NUREG-1157

Environmental Assessment
for renewal of Special Nuclear Material License No. SUB-1010

Docket No. 40-8027

Sequoyah Fuels Corporation

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

August 1985

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ABBREVIATIONS AND ACRONYMS

AMAD	Activity median aerodynamic diameter
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
SFC	Sequoyah Fuels Corporation
TBP	Tributyl phosphate
s	Seconds
min	Minutes
h	Hours
d	Days

LIST OF FACTORS FOR CONVERSION OF ENGLISH TO INTERNATIONAL SYSTEM OF UNITS (SI)

The following table gives the factors used in this document for the conversion of conventional English units to the equivalent International System of Units (SI) now being adopted worldwide or conventional metric units. The conversion factors have been obtained from the ASTM publication Standard for Metric Practice[a] and are used to four-digit accuracy, since most of the values in this document are not known to any more exactness. After conversion, the SI values have been rounded to reflect an accuracy sufficient for the requirements of this document. Most of the values will be presented in SI units with the equivalent English unit following within parentheses.

Conversion of English to SI Units

To Convert From	To	Multiply By
acre	hectare (ha)	0.4047
barrel (bbl)	cubic meter (m^3)	0.1590
cubic feet/min (ft^3/min)	m^3/min	0.02832
feet (ft)	meters (m)	0.3048
cubic feet (ft^3)	cubic meters (m^3)	0.02832
cubic yards ($yards^3$ or yd^3)	m^3	0.7645
gallon (gal)	cubic meters (m^3)	0.003785
gal/min	m^3/min	0.003785
gal/min	m^3/h	0.2271
gal/min	liters/s (L/s)	0.06309
inch (in.)	centimeters (cm)	2.54
inch (in.)	meter (m)	0.0254
mile (statute)	kilometer (km)	1.609
square mile ($mile^2$)	square kilometer (km^2)	2.590
pound (lb)	kilograms (kg)	0.4536
ton (short)	kilograms (kg)	907.2

[a] American Society for Testing and Materials, Standard E-380, Standard for Metric Practice, February 1980.

1. PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The Sequoyah Fuels Corporation (formerly the Kerr-McGee Nuclear Corporation) operates a privately owned uranium hexafluoride (UF_6) production facility at Gore, Oklahoma. At this facility, uranium ore concentrates (received as yellowcake solid or slurry) are converted into UF_6, which is shipped to Department of Energy (DOE) gaseous diffusion plants for enrichment of the U-235 isotope.

In response to an application (September 1, 1982) for renewal of Source Material License SUB-1010 for the plant, the U.S. Nuclear Regulatory Commission (NRC), with the technical assistance of Oak Ridge National Laboratory (ORNL), prepared this environmental assessment pursuant to NRC regulations (10 CFR Part 51), which implement requirements of the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190). Part 51 also takes account of the Council on Environmental Quality Regulations (40 CFR Parts 1500-1508) for implementing NEPA. Sections 51.14 and 51.30 of the NRC regulations (10 CFR) defines "Environmental Assessment" as follows:

1. An environmental assessment is a concise public document, for which the NRC is responsible, that serves to

   - briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a finding of no significant impact,

   - aid the NRC's compliance with NEPA when no EIS is necessary, and

   - facilitate preparation of an EIS when one is necessary.

2. An environmental assessment shall include brief discussions of the need for the proposal, of alternatives as required by Sect. 102(2)(E) of NEPA, and of the environmental impacts of the proposed action and alternatives. It shall also include a listing of agencies and persons consulted.

A Final Environmental Statement[1] for the operation of the UF_6 production plant was issued by the NRC in February 1975.

An Environmental Impact Appraisal (EIA)[2] for the facility was issued by the NRC in October 1977, in conjunction with a five-year renewal of License SUB-1010. Subsequently, the applicant made several changes in the physical plant and in operational, waste disposal, or environmental monitoring procedures. Many of those changes were authorized by NRC through license amendments. These changes are summarized in Sect. 1.2.

The purposes of this assessment are (1) to review the operation of the facility during the recent license period by comparing the plant operation,

pollutant releases, and environmental monitoring data with license requirements or permissible levels of environmental contamination, and (2) to determine the impact on the environment from continued operation of the plant in its current configuration.

1.2 Summary of The Proposed Action

The proposed action is the renewal of the license necessary for continued operation of the SFC production plant at Gore, Oklahoma. The plant has been in operation with authority to use source material for the production of UF_6 since February 1970. In addition to facilities for production of UF_6 (see Sect. 2.2.1), the site also includes: (1) a storage area for drums of uranium ore concentrates received from uranium mills, (2) a uranium sampling facility, (3) bulk storage of hazardous chemicals such as hydrofluoric (HF), nitric (HNO_3), and sulfuric (H_2SO_4) acids and tributyl phosphate-hexane solvent, (4) a facility for electrolytic production of fluorine from HF, (5) separate treatment systems and storage ponds for radiological and nonradiological liquid wastes, and (6) a program for disposal of raffinate from a solvent extraction system in the UF_6 production as fertilizer on land owned by SFC.

Following the 1977 license renewal, the plant license was amended to include the following major environmentally-related changes in the plant or operation:

1. Increased the storage volume for treated raffinate by adding ponds 3 and 4 (license amendments 2 and 7).

2. Increased the onsite acreage fertilized with treated raffinate; included offsite acreage owned by SFC in the fertilizer program; extended permit time for fertilizer program; and changed fertilization program from experimental to permanent (license amendments 4, 11, 13, and 15).

3. Remodeled raffinate pond 1 to include a lining and installation of a clarifier to improve solids removal from the raffinate (license amendment 6); and terminated raffinate input to pond 2.

4. Modified raffinate treatment system to reduce concentrations of metal ions (particularly molybdenum, nickel, and copper) that would be applied with raffinate fertilizer (license amendments 18 and 20).

5. Released forage grown on fields fertilized with treated raffinate for animal feed (license amendments 12 and 17).

6. Modified the radiological monitoring program to demonstrate compliance with EPA'S environmental radiation standard as specified in 40 CFR 190 (license amendment 9).

7. On a test basis, disposed of limited quantities of treated raffinate by injection into a deep well about 910 m (3000 ft) below land surface (license amendment 22).

8. Construction and use of a new storage pond No. 5 (license amendment 28).

During the final preparation of the EA, SFC by letters dated January 24 and April 22, 1985 requested a license amendment to allow construction and

operation of a UF_6 to UF_4 conversion building. The proposed license amendment is currently under review by the NRC. The NRC will conduct an environmental assessment of the proposed action including the cumulated impact from the existing operation.

1.3 Need For Action

The SFC UF_6 conversion plant is one of only two such facilities in the United States. (The other is at Metropolis, Illinois.) The UF_6 production is one phase (see Fig. 1.1) of the overall fuel cycle leading to production of fuel elements for nuclear reactors. Currently, the Sequoyah facility supplies UF_6 conversion services for the commercial nuclear power industry.

As long as the current demand for uranium fuel continues, the UF_6 production rate at either of the existing facilities is not expected to decrease. Denial of license renewal for the UF_6 conversion activity at the Gore site would require that similar activities expand at the only other existing UF_6 facility or at a new site. Although denial of renewal of the source material license for this plant is an alternative available to the NRC, it would be considered only if significant issues of public health and safety could not be resolved to the satisfaction of the regulatory authorities involved.

1.4 The Scoping Process

The overall production and impact of this UF_6 conversion facility were appraised in February 1975 and October 1977.[1,2] In connection with the current application for license renewal, the applicant submitted an environmental report[3-7] that includes an updated description of the facility and its operation, the affected environment, and a tabulation of effluent releases and environmental monitoring data for recent years. In conducting this assessment, the staff toured the site and surrounding area (May 4, 1983) and met with the applicant to discuss items of information related to facility operations and to seek additional information that might be needed for an adequate assessment. The staff also met with representatives of the Oklahoma Water Resources Board.

The applicant submitted responses to the staff's environmental questions,[4] a revised renewal application,[5] and supplemental information.[6,7] The staff also obtained information from other sources (identified in the references for each section) to assist in the evaluation.

The principal impacts of current operation of the UF_6 conversion facility result from release of the following effluents to the environment: (1) fluorides and radioactive gases or particulates to the atmosphere, and (2) contaminated liquids to the adjacent Illinois River. The actual gaseous and liquid pollutants released during normal operation of the plant have been measured, and the concentration of contaminants have been monitored at onsite and offsite locations. Because the proposed license renewal for the plant operation does not involve a significant increased scope of activity beyond that previously appraised, the staff concluded that the principal subjects to be addressed in this environmental assessment should include pollutant controls, waste management, environmental monitoring, and environmental impact of operation and accidents. The affected environment at the site and the plant operations will be described and aspects of insignificant impacts will be identified. Liquid waste seepage or leachate from pond 2 will be examined in detail to determine the extent of the impact and the action required to mitigate the impact.

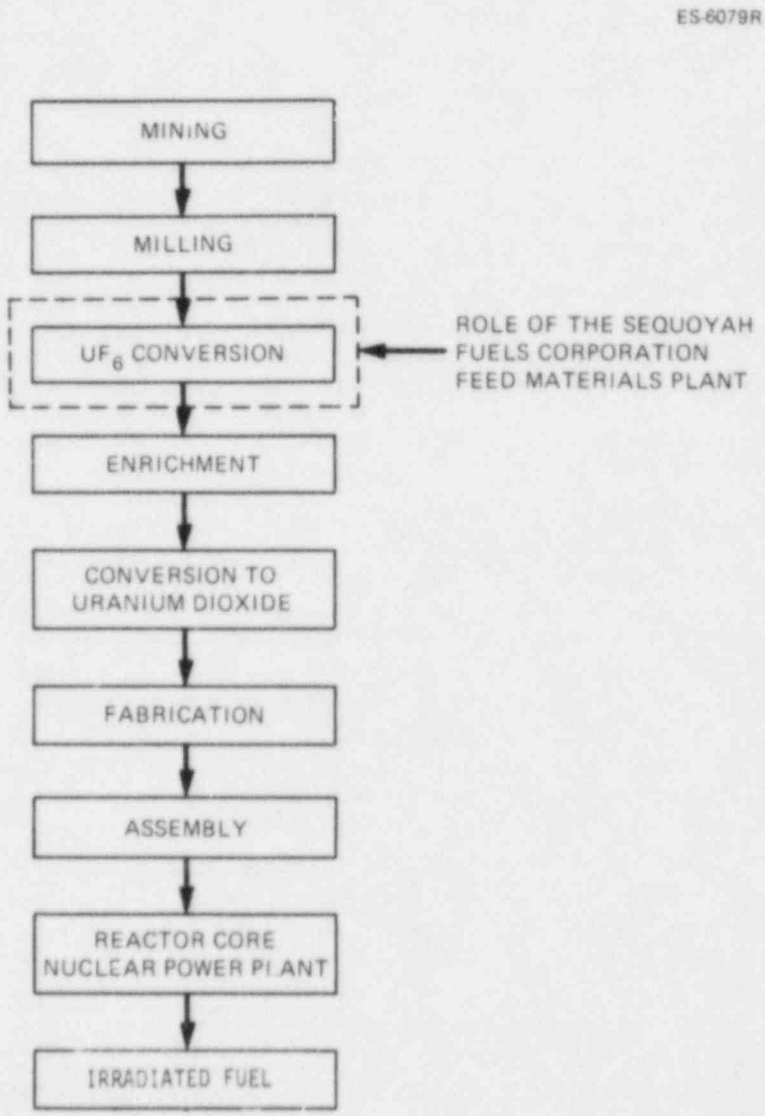

Fig. 1.1. Flow chart of the nuclear fuel cycle.

REFERENCES FOR SECTION 1

1. U.S. Nuclear Regulatory Commission, Final Environmental Statement Related to the Sequoyah Uranium Hexafluoride Plant, Kerr-McGee Nuclear Corporation, Docket No. 40-8027, NUREG-75/007, February 1975.

2. U.S. Nuclear Regulatory Commission, Environmental Impact Appraisal by the Division of Fuel Cycle and Material Safety Related to the Source Material License (SUB-1010) Renewal for the Kerr-McGee Nuclear Corporation Uranium Hexafluoride Facility, Sequoyah County, Oklahoma, Docket No. 40-8027, October 1977.

3. Kerr-McGee Nuclear Corporation, Sequoyah Facility License Renewal Application, License SUB-1010, Docket No. 40-8027, September 1982.

4. Kerr-McGee Nuclear Corporation, Response to U.S. Nuclear Regulatory Commission Site Visit Information Requests, July 11, 12, and 20, and August 19, 1983.

