and maintenance requirements are not considered a factor.

2.2.2.3 Implementability

Infrared thermal incineration is a corrective measure alternative that has been demonstrated to be technically feasible. Mobile infrared thermal incineration units are currently available for use. "Incinerators" are currently not being permitted by Bernalillo County. However, the infrared thermal incineration unit may possibly be permitted as a "thermal destruction unit." As discussed under Section 2.2.2.1: Performance, particle size is a limiting factor in the use of the infrared thermal incinerator. Pretreatment would be a necessary process prior to incineration to reduce the size of the materials comprising the drywell structures.

2.2.2.4 Health and Safety

The protection of public health would be achieved by excavation and infrared thermal incineration as this corrective measure alternative removes and destroys the contaminants present. Controls to limit potential impacts during the excavation and on-site treatment activities are described in Section 2.1.2.4.

2.2.2.5 Environmental

Excavation followed by infrared thermal incineration eliminates the potential for future adverse environmental impact.

2.2.2.6 Costs

A summary of the cost estimate for the excavation and infrared thermal incineration is presented on Table 3. The estimated cost for implementing this corrective measure alternative is $929,474. O & M costs are not considered as this alternative does not require them.

2.3 Corrective Measure Alternative # 3 (CMA #3) - Excavation and Rotary Kiln Incineration

2.3.1 Description of CMA #3

CMA #3 includes excavation, as described in Section 2.1, followed by off-site rotary kiln incineration. The necessity of incineration prior to landfilling will depend upon the results of laboratory analyses of the excavated materials.

2.3.2 Evaluation of CMA #3

This corrective measure alternative is evaluated in the following paragraphs according to the six criteria discussed in Section 2.0.

2.3.2.1 Performance

Rotary kiln incineration has been successfully demonstrated as effective in the treatment of PCBs, VOCs and semi-volatile organic compounds. Some limitations regarding the size of the materials requiring incineration exist but are not as restrictive as particle size limitations with respect to the infrared thermal incineration process. It is anticipated that six months would be required to implement CMA #3.

2.3.2.2 Reliability

The reliability of CMA #3 is consistent with that described in Section 2.2.2.2.

2.3.2.3 Implementability

As previously described, excavation is a widely used corrective measure alternative that is both feasible and administratively possible. Off-site rotary kiln incineration is available at several locations in neighboring states.

2.3.2.4 Health and Safety

Protection to human health and the environment would be achieved by excavation of the necessary materials and their destruction by rotary kiln incineration. Controls to limit potential impacts during the excavation and subsequent transport to incineration are described in Section 2.1.2.4.

2.3.2.5 Environment

The actual removal and subsequent treatment of contaminated material mitigates any adverse impacts on the environment.

2.3.2.6 Costs

A summary of the costs for the implementation of CMA #3 is presented on Table 4. The estimated cost for implementation of this CMA is $209,211. As for the other corrective measure alternatives, O & M costs are not considered.

3.0 JUSTIFICATION AND RECOMMENDATION OF THE CORRECTIVE MEASURE ALTERNATIVE

A summary of the evaluated corrective measure alternatives is presented on Table 5. Based on the evaluations discussed in Section 2.1 through 2.3, all three corrective measure alternatives evaluated would be technically feasible, reliable, implementable, and protective of human health and the environment. However, several factors present limitations to the timeliness in which CMA #2 can be implemented. Such factors include permitting requirements of Bernalillo County for on-site treatment (infrared thermal incineration) and availability of mobile infrared thermal incineration units.

The implementation of CMA #1, excavation and landfilling is recommended as the preferred corrective measure alternative due to its simplicity, relatively short implementation time and cost effectiveness.