5. Sequoyah Fuels Corporation, Sequoyah Facility License Renewal Application (Revised), License SUB-1010, Docket No. 40-8027, October 1983.

6. W. J. Shelley, Kerr-McGee Corporation, letter to Bernice M. Kosla, U.S. Nuclear Regulatory Commission, Docket No. 40-8027, November 4, 1983.

7. J. C. Stauter, Sequoyah Fuels Corporation, letter to W. T. Crow, U. S. Nuclear Regulatory Commission, Docket No. 40-8027, March 15, 1985.

2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 The Alternative of No License Renewal

Not granting a license renewal for the UF_6 conversion plant would cause SFC to cease production of UF_6 at this site. This alternative would be considered only if significant issues of public health and safety could not be resolved. Cessation of UF_6 conversion activities would probably result in closure of the facility because no other operations currently exist on the site. The benefits to be gained by such a course of action would be a decrease in the environmental impacts (as described in Sect. 4). Since demand for UF_6 feed material in the uranium fuel cycle is expected to continue, closure of the SFC facility at Gore, Oklahoma, would require expansion of production at the only other existing UF_6 conversion facility in the United States (Metropolis, Illinois) or construction of a new UF_6 conversion facility, thus merely transferring the impacts to another site.

2.2 The Alternative of License Renewal

This alternative, which is the proposed action, would result in the continued operation of the SFC facility for another 5 years essentially as it has been operated for the past years. Following is a description of the current operation, waste confinement, and effluent control systems.[1-4] Impacts of little consequence are identified and discussed in this section. More important impacts are assessed in Sect. 4.

2.2.1 Description of the Current Operation

The SFC plant produces high-purity UF_6 using uranium concentrates (yellowcake) as the starting material. It is currently designed to produce 10,000 tons of UF_6 per year. The manufacturing process being used includes wet chemical purification to convert yellowcake to pure uranium trioxide followed by dry chemical reduction, hydrofluorination, and fluorination techniques to produce UF_6.

The SFC plant layout shown in Fig. 2.1 uses about 34 ha (85 acres) of the 850-ha (2100-acre) site (Fig. 2.2). The total area under roof comprises about 7,900 m^2 (85,000 ft^2) of manufacturing, warehousing, and office space in four separate buildings. The main building, occupying about 7,250 m^2 (78,000 ft^2), contains the administrative offices and laboratory along with the sampling plant for dry yellowcake, the major processing and fluorine generation facilities, and utility and maintenance areas. The maximum height of this building is 18 m (60 ft) over the sampling plant area while most of the roof above the manufacturing area is 12 m (40 ft) above ground. The roof of the east wing of the building containing the fluorine production facilities, shops, and warehouse area is about 5 m (16 ft) high. The main plant stack is located near the northwest corner of the building and rises 46 m (150 ft) above ground level.

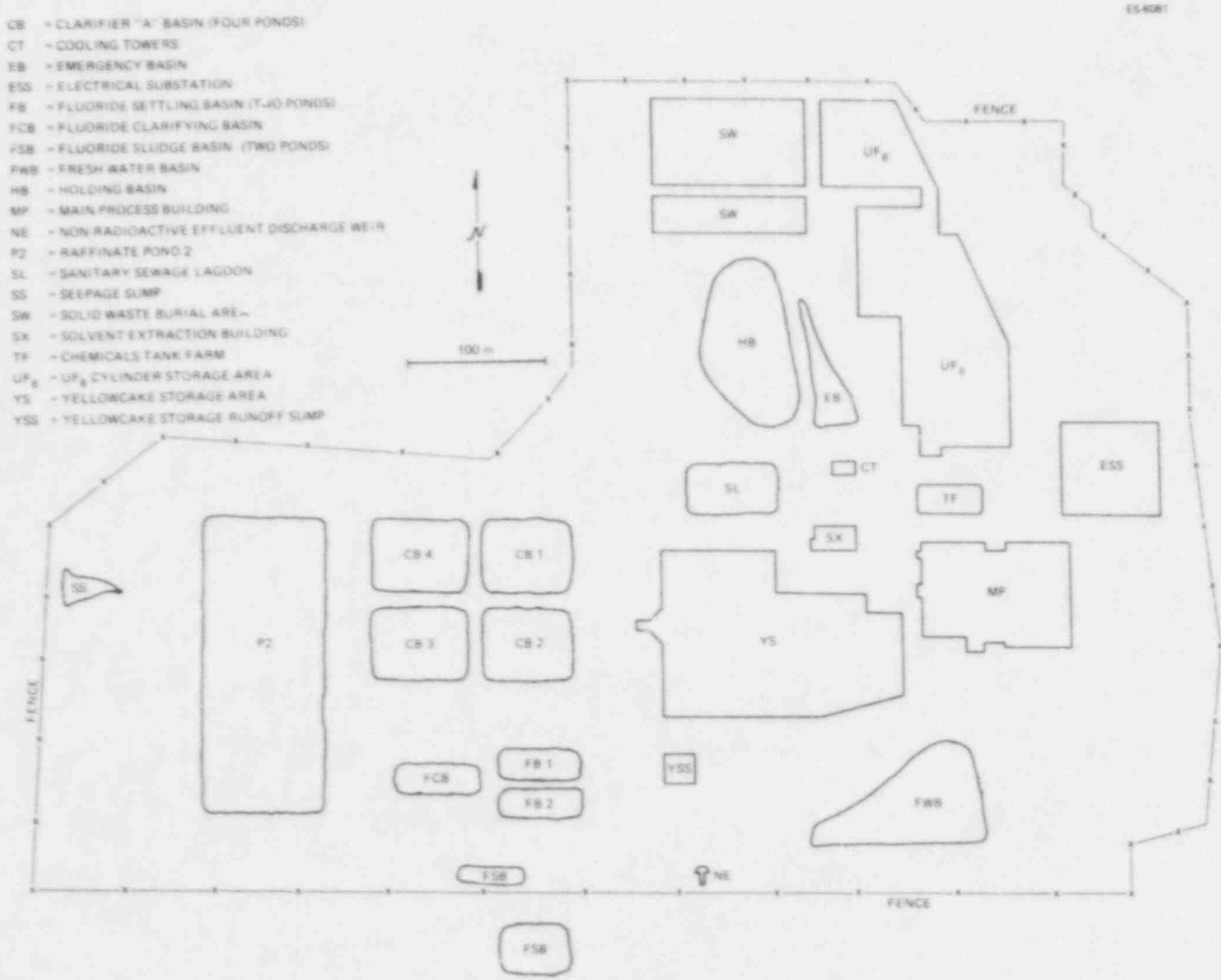

Fig. 2.1. Layout of the industrial portion of the Sequoyah Fuels Corporation plant site near Gore, Oklahoma.

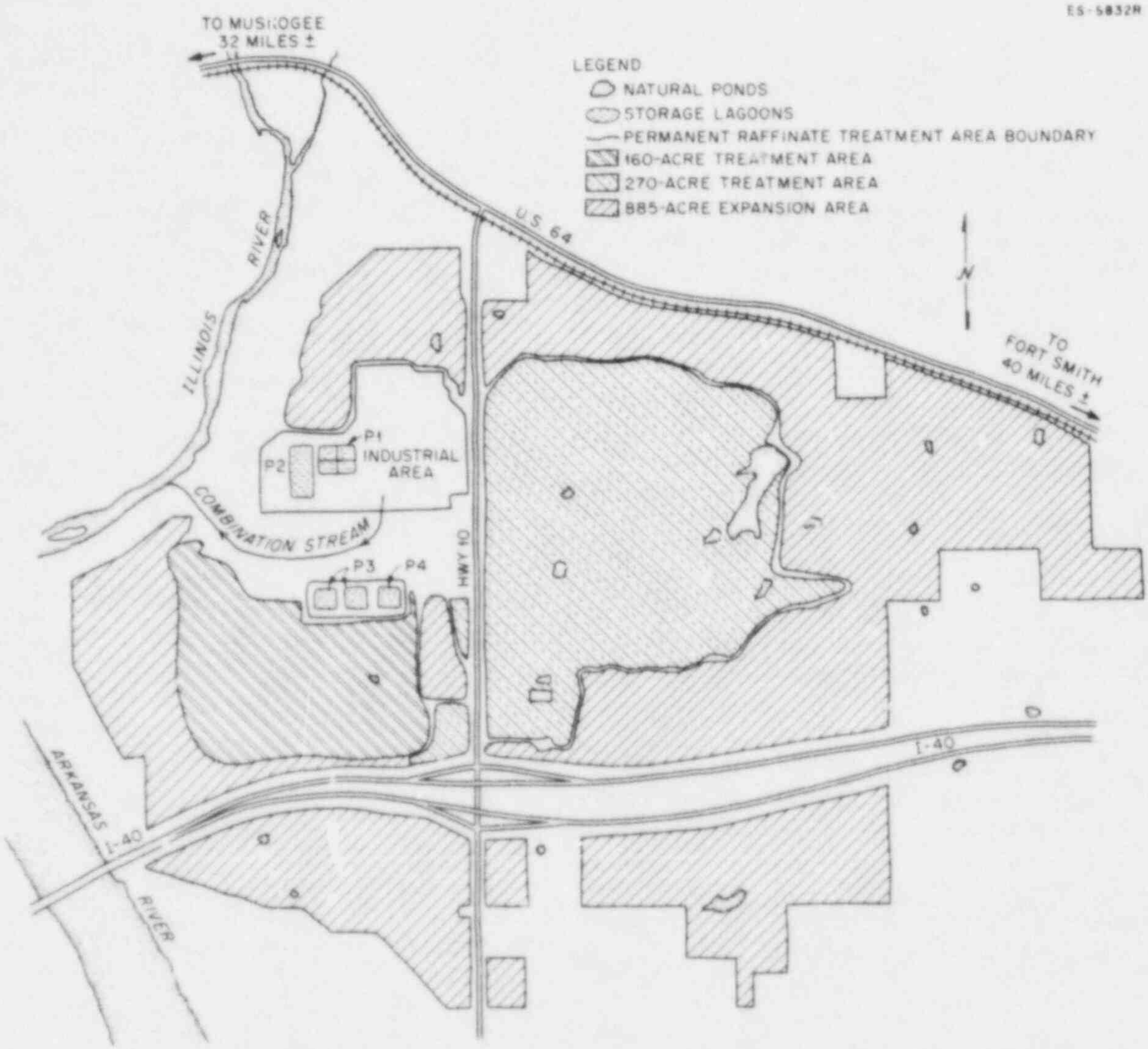

Fig. 2.2 Land usage at the Sequoyah Fuels Corporation plant site near Gore, Oklahoma.

About 61 m (200 ft) west of the main building is a 130-m^2 (1400-ft^2) building where yellowcake slurry can be received and processed. Facilities in this building enable the applicant to dissolve the slurried solids in nitric acid and sample the solution before piping it into the processing circuit. The solvent extraction facility is located in a separate 370-m^2 (4000-ft^2) building about 46 m (150 ft) west of the main structure. A one-story warehouse about 61 m (200 ft) north of the main building provides storage for spare mechanical equipment.

Additional plant facilities (Fig. 2.1) include the following: an electrical substation, UF_6 cylinder storage area, tank farm for liquid chemicals and fuel oil, uranium ore concentrate (yellowcake) drum storage area, cooling tower for waste heat dissipation, sanitary sewage facilities, retention ponds for fluoride-contaminated wastes, retention ponds for untreated raffinate waste from the solvent extraction process which contains significant quantities of radioactive

material, retention ponds for treated raffinate, and a reservoir for an emergency supply of water.

The production method involves: (a) feed preparation, (b) dissolution of the ore concentrate in nitric acid, (c) purification of the uranium solution by solvent extraction, (d) thermal denitration of the uranyl nitrate to prepare uranium trioxide, (e) hydrogen reduction of the uranium trioxide to uranium dioxide, (f) conversion of the uranium dioxide to uranium tetrafluoride by reaction with anhydrous hydrogen fluoride, and (g) formation of uranium hexafluoride by contacting the uranium tetrafluoride with elemental fluorine.

A simplified block-diagram process flowsheet is shown in Fig. 2.3 and a more detailed schematic process flowsheet is provided in Fig. 2.4. The process waste streams indicated in Figs. 2.3 and 2.4 are discussed in detail in Sect. 2.2.2. Following is a discussion of each of the steps indicated in Fig. 2.3.

2.2.1.1 Receiving and sampling

Uranium feed material is delivered to the SFC facility in three forms: dry yellowcake (ore concentrate), wet yellowcake slurry, and wet UF_4 slurry. Processing of wet yellowcake slurry and UF_4 slurry will be discussed in Sect. 2.2.1.2.

The dry concentrate (yellowcake) is received from uranium mills in 55-gal steel drums. Each drum has an identifying number so that an accurate record may be maintained of the contents and analysis for purposes of uranium accountability and for billing or payment to customers. The drums are stored four to a pallet and up to three pallets high on an outside storage pad. The drums and pallets are strapped down for storm protection. Incidental uranium concentrate loss onto the storage pad is flushed by rainfall runoff to the yellowcake storage rainwater sump (Fig. 2.1).

After weighing, each drum is emptied through a falling stream sampling unit. This unit consists of two samplers in series, each taking a small cut. The first cut provides an initial sample weight of about 1% or less of the contents of a drum. The sample is split down again by a factor of about 50 and is collected in trays. The material collected in the trays is processed to a final sample pulp by the operations of drying, pulverizing, riffling, sieving, and blending as needed.

The remaining ore concentrate from each drum can be fed directly into the two digester feed hoppers or can be redrummed for later use. The hoppers have a combined capacity of about 45 t (50 tons), which is one day's output of the sampling system.

All operations in the dry yellowcake sampling area of the main building involving open drums or uncontained yellowcake powders are performed under dust collection hoods. See Sect. 2.2.2 for discussion of emission controls.

2.2.1.2 Dry yellowcake digestion

Dry yellowcake digestion is the primary digestion process in the SFC facility. This is a batch process where the concentrate is reacted with preheated

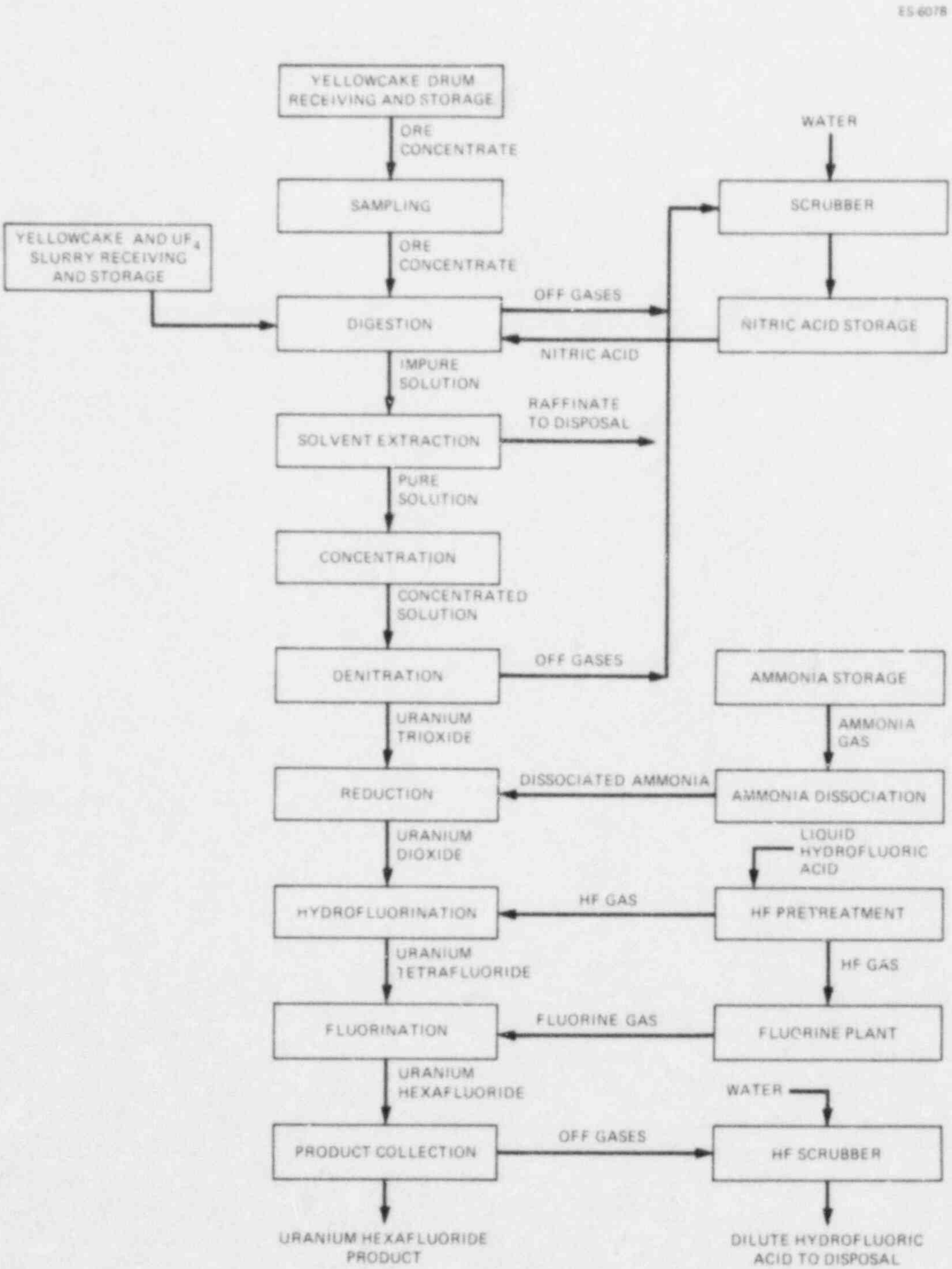

Fig. 2.3. Flow chart for conversion of yellowcake (U_3O_8) to uranium hexafluoride (UF_6) and for environmental control.

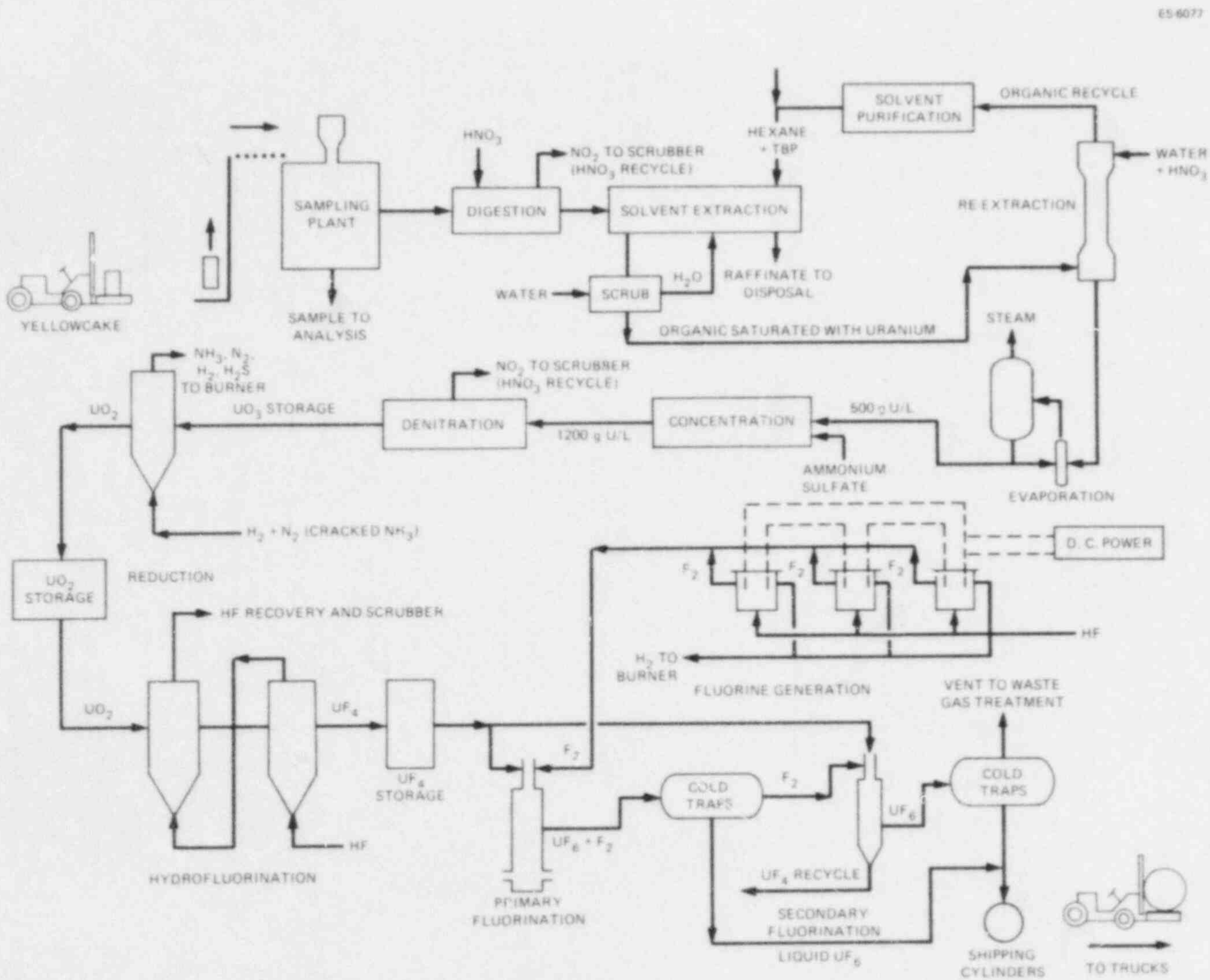

Fig. 2.4. Process diagram for uranium hexafluoride (UF_6) production from yellowcake (U_3O_8), including process inputs and waste product treatment.

nitric acid in one of three 15 m^3 (4000-gal) digestion tanks to convert the uranium, present in the form of oxides or diuranates, to uranyl nitrate solution.

Initially, about 5.3 m^3 (1400 gal) of nitric acid of up to 60% concentration is pumped from the tank farm to a digester tank. Steam coils in the digester tank are used to raise the acid temperature to between 88 and 104°C (190 and 220°F). When the proper temperature is attained, dry concentrate is fed from the digester feed hoppers into the digester tank using screw-type feeders. About 5,400 kg (12,000 lb) of concentrate is added to the nitric acid. The normal batch volume is about 11.7 m^3 (3100 gal). An agitator is operated continuously to promote both thorough mixing of the concentrate in the acid and thermal equilibrium. The reaction of the concentrate with nitric acid is exothermic, and water-cooled coils are used to remove excess heat to control the solution temperature. The reaction is also accompanied by evolution of nitrogen oxides.

When digestion is complete, the slurry is transferred to an adjustment tank and the digester tank and transfer lines are flushed with water. The adjustment tank provides a holdup period for cooling of the slurry, for adjustment of the chemistry of the slurry to prevent uranium loss as precipitates, and to improve uranium recovery in the subsequent solvent extraction process. Composition adjustment may involve modifying the acidity of the uranyl nitrate slurry or the addition of special feed solutions from other digestion processes discussed below.

Wet yellowcake slurry containing approximately 38 wt % of water is delivered from some uranium mills in stainless steel cargo tanks. The cargo tank arrives at the plant about 60% full. Pumps and piping enable transfer of the slurry to plant receiving tanks and recycle to the cargo tank.

In batch quantities, 60% HNO_3 is fed into the cargo tank until the solids in the yellowcake slurry are completely dissolved. This uranyl nitrate solution is then pumped to a receiving tank where the contents are weighed, sampled, and transferred to a 38-m^3 (10,000-gal) storage tank. Subsequently, this solution is pumped to the uranyl nitrate feed preparation tanks for final adjustment of solution chemistry before entering the solvent extraction operation (Fig. 2.4).

Tanks, pumps, and piping for processing the wet yellowcake slurry and the uranyl nitrate solutions are mostly enclosed in a separate building surrounded by curbs that can contain the total volume of the tanks in case of tank rupture. The parking area for the cargo tank is also curbed to contain the entire tank volume.

The UF_4 slurry with about 50% water is received in 0.2-m^3 (55-gal) drums with polyethylene liners. These drums are stored in a building with a curbed foundation that is adjacent to the west wall of the yellowcake slurry receiving building. The drums are emptied into a 16-m^3 (4500-gal) digester tank containing an HNO_3-$Al(NO_3)_3$ solution. The resulting uranyl nitrate solution can be stored or pumped to the feed preparation tanks for final adjustment before entering the solvent extraction operation (Fig. 2.4). Nitrogen oxide and hydrogen fluoride gases evolve during this digestion process.

A miscellaneous batch digester [5.7 m^3 (1500 gal)] is used to recover uranium from fluorination ash and dusts collected in dust control systems by dissolution in a HNO_3-$Al(NO_3)_3$ solution. Fluorination ash is derived from the exit filters of the fluorination reactors which are blown down periodically into ash receivers below the filters. Batch weight in the miscellaneous digester is approximately 900 kg (2000 lb) of ash [approximately 310 kg (750 lb) of uranium], and the resulting solution is blended with the primary digestion product from yellowcake digestion and fed to the solvent extraction system. Again, nitrogen oxides and hydrogen fluoride are produced.