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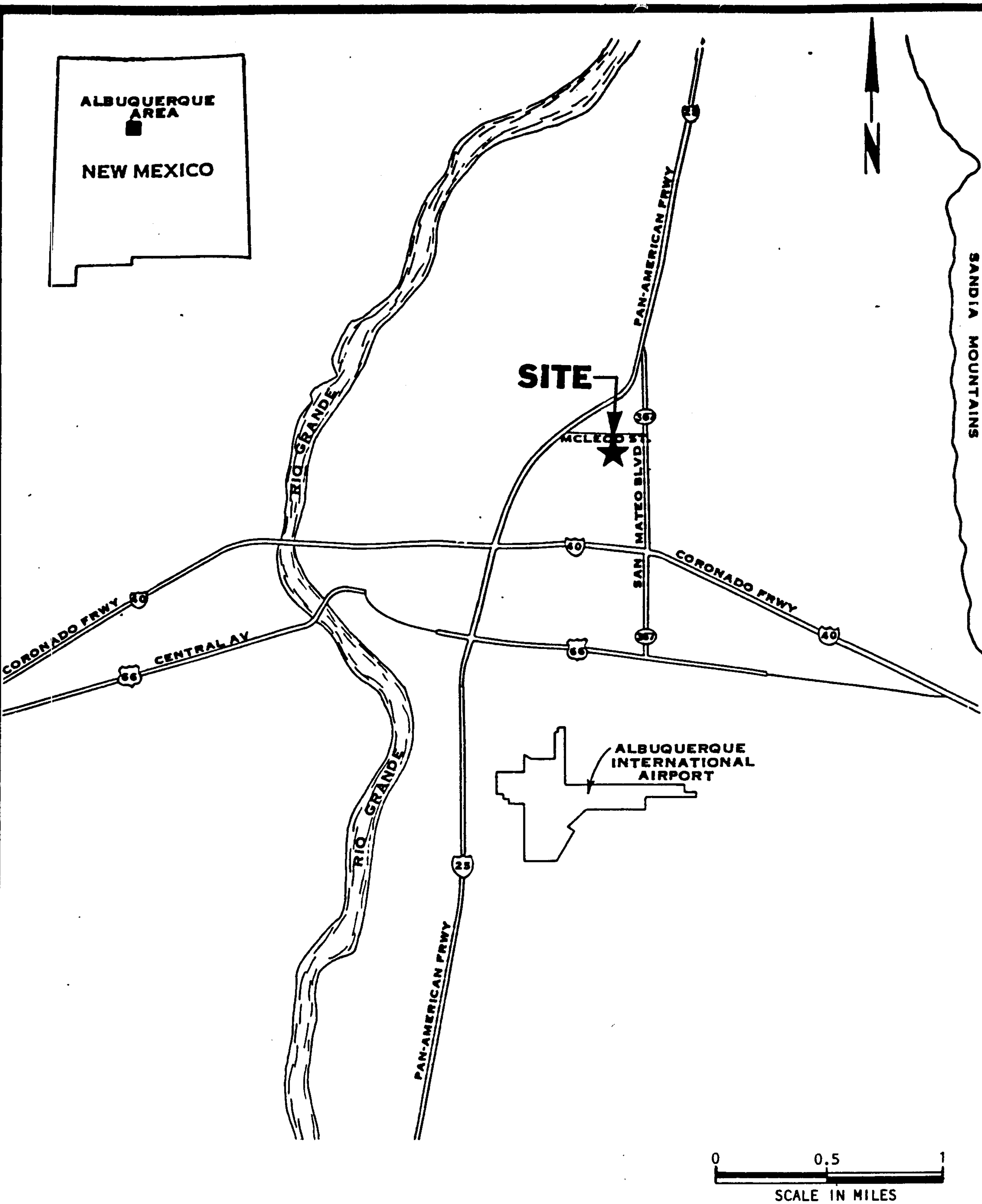
TABLES

FIGURES



GENERAL ELECTRIC
SERVICE SHOP

ALBUQUERQUE,
NEW MEXICO

LAW ENVIRONMENTAL
INC.