The liquids of all digester tanks discussed above are eventually pumped into the solvent extraction system for purification of the uranium. There are no solid wastes from the digestion operations. Off-gases from the digester tanks are cooled with dilute HNO_3 and treated to remove most of the acid fumes, water vapor, and noxious nitrogen oxides. Condensed vapors are returned to the digestion tanks, caustic chemical-waste-containing fluoride is collected for disposal, and the remaining off-gases are piped to the HNO_3 recovery plant for recycle of remaining HNO_3 vapors.

The primary and miscellaneous digester tanks have spill curbs to contain any accidental leakage. Drainage from these curbed areas can be pumped into other digester tanks for processing.

2.2.1.3 Solvent extraction

The uranyl nitrate slurry is fed from the adjustment tanks to the solvent extraction system. The uranyl nitrate is processed by countercurrent extraction in a series of pumper-decanters using 30% vol tributyl phosphate (TBP) in hexane solvent. Two control criteria have been established for the solvent extraction process. First, the digester slurry feed rate is adjusted at constant solvent flow to assure an acceptably low uranium loss in the raffinate waste stream. Second, a high uranium saturation level is maintained in the organic extraction product to obtain satisfactory separation of uranium from the impurities.

There are two liquid streams flowing from the series of pumper-decanters: the raffinate waste stream with very low uranium content and the organic extraction product that includes most of the uranium. The raffinate stream passes from the solvent extraction system to a raffinate decanter vessel where it is washed with hexane. The raffinate is then discharged to one of the four settling basins of clarifier A (Fig. 2.1) for treatment and disposal (see Sect. 2.2.2).

The organic extraction product containing the uranium is then washed in a two-stage mixer-settler scrub system using 0.01 M HNO_3. The aqueous phase with impurities from the first-stage wash is recycled to the solvent extraction tanks, and the washed organic product is again contacted with 0.01 M HNO_3 in the re-extraction column where the uranium is stripped from the organic phase and transferred to an aqueous solution. The aqueous uranyl nitrate containing 80 to 100 g of uranium per liter is washed with hexane to remove TBP and transferred to the evaporation system feed tank.

The hexane from the raffinate wash, re-extraction column, and the aqueous uranium product wash is processed in the solvent rework system for recycle to the solvent extraction system.

2.2.1.4 Solvent rework

The impure hexane solvent waste stream from the solvent extraction system is processed in the solvent rework (purification) system. Most of the residual uranium is recovered by washing the hexane with 25% ammonium sulfate. The TBP hydrolysis products, dibutyl phosphate and monobutyl phosphate, and remaining uranium are then removed as sodium salts by scrubbing the hexane with 5% sodium hydroxide (NaOH). The purified hexane is then adjusted for recycle to the solvent extraction system by addition of new hexane and/or TBP.

2.2.1.5 Evaporation and boildown

From the evaporation system feed tank, the aqueous uranyl nitrate liquor flows through a feed condensate heat exchanger to a combination evaporator-condenser. In this equipment, the uranium concentration is increased to about 500 g/L as water and HNO_3 are evaporated. These vapors are compressed, recycled through the evaporator condenser to assist in the evaporation of the liquor, and condensed. The condensate collects in the recovered acidic condensate tank and is then pumped through the feed condensate heat exchanger to heat the incoming uranyl nitrate liquor. The acidic condensate tank is vented to atmosphere to dispose of small amounts of saturated steam, traces of hexane, and noncondensable gases. The acidic condensate is then stored for reprocessing and recovery of the HNO_3.

The concentrated uranyl nitrate liquor (~500 g/L) is collected in a 7.6-m^3 (2000-gal) surge tank and held at 104°C (200°F) until transferred to the boildown system.

The boildown system consists of three tanks in which batches of product from the evaporation system are heated using steam coils to boil off additional water and nitric acid, which increases the uranium concentration in the aqueous solution to about 1200 g/L. Vapor from the boildown tanks is condensed and the acidic condensate (0.1 M nitric acid) is transferred to a storage tank for subsequent recovery and recycle of the acid. The concentrated uranium product is pumped from the bottom of the boildown tanks into a recirculation piping system that permits feed to the denitration system.

2.2.1.6 Denitration

The concentrated product, uranyl nitrate hexahydrate (UNH), is bled from the boildown recirculation loop to the denitration system at the rate of 4.2 L/min (1.1 gpm). The UNH is heated in enclosed denitrator trays to a temperature of about 272°C (550°F) with a slight negative pressure. The UNH is decomposed according to the following approximate reaction:

$$UO_2\ (NO_3)_2(n\ H_2O)\ \rightarrow UO_3 + NO + NO_2 + O_2 + n\ H_2O.$$

The uranium trioxide (UO_3) produced in the denitrator trays consists of a free flowing, minus 8 mesh material that is discharged over an internal well and

through seal legs to an enclosed screw-type system conveyor. The granular material is then ground in a pulverizer to a powder finer than 60 mesh (250 μm) and discharged into the UO_3 storage bin.

The off-gases from the denitrator trays are scrubbed with 40% HNO_3 for removal of particulates and a portion of the nitrogen oxides and water vapor. The scrubbing fluid is cooled to 38°C (100°F) and recirculated to the off-gas scrubbers. Excess nitric and scrubbing fluids are returned to the HNO_3 storage tank.

The conveyor system, pulverizer, and storage bins are vented through a bin vent baghouse. Fine particulates of UO_3 trapped in the baghouse are periodically blown back into the storage bin by reverse air flow.

2.2.1.7 Reduction

The UO_3 is transferred by screw conveyor to the UO_3 feed bin which is slightly pressurized with nitrogen. The UO_3 is then moved by screw conveyor and charged into a two-stage fluid-bed reactor at about 910 kg/h (2000 lb/h). Cracked ammonia (hydrogen and nitrogen) from an ammonia dissociator is introduced at the bottom of both stages. The reduction of UO_3 with hydrogen proceeds according to the following reaction:

$$UO_3 + H_2 \rightarrow UO_2 + H_2O \text{ (vapor)} + \text{heat.}$$

Sufficient cracked ammonia is introduced to assure complete reduction. The thermal energy (heat) released in the reaction is used to help maintain the reaction temperature of 510-590°C (950-1100°F). Electrical furnaces are used to attain initial operation of the reactors and air-cooled coils are used to maintain temperature control.

Excess gas and UO_2 product from the reduction reactors are discharged to a UO_2 filter bin where the UO_2 is filtered from the gas by porous stainless steel filter elements that can remove 98% of all particles larger than 0.7μm. The filters are periodically cleansed by a reverse flow of nitrogen.

Solids collected in the filter bin are discharged to a screw conveyor and subsequently transported to the HF recovery reactor or directly to the UO_2 seal bin for storage.

Exit gases from the filter bin are discharged through another stainless steel filter element to remove final traces of UO_2 product. The filtered off-gases, consisting of ammonia, nitrogen, water vapor, hydrogen, and hydrogen sulfide, are piped to a reduction hydrogen burner before disposal to the atmosphere.

The HF recovery reactor is a screw-type conveyor where contact between UO_2 powder and unreacted HF from the filter bin of the subsequent hydrofluorination stage can reduce loss of fluoride to the environment. The off-gas from the HF recovery reactor is filtered to remove particulates and cooled to condense the HF. The HF condensate and noncondensable gases are routed to the HF scrubber in the gaseous waste disposal system (Sect. 2.2.2). The UO_2 powder partially reacted with HF is discharged into the UO_2 seal bin.

2.2.1.8 Hydrofluorination

Uranium dioxide is screw-fed from the UO_2 seal bin to the first stage of the hydrofluorination system where the powder is contacted with a countercurrent flow of HF in a stirred fluid-bed reactor. The reactor wall temperature is maintained at about 200-340°C (400-650°F) using electrical heaters and air blowers. A mixture of UO_2, UF_4 product, excess HF, and water vapor are discharged from the first-stage reactor at a temperature of about 320-370°C (600-700°F) into the UO_2-UF_4 filter bin where the solids are separated from the gases using porous carbon filter elements. These filters remove 98% of all particles larger than 0.7 μm and are periodically cleaned by back-flushing with hot nitrogen gas. Gases discharged from the UO_2-UF_4 filter bin are routed to the HF recovery reactor discussed in the previous section. The solids in the UO_2-UF_4 filter bins are transferred by screw conveyor to the second-stage hydrofluorinator for contact with anhydrous HF vapor heated to about 540°C (1000°F). The second-stage reactor is maintained at about 480°C (900°F) with an electrical furnace and a cooling air blower. The UF_4 product, excess HF vapor, water vapor, and other gases are discharged from the second-stage reactor into the UF_4 seal bin where most of the UF_4 solids are collected and most of the gases and entrained fine particles are piped to the first-stage fluorinator.

The UF_4 powder is transferred from the UF_4 seal bin by screw conveyor to a UF_4 nitrogen lift chamber where gaseous nitrogen is used to purge entrained HF vapor from the UF_4 powder. The UF_4 and all the gases then enter the UF_4 filter seal bin where the gases are separated and piped to the HF scrubber in the gaseous waste disposal system (Sect. 2.2.2). The UF_4 powders are transferred by screw conveyor to UF_4 storage bins.

2.2.1.9 Fluorination

The UF_4 is transferred to a two-stage fluorination system by enclosed conveyors. The UF_4, charged into the first stage at a temperature of 38°C (100°F), is converted to UF_6 by reaction with elemental fluorine at a temperature of 450°C (850°F) according to the following reaction:

$$UF_4 + F_2 \rightarrow UF_6 + \text{thermal energy}.$$

Excess reaction heat is removed from the reaction vessels using steam-cooled coils. About 15% excess fluorine over the stoichiometric conversion requirement is introduced into the first-stage reactor to maximize conversion of UF_4 to UF_6. Approximately 1% of the feed material is collected as unreacted UF_4 or intermediate products in ash containers at the bottom of the first-stage reactors. Each first-stage reactor is periodically shut down, and the ash is ground and returned to the UF_4 storage bin.

The outlet gases from the first-stage fluorination reactors are cooled to about 150°C (300°F), and entrained solids are removed in a cyclone separator and by porous Monel filter elements in the F_2 reactor filters. The filters remove 98% of all particles greater than 0.7 μm and are periodically cleaned using a backflow of air. The particulates are returned to the miscellaneous digester for reprocessing (Sect. 2.2.1.2).

The filtered gas, containing UF_6, F_2, HF, O_2, and N_2, is passed through the primary cold traps at -1°C (30°F) where approximately 90% of the UF_6 is condensed as a solid. The noncondensed gases are heated to 430°C (800°F) and forced into the second-stage fluorinators (cleanup reactors) for reaction with an excess of the stoichiometric requirement of UF_4 at a temperature above 395°C (750°F). About 10% of the UF_4 will be unreacted and is removed from the bottom of the cleanup reactor by screw conveyor where the product is cooled to 200°C (400°F). The excess UF_4 is subsequently returned to the UF_4 storage bin for feed to the fluorinators. The system is designed, monitored, and controlled so that the excess F_2 from the primary fluorinator will be completely consumed by the reactions with UF_4 and any UO_2 or UO_2F_2 in the feed material.

The gases and entrained solids from the cleanup reactor enter the cleanup reactor filter where 98% of the particles greater than 0.7 μm are removed by porous Monel filters (primary and backup). These filters are also periodically cleaned using a backflow of air.

The filtered gas is passed through the secondary cold traps for condensation of UF_6 as a solid at -54 to -60°C (-65 to -75°F). The noncondensable gases are pumped to the HF scrubber in the gaseous waste disposal system. Fluorine is monitored in the noncondensable gas discharge as an element in the process control.

2.2.1.10 UF_6 handling and shipping

When any primary or secondary cold trap is full, the UF_6 is melted and drained by gravity through porous Monel filters into evacuated 9100-kg (10-ton) or 12,700-kg (14-ton) shipping cylinders where it slowly solidifies at ambient temperature. The piping from the cold traps to the cylinders consists of a 2-in.-diam sloped, steam-traced transfer header. The transfer header and filter are connected to the cylinder valve through a 3/4-in.-diam copper tubing pigtail.

Two transfer headers and filling stations are in use. The headers are manifolded so that each filling station can handle UF_6 from either the primary or the secondary cold traps. The primary cold traps have a nominal capacity of 9100 kg (10 tons). After filling, the cylinders are weighed and transferred to the cylinder storage area in the yard. The cylinders are cooled for a minimum of 5 d before shipment.

2.2.1.11 Fluorine production

Fluorine is produced by electrolysis of anhydrous HF in a molten electrolyte composed of potassium fluoride, lithium fluoride, and hydrofluoric acid maintained at about 93°C (200°F). When a direct current is passed through the electrolyte, the HF is electrolytically reduced to hydrogen and fluorine. Hydrogen fluoride is intermittently added to the cells to replace the HF decomposed or lost by evaporation.

The fluorine gas stream exiting the electrolytic cells contains about 10 mole % HF which is reduced to an acceptable level of 3-4% by cooling the gas stream to -90°C (-130°F).

The hydrogen gas exiting the electrolytic cells is not needed in the facility and is piped to a hydrogen burner for conversion to water vapor.

2.2.1.12 Stored chemicals

The potential inventory of chemicals stored at the plant is shown in Table 2.1. The tanks of acids and ammonia are located in a tank farm on the north side of the UF_6 production building (Fig. 2.1). The remaining chemicals are stored in various locations that are convenient for their use.

The tanks of HF and HNO_3 are installed over an 0.6-m (24-in.) bed of limestone that will neutralize any acid lost from leaking equipment. Hydrofluoric acid vapors from the HF tanks are normally vented to the HF scrubber in the gaseous waste treatment system. Emergency venting of HF vapor from the anhydrous HF tank may occur through relief valves or a rupture disk.

The 60% HNO_3 is purchased. The 40% HNO_3 is produced by blending 60% HNO_3 with HNO_3 wastes recovered from the denitration system off-gas scrubbers.

2.2.1.13 Power supply

Electrical power supplied by Oklahoma Gas and Electric Company is used to operate all process mechanical equipment and to provide process heat. In case of power outage, a standby, diesel-driven, emergency generator will automatically start. There are no other major consumers of fossil fuels on the site that could contribute to degradation of air quality.

2.2.1.14 Water supply

About 10.6 m^3/min (2800 gpm) of water is normally piped from Tenkiller Reservoir about 10.7 km (6.7 miles) to the north (see Sect. 3) into a 114-m^3 (30,000-gal) storage sump at the plant. This water is distributed to the following systems:

1. Potable water for human consumption, production processes and laboratory use, and boiler makeup,

2. Normal cooling water for process cooling, and

3. Emergency water for critical equipment cooling and for fire pumps.

Normal plant usage is only a small fraction of the normal flow from the reservoir. The excess water input overflows from the storage sump into the cooling tower equalizing pit which subsequently overflows and is discharged with the plant nonradioactive liquid effluent (see Sect. 2.2.2). Low flow from the reservoir can be supplemented from a 380 m^3 (100,000 gal) emergency cooling water storage at a rate adequate to satisfy normal plant usage. However, the excess flow to the plant effluent discharge would not be continued.

Table 2.1. Inventory of chemicals stored at the Sequoyah UF_6 plant

Chemical	Number and type of container	Total storage capacity
Anydrous hydrofluoric acid	3--carbon steel	45,000 gal
Aqueous hydrofluoric acid	1--rubber lined	7,500 gal
60% nitric acid	3--stainless steel	45,000 gal
40% nitric acid	2--stainless steel	30,000 gal
Ammonia	2--steel	30,000 gal
Sulfuric acid	2--steel	1,000 gal
Fuel oil	1--steel	30,000 gal
Diesel fuel	1--steel	2,000 gal
Diesel fuel	1--steel	500 gal
Hexane	1--stainless steel	15,000 gal
Solvent dump tank	1--stainless steel	15,000 gal
Tributyl phosphate	12--steel drum	55 gal/each
Propane	1--steel	10,000 gal
Methylene chloride	1--steel	55 gal/each
Liquid nitrogen	2--stainless steel	21,000 gal
Flocculant (water treatment)	12--steel drum	55 gal/each
Ammonium oxalate	Paper sack/cardboard drum	50 lb/each
Soda ash	Paper sack/drum	50 lb/each
Caustic soda	Paper sack	100 lb/each
Aluminum nitrate (or sulfate)	Paper sack	50 lb/each
Aluminum nitrate (or sulfate)	1--stainless steel	70,000 lb
Lime	1--steel silo	138,000 lb
Freon		
R-11	10-15--steel drum	200 lb/each
R-13	6-8--cylinder	80 lb/each
R-22	8--cylinder	125 lb/each

2.2.2 Waste Releases

2.2.2.1 Gaseous

As discussed in Sect. 2.2.1, the gaseous component of each phase of the UF_6 conversion process is filtered to remove particulates and/or scrubbed to remove acid or water vapors. The treated gaseous wastes, which contain some uranium, fluorides, and oxides of nitrogen, are released through the main stack, the HF off-gas scrubber exhaust, and the dust collector exhaust. Additional quantities of fluoride and uranium from inadvertent process leakage and from laboratory procedures are released to the environment from laboratory hood exhausts, process building air vents, and powered roof hatch exhausts.

Uranium-bearing filtered particulates are recycled to the appropriate UF_6 processing step (Sect. 2.2.1). Radiological emissions for 1980 through 1984 are shown in Table 2.2.

Table 2.2. Semi-annual releases of gross-alpha and natural uranium in gaseous emissions for the years 1980-1984

Period	Gross alpha (Ci)	Natural uranium (Ci)
January-June 1980	0.086	0.084
July-December 1980	0.060	0.059
January-June 1981	0.051	0.050
July-December 1981	0.031	0.029
January-June 1982	0.032	0.031
July-December 1982	0.033	0.032
January-June 1983	0.030	0.027
July-December 1983	0.027	0.026
January-June 1984	0.030	0.028
July-December 1984	0.031	0.030

Nitric acid vapor and nitrogen oxides evolving from the digesters and the denitration systems are scrubbed from the gas phase and converted to dilute HNO_3 for recycle. Liquid waste from this treatment system, containing nitrates, is discharged to the raffinate clarifier basins (Fig. 2.1). The final gaseous waste from this system results in less than 100 ppm of NO_2 in the stack emissions. The nitrogen oxide emissions have been measured at between 1 and 10 kg (2.2 to 22 lb) per day depending on the UF_6 production rate.[2] A small amount of organic gaseous waste also arises from operating diesel-fueled boilers to provide steam for process heating.

Unused HF vapors from the hydrofluorination and fluorination steps are primarily condensed in the aqueous HF recovery system with remaining vapors removed by HF scrubbers. The resulting dilute HF aqueous solution is treated and piped to a fluoride sludge pit for settling of the precipitates (see Sect. 2.2.2.2).

2.2.2.2 Liquid

As discussed in Sect. 2.2.1, process liquids from the UF_6 conversion system, such as hexane, HNO_3, and HF, are recovered in treatment systems and recycled to the process. These treatment systems contribute waste to two liquid waste streams that are processed separately because of their principal difference. One is nitrate contaminated, and the other is fluoride contaminated.

Nitrate stream

A high-nitrate (HNO_3 and ammonia nitrate) raffinate containing significant concentrations of heavy metals, including uranium, is discharged from the aqueous stream of the solvent extraction phase of the UF_6 conversion process. The raffinate is combined with small volumes of chemically contaminated dilute HNO_3 waste from the HNO_3 recovery system. A total flow of about 29,500 m^3 (7.8×10^6 gal) per year is treated with ammonia to reduce the heavy-metal content (including uranium and thorium) by precipitation of heavy-metal salts and is further treated

with barium salts to reduce the concentration of ^{226}Ra by precipitation of barium-radium sulfate. The treated liquid waste is discharged to clarifier A (Fig. 2.1) which consists of four Hypalon-lined ponds where precipitates coagulate and settle. The clear-liquid, very low activity raffinate, is then pumped to Hypalon-lined storage ponds 3 and 4. This waste is not allowed to be discharged to the local rivers because of the high nitrogen concentration. The clarifier A settling ponds and raffinate storage ponds 3 and 4 have drainage systems beneath the linings for collection and monitoring (Sect. 4.1) of any leakage. Each year, under strict control of operating license conditions, some of the treated raffinate is used as a liquid fertilizer by spreading it over unused areas of the site and on offsite land also owned by the applicant. The average analysis of the treated raffinate is given in Table 2.3 for 1982.[5] The impurity concentrations have been reduced by improvements in the raffinate treatment since prior evaluation of the raffinate disposal program.[6] Evaluation of the impacts of raffinate disposed as a liquid fertilizer are presented in Sects. 4.1.2.2 and 4.2.2. Current raffinate production is greater than the amount that can be applied as fertilizer on the applicant's nearby real estate, and the permit amendments do not authorize sale of the excess raffinate to commercial fertilizer users or manufacturers. Thus, there has been a continually increasing storage requirement for the treated raffinate.

Table 2.3. Average analysis of composite samples of treated raffinate applied as fertilizer to SFC property (mg/L unless noted)

Chemical impurty	Location of fertilizer application	
	Sequoyah (onsite)	Rabbit Hill (offsite)
As	0.10	0.09
Ba	0.41	0.41
B	<0.09	<0.09
Cd	0.14	0.16
Co	0.24	0.20
Cr	<0.01	0.01
Cu	5.4	5.3
Fe	<0.08	<0.08
Hg	0.002	0.002
Mg	150	153
Mn	8.3	8.0
Mo	18.3	17.3
Ni	8.5	8.4
Pb	<0.04	<0.04
Se	<0.25	<0.25
V	<0.03	<0.03
Zn	2.0	1.9
U	0.02	0.01
N, g/L	27.2	31.6
^{230}Th, pCi/L	0.011	0.025
^{226}Ra, pCi/L	0.22	0.35

Source: Kerr-McGee Nuclear Corporation, 1982 Completion Report (Related to Treated Raffinate Disposal), Apr. 26, 1983.

Recently, the NRC approved license amendment 22 authorizing the applicant, on an experimental basis, to dispose of a limited quantity, 18,900 m^3 (5×10^6 gal) at up to 0.23 m^3/min (60 gpm) by deep well injection.[7] The applicant is required to monitor subsurface hydrologic pressure increases, shallow groundwater contamination, and local seismic conditions. If this raffinate disposal technique proves to be acceptable, the authorization could be extended for additional years with suitable disposal conditions and monitoring requirements.

Prior to 1979, the raffinate was discharged to storage ponds 1 and 2. Pond 1 has since been rebuilt as clarifier A. The sludge from pond 1, containing more than 20 pCi/g of uranium, thorium, and decay products, was placed in pond 2. Although pond 2 is no longer in active service for untreated raffinate disposal, a large quantity of radioactive sludge and entrained acidic liquids (high nitrate) are contained there. A leakage of leachate was detected through the south embankment of pond 2 by groundwater monitoring in May 1974. This leakage, which has been the subject of considerable evaluation, is discussed in Sects. 4.1 and 4.2. In license amendment 28, the NRC staff required that SFC decommission pond 2 and all the sludge in pond 2 be removed and placed in a plastic lined pond. This will eliminate the source of leakage from pond 2. License amendment 28 authorized SFC to construct and use a new pond for storage of additional raffinate. At present, the deep-well injection project is on hold by the State of Oklahoma and the fertilizer program only utilizes a small portion of the raffinate generated every year. There will be a gradual increase of raffinate and more ponding capacity is needed. The staff believes that it is undesirable for SFC to keep on storing the raffinate in additional ponds without finding a solution for its ultimate disposal. Therefore, the staff encourages SFC to explore other alternatives for the ultimate disposal of the raffinate, so that it would not be accumulated to an unmanageable situation.

Fluoride stream

The fluoride stream includes dilute HF from the HF scrubbers (with low concentrations of uranium and thorium) and from the anhydrous HF vaporizer sump combined with wastes from the fluorine cell rework area, the chemistry laboratory, the sanitary treatment system, and chemically-contaminated process water (e.g., boiler blowdown and cooling tower excess).

The liquid wastes containing fluorides are treated with excess slaked lime to a pH of about 12 to induce formation of calcium fluoride (CaF_2) precipitates and small quantities of heavy metal precipitates. The solution is discharged into the fluoride sludge pit where the CaF_2, excess lime, and heavy metal particles settle out. The pH of the overflow from the sludge pit is adjusted to 6 to 8 with additions of H_2SO_4 and piped to a clarifying lagoon where additional CaF_2 and precipitated calcium sulfate ($CaSO_4$) settle out. The overflow from this lagoon mixes with the treated sanitary waste and some lightly contaminated process water in a stilling basin. This fluoride-contaminated stream is then diluted with about 95% of the water supply from Tenkiller Ferry Reservoir (Sect. 2.2.1.4). This "combination stream" is discharged to a natural drainage course at the south side of the plant. The effluent then flows about 1 km (0.6 mile) to the Illinois River embayment of the Robert S. Kerr Reservoir.