SITE LOCATION MAP

JOB NO. 55-4342 FIGURE 1

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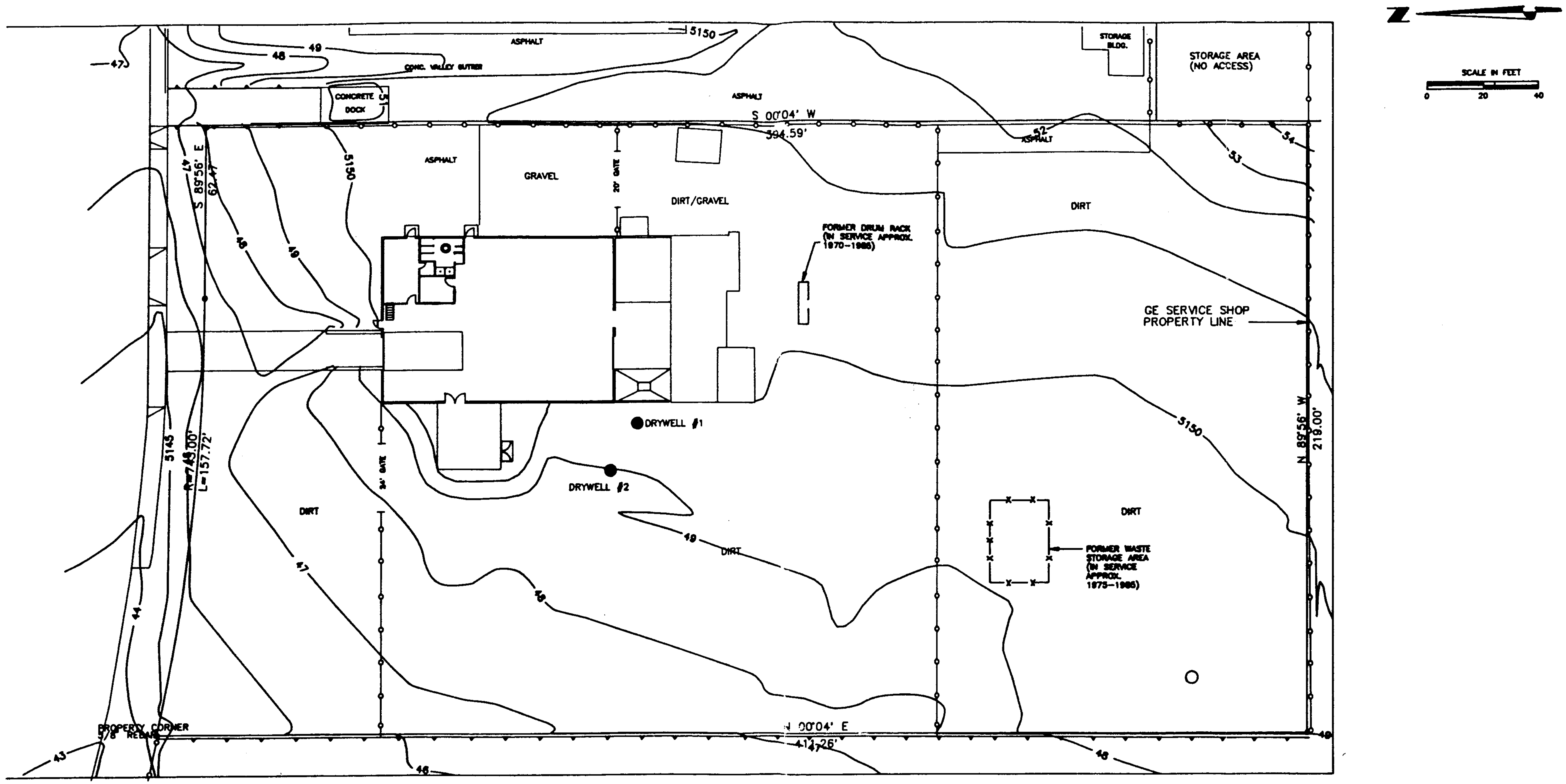

GENERAL ELECTRIC SERVICE SHOP
ALBUQUERQUE, NEW MEXICO

LAW ENVIRONMENTAL, INC.

SITE PLAN

JOB NO. 55-4342

FIGURE 2