The applicant has a National Pollutant Discharge Elimination System (NPDES) permit (Appendix B) for the combination stream (outfall 001) that establishes the acceptable range of physical parameters, the maximum level of specific contaminants, and the monitoring requirements (summarized in Table 2.4). Although the NPDES limits may be exceeded for short periods due to equipment malfunction, the annual average releases, also shown in Table 2.4, are well within the prescribed limits.[2] The NPDES permit requires separate monitoring of the sanitation system effluent, with daily flow estimates and daily average and daily maximum limits of 30 and 45 mg/L, respectively, for both total suspended solids and biochemical oxygen demand.

Table 2.4. Requirements of the NPDES permit and range of effluent values reported monthly from October 1982 through March 1983 at outfall 001 (combination stream)

Parameter	NPDES requirements			Range of reported data
	Sample frequency	Sample type	Concentration limit	
Flow, millions of gallons per day	a	a		3.38-3.64
Temperature, °F	3/d	In situ		50-68
Total suspended solids, kg/d	3/week	24-h composite	340 (average) 680 (maximum)	7-47 17-117
Fluoride, kg/d	3/week	24-h composite	14 (average) 34 (maximum)	7-11 12-23
Nitrate (N), Kg/d	3/week	24-h composite	34 (average) 140 (maximum)	18-29 22-42
pH	3/d	Grab	6.0 (minimum) 9.0 (maximum)	7.2-7.9 8.6-8.9
Oil and grease, mg/L	3/d	Grab	15 (maximum)	2-13

[a]Continuous record.

The radioactivity released to the environment by the combination stream at outfall 001 is given in Table 2.5 for semiannual periods from 1980-1984. For the average discharge flow (similar to water supply flow from Tenkiller Reservoir: see Sect. 2.2.1.14), the maximum annual average effluent gross-alpha radioactivity (1982) would be about 1.0×10^{-6} μCi/mL, which is below the maximum permissible concentration (MPC) of uranium specified in 10 CFR 20. Additional measurements[1,2] indicate that gross beta activity is about 10% of gross alpha and that ^{226}Ra and thorium contribute about 0.01% to the total activity release. Although the release of radioactive liquid waste into the Illinois River complies with 10 CFR 20, the staff is concerned with the transfer of this waste from the plant

through a low-flow 5,000 ft. natural drainage course. The accumulation of uranium in the sediment or soil along the combination stream has reached a significant level, therefore, the staff has requested SFC to propose a better method of transferrence of this waste from the plant to the Illinois River.

The NPDES permit also sets concentration limits for ammonia nitrate, nitrogen, dissolved and total radium (^{226}Ra and ^{228}Ra), total suspended solids, and pH in discharges from runoff-holding dams in the raffinate-treated area of the plant site. The only violations of permit requirements during the period of October 1982-March 1983 involved excessive total suspended solids for outfall 002 following a large precipitation in December and a slightly high average nitrate nitrogen for outfall 003 for March.

Table 2.5. Release of gross-alpha and natural uranium in the combination stream at outfall 001 for the years 1980-1984

Period	Gross alpha (Ci)	Natural uranium (Ci)
January-June 1980	1.75	1.50
July-December 1980	3.30	3.12
January-June 1981	1.94	1.71
July-December 1981	1.04	1.04
January-June 1982	2.57	2.01
July-December 1982	3.02	2.69
January-June 1983	2.41	2.20
July-December 1983	1.00	0.85
January-June 1984	0.98	0.79
July-December 1984	0.79	0.71

2.2.2.3 Solid

Solid wastes resulting from operation of the Sequoyah facility include the following:

1. Burnable and nonburnable equipment and material that is not contaminated with uranium.

2. Burnable and nonburnable equipment and material that is contaminated with uranium.

3. Fluoride solids in the fluoride sludge pits and the industrial wastewater clarifying lagoon.

4. Precipitates of uranium, thorium, radium, and other heavy metals in the clarifier A ponds and precipitates in raffinate pond 2 generated from previous use of that pond.

The uncontaminated equipment and material wastes are transported to an approved offsite waste disposal area by a local sanitation service. Easily separated

burnable material is burned in an onsite open pit incinerator. Fluoride-contaminated equipment from the fluorine generation cells will be disposed of with the fluoride sludge wastes.

In the past, contaminated equipment and maintenance wastes have been buried onsite but are currently packaged to minimize spread of contamination and are stored for later disposal. Contaminated steel drums used for transport of yellowcake to the plant are vacuum cleaned after emptying, returned to the uranium mill if reusable, shipped to an NRC-licensed facility for repair if necessary, or stored onsite with other contaminated equipment for subsequent burial if no longer salvageable.

At present, the fluoride solid waste remains in the sludge pit where it is deposited from the liquid waste stream.

The heavy metal precipitates (including uranium and thorium) from the raffinate stream are being held in the clarifier A ponds where they settle out, and in raffinate pond 2. The NRC staff has required that pond 2 be decommissioned and all the solid wastes be transferred and stored in a lined pond. These wastes with an estimate of about 2.4×10^6 cu. ft. are presently stored for future disposal in a manner that minimizes spread of contamination. At present, SFC does not have an acceptable method of permanent disposal. The NRC has requested that SFC submit a comprehensive waste management program for the permanent disposal of these and other solid wastes (license amendment 25). By letter dated May 24, 1985, SFC proposed: 1) to dispose of the calcium fluoride sludge, non-combustible materials, and incinerator ash by onsite burial, and 2) the raffinate sludge will be stored onsite pending SFC finding a contractor to accept the sludge for uranium recovery. The proposed solid waste management plan from SFC is currently under NRC's review.

2.3 Decommissioning

At the end of its operating life, the plant will be decontaminated before the site and any plant buildings remaining on the site can be released for unrestricted use. By letter dated March 14, 1978, the applicant submitted a decommissioning plan and cost estimate. By letter dated October 27, 1978, a corporate commitment that funds will be made available for the decontamination (decommissioning) effort was also provided. This plan and commitment to make funds available for it were incorporated into SFC's license by amendment on March 26, 1979.

The major guidelines embodied in the decommissioning plan are as follows:

1. Current radiological limits and decontamination technology are to be used.

2. All buildings are to be cleaned to levels established for unrestricted use. Some structures may be decontaminated and remain in place, but some areas, such as floors, may require removal and disposal.

3. All process and ancillary equipment in controlled areas is to be cleaned to the extent practicable, packaged, and buried in a licensed disposal facility.

4. Any contaminated underground piping is to be removed, cleaned to the extent practicable, packaged, and transported to a licensed disposal facility for burial. The ground surrounding such piping is also to be surveyed and removed for disposal if contaminated beyond established limits.

5. All decontamination activities are designed to maximize recovery of uranium.

6. Packaging, transportation, and disposal charges are to be calculated using information from existing licensed low-level waste disposal facilities.

7. Recognizing that actual decommissioning of the UF_6 conversion plant is not anticipated for many years, the applicant will develop and submit a subsequent detailed step-by-step decommissioning plan for NRC review and approval before any decommissioning activities would take place.

The NRC reviewed the decommissioning plan for the UF_6 conversion plant and concluded that the plan was reasonable and adequate except that the permanent disposal of radioactive sludge from the raffinate treatment ponds (clarifier A and pond 2) and contamination of soil along the effluent stream was not yet developed.

2.4 Material Control and Accountability

Because there is no enriched uranium on the SFC site, material control and safeguard requirements set forth in 10 CFR Parts 70 and 73 are not applicable to the UF_6 conversion operations. The applicant maintains detailed records of raw material use and UF_6 production and shipment as a matter of prudent economical operation and maintains control of all operations, including waste handling, to ensure the health and safety of the employees and the public.

2.5 Staff Evaluation

The staff has conducted an environmental assessment associated with SFC's proposed action. At present, the emission of effluents from SFC's operation comply with the State and Federal standards (Sect. 4). The staff has set strict conditions to ensure that SFC will comply with these standards for the continued operation (Sect. 4). The staff has reviewed the past effluent and monitoring data submitted by SFC. The staff has taken actions to require that (1) SFC decommission pond 2 and transfer all the sludges to a lined pond to minimize seepage problems, (2) SFC construct a spare pond to hold liquid wastes in case of leakage from other storage ponds and (3) SFC set action levels on every sampling medium and investigate and take mitigating measures if the action level is exceeded. Therefore, the staff concludes that the environmental impact from the continued operation of SFC's facility is insignificant. The staff is concerned with the long-term liquid and solid waste management program of SFC. Although the interim storage of the liquid and solid wastes in onsite plastic lined ponds is not expected to result in an immediate environmental impact, the gradual increase of these wastes from continued operation may reach an unmanageable situation that could create a significant long-term impact. In the long run, the staff requires SFC to dispose of the raffinate sludge in a manner approved by NRC and dispose of the liquid waste in a manner approved by the NRC or the State. In addition, the staff recommends the following conditions be added to the SFC's renewed license:

1. The licensee shall sample the main stack continuously and analyze for gross-alpha on a daily or weekly basis (Sect. 4.1.1.1).

2. The average uranium concentration in the raffinate used in the fertilizer program shall not exceed 0.1 mg/l (Sect. 4.1.2.1).

3. Within 3 months of the renewal of this license, the licensee shall reevaluate the existing groundwater conditions in the area of the treated raffinate storage ponds and prepare and submit for NRC review a report which describes these conditions and either justifies the current monitoring program or proposes a new program for groundwater monitoring.

4. Within 3 months of the renewal of this license, SFC shall submit to NRC for review and approval a supplemental vegetation monitoring program to provide additional information for the radiological assessment on the ingestion pathway. The vegetation monitoring program shall include the sampling of food crops in the general area. The vegetation samples collected shall be analyzed for uranium, Ra-226, and Th-230. The licensee shall be able to use these data to assess the radiological impact to any member of the general public exposed from the ingestion pathway. A report of the findings shall be submitted to NRC for review. The program shall be initiated on the next growing season upon approval by NRC (Sect. 4.1.2.1). The licensee shall report the concentrations of radionuclides in vegetation on a dry basis and supply the percentage of moisture.

5. The licensee shall investigate and verify that the elevated uranium and nitrate concentrations found in Well FTP-2A are not the results of the liquid seepage from ponds 3 or 4. A report of the investigation shall be submitted to NRC within 6 months from the date of renewal of the license (Sect. 4.1.2.1).

6. The licensee shall propose an appropriate surface water monitoring program to determine the total quantity of uranium discharged to the environs from the runoff drainage ditches which are not included in the NPDES permit. The proposed program shall be submitted to NRC for review and approval within 3 months from the date of renewal of the license (Sect. 4.1.2.1). The licensee shall investigate the cause of some of the elevated uranium concentrations in the above runoffs. Within 3 months from the date of renewal of the license, a report of the investigation shall be submitted to NRC. The report shall describe what mitigating measures, if any, were taken to eliminate the source(s).

7. The licensee shall conduct a comprehensive soil/sediment radiological survey to determine the extent of uranium accumulation along the length of the effluent stream (001), at the confluence, along upstream and downstream of the Illinois River, and along the intermittent runoff areas identified in Condition 6. The results of this survey and any recommendations for mitigation shall be reported to NRC within 12 months from the date of the renewal of the license (Sect. 4.1.2.1).

8. The licensee shall follow the quality assurance program as specified in NRC's Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Program (Normal Operation)-Effluent Streams and Environment" (Sect. 4.1.2.1).

9. If the radioactivity in plant gaseous effluents exceeds 30,000 μCi per calendar quarter, the licensee shall, within 30 days, prepare and submit to the Commission a report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce release rates. If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describes the changes in parameters and includes an estimate of the resultant change in dose commitment (Sect. 4.2.5.1).

10. The licensee shall conduct a dose assessment on a quarterly basis using site-specific information and methodology in Appendix A of the Environmental Assessment. If the quarterly dose commitment to a maximally-exposed individual in the general public exceeds 6.25 mrem for any organs, a report shall be submitted to the Commission within 30 days of the determination of the quarterly dose. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10. If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10 (Sect. 4.2.5.1).

REFERENCES FOR SECTION 2

1. Kerr-McGee Nuclear Corporation, Sequoyah Facility License Renewal Application, License SUB-1010, Docket No. 40-8027, September 1982.

2. Kerr-McGee Nuclear Corporation, Response to U.S. Nuclear Regulatory Commission Site Visit Information Request, July 11, 12, and 20 and Aug. 19, 1983.

3. U.S. Nuclear Regulatory Commission, Environmental Impact Appraisal by the Division of Fuel Cycle and Material Safety Related to the Source Material License (SUB-1010) Renewal for the Kerr-McGee Nuclear Corporation Uranium Hexafluoride Facility, Sequoyah County, Oklahoma, Docket No. 40-8027, October 1977.

4. Sequoyah Fuels Corporation, Sequoyah Facility License Renewal Application (Revised), License SUB-1010, Docket No. 40-8027, October 1983.

5. Kerr-McGee Nuclear Corporation, 1982 Completion Report (Related to Treated Raffinate Disposal), Apr. 26, 1983.

6. U.S. Nuclear Regulatory Commission, Environmental Impact Appraisal of the Proposed Amendments for the Use of Raffinate Related to Source Material License (SUB-1010) for Kerr-McGee Nuclear Corporation Uranium Hexafluoride Facility, Sequoyah, Oklahoma, Docket No. 40-8027, March 1982.

7. U.S. Nuclear Regulatory Commission, Letter to Kerr-McGee Nuclear Corporation Authorizing Amendment 22 to Source Material License SUB-1010, Docket No. 40-8027, May 18, 1983.

3. AFFECTED ENVIRONMENT

3.1 Site Location

The SFC UF_6 plant is located in Sequoyah County in mideastern Oklahoma at 95°5' west longitude and 35°30' north latitude, about 240 km (150 miles) east of Oklahoma City, 64 km (40 miles) west of Fort Smith, Arkansas, 40 km (25 miles) southeast of Muskogee, and 4 km (2.5 miles) southeast of Gore (Fig. 3.1). The site consists of 850 ha (2100 acres) bounded on the north by U.S. Route 64 and on the west by U.S. government-owned land along the Illinois and Arkansas Rivers. The eastern boundary of the site is the eastern boundary line of Survey Section 22 (Township 12 North, Range 21 East). Most of the site is north of Interstate 40 (Fig. 2.2). The principal industrial facilities are located in a fenced-in, restricted area of about 34 ha (85 acres) in Section 21.[1-3]

3.2 Climatology and Meteorology

3.2.1 Climatology

Sequoyah County has a warm-temperate, continental climate. Storms bring ample precipitation when moisture-laden air from the Gulf of Mexico meets cooler, drier air from the western and northern regions. The most variable weather occurs in the spring, when local storms are severe and bring large amounts of precipitation. The mean annual temperature is 16.5°C (61.5°F). The monthly average ranges from 5°C (40°F) in January to 28°C (82°F) in July. The average daily range in temperature is 13°C (24°F). The lowest temperature on record was -28°C (-19°F) in January 1930, and the highest was 46°C (115°F) in August 1936. The mean annual precipitation ranges from 109 cm (42.9 in.) in Sallisaw to about 112 cm (44.1 in.) in the northeastern part of Sequoyah County. The seasonal distribution of rainfall is fairly even, with 31% in spring, 26% in summer, 23% in fall, and 20% in winter. The average amount of snowfall from November through April is about 13 cm (5.2 in.).[2,3,5]

3.2.2 Winds, Tornadoes, and Storms

The most severe storms occur in the spring months of April, May, and June, although thunderstorms are also frequent during the summer months. Strong winds, heavy precipitation, and intense lightning may be associated with these storms. Severe hailstorms are rare and only five damaging hailstorms were recorded in a 42-year period in Sequoyah County. Tornadoes touch down in Sequoyah County on the average of once every six years. During a 91-year period, 25 tornadoes were recorded in the county, with roughly 80% of them occurring from April through June.[4] The probability of any particular point in the county being hit by a tornado is 1.66 10^{-3} (the equivalent of once every 600 years).[2]

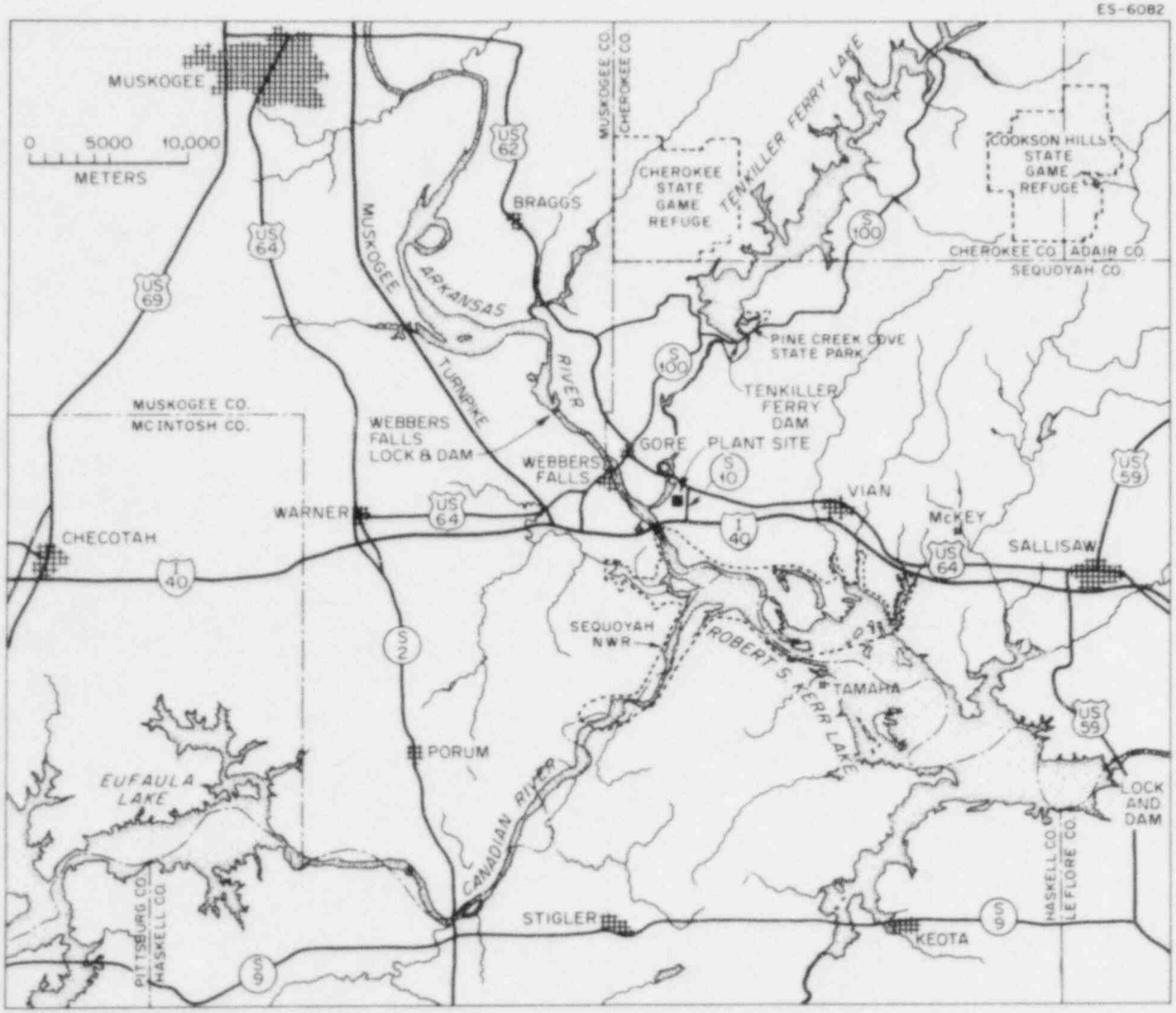

Fig. 3.1. Map of the region surrounding the Sequoyah Fuels Corporation facility.

3.2.3 Meteorology

There is no official weather station in the immediate plant vicinity. Consequently, the meteorological data used for calculating the atmospheric dispersion of airborne effluents were obtained from the weather station about 40 miles away at Fort Smith, Arkansas, for the years 1955-1974. This is the closest first-order data station having similar topographic and climatological characteristics as the plant site. These data, which include the wind direction-speed-stability frequency information, are shown in Tables A.6 and A.7 of Appendix A.

Meteorological dispersion factors (annual χ/Q values) are estimated using the Gaussian plume model and diffusion coefficients for Pasquill-type turbulence.[6,7] The annual average χ/Q values in 16 sectors up to a distance of 80 km (50 miles) from the site are given in Table A.5 of Appendix A. An average annual mixing height[8] of 1000 m is used in the calculations.

3.2.4 Air Quality

Oklahoma has adopted air quality standards (Table 3.1) that are very similar to the National Ambient Air Quality Standards.

Table 3.1. Ambient air quality standards for Oklahoma

Pollutant	Time criteria	Concentration Standard ($\mu g/m^3$)	
		Primary	Secondary
SO_2	3-h maximum[a]		1,300
	24-h maximum[a]	365	
	Annual arithmetic mean	80	
Total suspended particulates	24-h maximum[a]	260	150
	Annual geometric mean	75	60
NO_x	Annual arithmetic mean	100	100
CO	8-h maximum[a]	10,000	10,000
	1-h maximum[a]	40,000	40,000
Ozone	1-h maximum[a]	235	235
Nonmethane hydrocarbons	3-h maximum[a] (6 a.m. to 9 a.m.)	160	160

[a]The concentration standard for this time criteria is not to be exceeded by more than once per year.

A small area near the juncture of Sequoyah, Haskell, and Muskogee Counties could be affected by atmospheric discharges from the applicant's UF_6 production facility (Fig. 3.1). The air quality in these counties is classified as "better

than national standards" for total suspended particulates and SO_2. For CO, NO_{x1}, and ozone, the air quality cannot be classified. Generally, this means that there is insufficient data to establish a classification under Environmental Protection Agency (EPA) regulations. This is not uncommon in a clean air region such as southeastern Oklahoma.

3.3 Demography and Socioeconomic Profile

The SFC site is located in rural Sequoyah County, which had a 1980 population of 27,900. The four adjacent counties of Muskogee, Haskell, McIntosh, and Cherokee had a combined 1980 population of about 120,000. The major population center is the city of Muskogee (40,000), about 40 km (25 miles) to the northwest. Nearby towns include Gore (population 478), Webbers Falls (485), Warner (1217), Vian (1131), Checotah (3074), and Sallisaw (4888), all of which are located along Interstate 40 or old U.S. Route 62.

The incremental and cumulative populations within 80 km (50 miles) of the site are given in Tables 3.2 and 3.3. The total population within 8 km (5 miles) of the site is 2371.

Employment at the site is 146, which is only 0.2% of the estimated employment in the five-county region.[9] Most of the employees reside in Muskogee or the other nearby towns listed above. Neither continued operation nor shutdown of the SFC facility is likely to have a significant socioeconomic impact on the region.

3.4 Land

3.4.1 Site Area

The 850-ha Sequoyah site is on gently rolling to level land of which about two-thirds is forested and one-third is open field. Elevations on or near the site range from 140 m (460 ft) above mean sea level for the normal pool elevation of the Robert S. Kerr Reservoir to 213 m (700 ft) on top of a hill in the southeastern corner of the site. Slopes over most of the upland areas of the site are less than 7%. Steeper slopes of creek ravines and hillsides average roughly 28%. The main plant is located on land above 162 m (530 ft) in elevation. Small portions of the raffinate treatment areas are located between elevations of 143 and 149 m (470 and 490 ft). Raffinate storage ponds 3 and 4 (Fig. 2.2) are at an elevation of approximately 158 m (520 ft).

About 34 ha of the 850-ha site are occupied by the industrial complex. Most of the remaining 816 ha are used for production of cattle forage (Fig. 2.2). The industrial area is used primarily for ponds or basins for storage of fresh water, sewage waste, and process waste fluids; for yellowcake and UF_6 cylinder storage areas; for the main processing building and auxiliary facilities, and for the electrical substation (Fig. 2.1). The functions of these facilites are described in more detail in Sect. 2.2.

3.4.2 Adjacent Area

Prior to the advent of railroads in the area, the land was used primarily as cattle range. With availability of railroads, corn and cotton became the main agricultural products. In the last 30 years, however, the trend has been away

Table 3.2. Incremental 1980 population within 80 km (50 miles) of the Sequoyah UF_6 plant for the indicated radial/angular segments

Direction	Distance (miles)									
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	13	19	38	50	72	607	586	8,563	4,424	5,068
NNE	0	23	42	67	110	816	1,229	15,663	3,795	3,791
NE	13	25	42	61	85	451	1,005	3,478	7,593	7,858
ENE	0	23	42	61	91	392	707	2,282	2,222	1,483
E	12	21	37	70	123	816	6,885	4,426	28,495	31,301
ESE	0	17	37	53	79	621	1,881	9,212	43,523	19,263
SE	8	18	35	47	53	114	800	3,197	8,222	7,370
SSE	0	13	22	28	19	27	912	2,051	1,755	3,591
S	7	10	18	25	14	96	2,535	1,436	1,830	1,349
SSW	0	10	17	23	28	254	1,771	1,505	2,876	4,884
SW	7	10	17	25	34	390	1,112	1,966	1,226	2,489
WSW	0	10	17	25	36	354	1,326	2,372	4,151	1,303
W	7	10	17	28	35	328	1,459	7,595	2,002	15,647
WNW	0	10	17	26	38	287	936	2,705	3,024	3,587
NW	10	17	27	38	48	214	2,018	61,914	5,414	12,599
NNW	0	18	30	41	52	269	907	6,024	12,844	5,410
Total	77	254	455	668	917	6,036	26,149	134,389	133,396	126,995

Table 3.3. Cumulative 1980 population within 80 km (50 miles) of the Sequoyah UF_6 plant for the indicated angular direction and radial zones

Direction	Distance (miles)									
	0-1	0-2	0-3	0-4	0-5	0-10	0-20	0-30	0-40	0-50
N	13	32	70	120	192	799	1,385	9,948	14,372	19,440
NNE	0	23	65	132	242	1,058	2,287	17,950	21,745	25,536
NE	13	38	80	141	226	677	1,682	5,160	12,753	20,611
ENE	0	23	65	126	217	609	1,316	3,598	5,820	7,303
E	12	33	70	140	263	1,079	7,964	12,390	40,885	72,186
ESE	0	17	54	107	186	807	2,688	11,900	55,423	74,686
SE	8	26	61	108	161	275	1,075	4,272	12,494	19,864
SSE	0	13	35	63	82	109	1,021	3,072	4,827	8,418
S	7	17	35	60	74	170	2,705	4,141	5,971	7,320
SSW	0	10	27	50	78	332	2,103	3,608	6,484	11,368
SW	7	17	34	59	93	483	1,595	3,561	4,787	7,276
WSW	0	10	27	52	88	442	1,768	4,140	8,291	9,594
W	7	17	34	62	97	425	1,884	9,479	11,481	27,128
WNW	0	10	27	53	91	378	1,314	4,019	7,043	10,630
NW	10	27	54	92	140	354	2,372	64,286	69,700	82,299
NNW	0	18	48	89	141	410	1,317	7,341	20,185	25,595
Total	77	331	786	1,454	2,371	8,407	34,476	168,865	302,261	429,236

from cultivation and back to cattle grazing. Areas remaining in cultivation are primarily in the bottom lands along the Arkansas River. In 1970, about 30% of the acreage of Sequoyah County was used for range and about 40% was forested. The range is usually grazed year around, but the forage is supplemented with protein cubes, hay, and prepared pasture and hay consisting of tame grasses and small grain. High-quality trees have been largely eliminated from the forested areas by heavy cutting, fires, and uncontrolled grazing. Most woodland in the county is used for grazing.[4]

Within a 16-km (10-mile) radius of the SFC plant, the following land uses have been estimated:[2]

Land use	Percent[a]
Agriculture (mostly pasture)	30
Recreation	35
Residential	20
Commercial and industrial	15
Unused rough terrain	25

[a]Due to multiple use of some areas, the total exceeds 100%.

The large acreage for recreation is represented primarily by the federally-owned land and water areas along the Arkansas and Illinois Rivers and includes the 8,500-ha (21,000-acre) Sequoyah National Wildlife Refuge, where large numbers of waterfowl are found in the spring, fall, and winter.

3.4.3 Historic Significance

The National Register of Historic Places (Fed. Regist.48(41): 8626-8679, Mar. 1, 1983, and prior annual listings) lists a number of historic places in Sequoyah County and in nearby Haskell and Muskogee Counties. The Tamaha Jail and Ferry Landing in Haskell County are within about 16 km (10 miles) of the SFC site. The historic places in Sequoyah County are Sequoyah's Cabin, about 40 km (25 miles) east of the plant site; Dwight Mission, about 27 km (17 miles) northeast of the plant site; and Parris Mound in Sallisaw, about 27 km (17 miles) east-southeast of the site. The National Registry of Natural Landmarks has no listings for Haskell, Muskogee, or Sequoyah Counties (Fed. Regist. 48(41): 8682-8704, Mar. 1, 1983).

The plant site was a part of the land given to the Cherokee Nation after their move from the southeastern United States. The State of Oklahoma Historical Society lists Talonteeskee, the western capital of the Cherokee Nation which was located in the area from 1829 to 1839, as a location of interest. Dwight Mission was established in the area in 1821, and served the Cherokees until after the Civil War. The Carlisle House, initially on the plant site, served at one time as a weigh station for a stage running between Fort Smith and Fort Gibson. This house has been moved to a location on U.S. Route 64 near State Route 10 where it is preserved as a public attraction.[2]

3.4.4 Floodplains and Wetlands

Floodplains at the SFC site are associated primarily with the Illinois and Arkansas Rivers. A very narrow floodplain is located along the small stream

at the northern border of the site. The Illinois and Arkansas Rivers in the immediate vicinity of the site are considered to be part of the Robert S. Kerr Reservoir. The normal pool elevation of the reservoir is 140 m (460 ft), which is about 3 m (10 ft) above the original water level of the rivers at the SFC site prior to construction of the dam. Based on maintenance of a normal pool elevation of 140 m (460 ft) at the Robert S. Kerr Lock and Dam, the maximum historical flood (1943) would cause the water level in the reservoir to rise to 146 m (479 ft) at the site, while a 50-year flood would raise water levels at the site to only about 145 m (474 ft) (Ron Bell, Corps of Engineers, Tulsa, Okla., telephone communication to N. E. Hinkle, ORNL, Oak Ridge, Tenn., Sept. 1, 1983). Thus, only a small part of the forage production area near the confluence of the rivers could be impacted by the maximum floods.

Wetland on the site includes about a dozen small ponds (Fig. 2.2). No large marshes or swamps occur on the site.

3.5 Hydrology

3.5.1 Surface Water

The Sequoyah facility is located on the east bank of the Illinois River approximately 4.8 km (3 miles) south-southeast of Gore, Oklahoma (Fig. 3.1). The Illinois River flows in a southwesterly direction about 1.6 km (1 mile) to join the Arkansas River (Robert S. Kerr Reservoir) and approximately 3.2 km (2 miles) downstream from Webber Falls, Oklahoma. Although the Illinois River in the vicinity of the plant site is part of the reservoir, it is not considered navigable.[10] The river flow has been regulated since 1952 by Tenkiller Ferry Reservoir, which is approximately 11 km (7 miles) upstream of the plant site. The average flow of the river near the plant site is 45 m^3/s (1600 ft^3/s).

Because of the rugged nature of the watershed and the spring-fed streams in the area, the Illinois River carries less sediment than other major rivers entering the Arkansas River in Oklahoma.[10] The Illinois River in the vicinity of the plant site has an average specific conductance of 170 microseimen (μS/cm) and a turbidity of 3 Jackson Turbidity Units (JTU). Downstream at the Robert S. Kerr Dam, the average values for these parameters are 600 μS/cm and 15 JTU.[11] Values for specific conductance and turbidity at the site are influenced by the upstream movement of surface water from the Arkansas River into the Illinois River.[12,13] Comparison of other water quality parameters of the Illinois River in the vicinity of the plant with the Oklahoma standards for drinking waters are shown in Table 3.4.

In the vicinity of the plant site, the Illinois River drains an area of 4200 km^2 (1620 $miles^2$).[11] Most of the site drains to the Illinois River. The principal site drainage consists of the plant effluent, identified as the combination stream (Fig. 2.2), and Salt Branch, which flows along the northern boundary of the site. Runoff from portions of the site that are fertilized with the treated raffinate are temporarily held up by retention dams before release to the combination stream or to Salt Branch. The only known spring in the vicinity of the industrial facility is about 300 m (1000 ft) west of raffinate pond 2 and has an average flow of less than 0.5 L/min.

Table 3.4. Comparison of water quality parameters in the Illinois River in the vicinity of the site with Oklahoma water quality standards

(units in mg/L unless otherwise noted)

	Illinois River[a,b]	Oklahoma standards[c]
Flow (m^3/s)	20-145	d
Temperature (°C)	6-19	d
Total suspended solids	20	d
Fluoride	0.1-0.3	1.6
Nitrate	0.2-3.9	10
pH (no units)	7.4-8.1	6.5-9.0
Alkalinity ($CaCO_3$)	63-76	d
Hardness ($CaCO_3$)	7.3-10	88

[a]U.S. Geological Survey, Water Resources Data of Oklahoma, Vol. 1, Arkansas River Basin, U.S. Geological Survey Water Data Report OK-76-1.

[b]STORET, Water Quality Database, Environmental Protection Agency, 1980, 1981, 1982.

[c]Oklahoma Water Resources Board, Oklahoma's Water Quality Standards, Oklahoma Water Resources Board, Publ. 111, Oklahoma City, Okla., 1982

[d]Not applicable.

3.5.2 Groundwater

3.5.2.1 General

Of the many core holes and test borings drilled in the facility area, only a few have encountered groundwater. Monitor wells M5, M6, M7, M8, and M9, located a few meters from the combination stream and in the lowest topographic area of the site, have water in them most of the year (see Sect. 4.1.2). One core hole (CH 17), drilled in the Carlisle School fault zone, also bears water most of the year. Two offsite wells yield water for nearby rural residences north and southeast of the plant. These few locations and the aforementioned spring (see Sect. 3.5.1) along the Port Road constitute the only points with which to assess the occurrence of groundwater.[3,9] Considering the very erratic nature of the rocks in the subsurface, rapidly thinning layers of rather tight sandstone enclosed in shale, one would expect there to be little groundwater and virtually no continuous water table.

3.5.2.2 Site-specific groundwater movement and lithologic bedrock characteristics

There is no evidence to suggest the presence of an unconfined or natural perched water table in the facility area. However, following periods of heavy rainfall, the terrace material apparently becomes saturated for brief periods of time, producing a temporary and transitory body of water. Water occurring in saturated zones of the terrace material underlying the main facility and holding ponds would be expected to move vertically until encountering underlying bedrock. Then it would travel both vertically and laterally along the

joint system of the underlying stratum described below, until it emerged very shortly afterward at a topographically lower elevation downgradient.

The bedrock just beneath the surface in the area of the Sequoyah facility is a combination of interbedded siltstones, very fine sandstones, and shales as described in Sect. 3.6.1. The uppermost Atoka beds underlying the Sequoyah facility consist of three distinct horizons: a lower sandstone, an intermediate shale, and an upper sandstone-siltstone member. This subsurface geology is shown in Fig. 3.2 for vertical north-south sections through ponds 2 and 3, including the combination stream in both cases.

The shale member beneath the lower sandstone is comprised of medium to dark gray hard silty shale, locally fissile, and fairly soft plastic clay shale. The base of this unit was not drilled so that its true thickness cannot be ascertained. No visible traces of water nor fractures or open surfaces along which fluids might be expected to move were encountered during core drilling of this unit.

The lower sandstone member ranges from about 2 to 3 m (8 to 10 ft) in thickness. The upper surface is a sharp contact overlain by intensely black clay shale, which locally contains pyritic or calcareous concretions. This contrasts somewhat with the lower contact, which appears to be gradational. The sandstone is very fine grained, actually bordering on siltstone. In most samples, the rock has a calcareous cement which renders it tight and impermeable.

The middle shale unit is the most distinctive of the rocks drilled. It ranges from about 8 to 9 m (25 to 27 ft) in thickness; the changes in thickness result from the intertonguing of silty and sandy layers of the overlying unit. The shale itself is a nearly pure clay shale in the lower 5 to 7 m (16 to 20 ft); the upper portion contains varying amounts of silty shale and locally thin beds of siltstone. The upper part of the shale, both in the very silty intervals and in those portions less silty or lacking in silt, is light to medium gray in color. At about 0.5 to 1 m (2 to 3 ft) below the lowest silty shale, the rock becomes intensely black, smooth-breaking, soft, and plastic. There are numerous slick-sided surfaces and less-common vertical fractures in the shale, and in places it becomes slightly fissile and crumbly. In several core holes, a small amount of water was detected on broken surfaces in the lower 0.3 m (1 ft) or so of this black shale. Presumably, the fractured shale may act as an aquifer. The spring mentioned previously (see Sect. 3.5.1) emerges from this same stratigraphic horizon on the hillslope west of the plant. Some dampness was also detected near the top of the middle shale unit, about 0.3 m (1 ft) or so below the upper sandstone. The upper sandstone member rests on the upper silty portion of the middle shale. The sandstone is at least 1.6 m (8 ft) thick. Like the sandstone below the middle shale, this upper unit is very fine-grained, subangular tight, and locally calcareous. The two upper sandstone units may merge with each other and a larger sandstone unit to the north (see Fig. 3.2).

3.5.2.3 Groundwater quality and use

The only significant fresh water aquifer in the immediate plant site area is the alluvium of the Arkansas River Valley. The lower part of the alluvium consists of up to 5 m (15 ft) of coarse sand with a productivity of as much as 57 L/sec (900 gpm). The water is classified as "hard to very hard" (greater

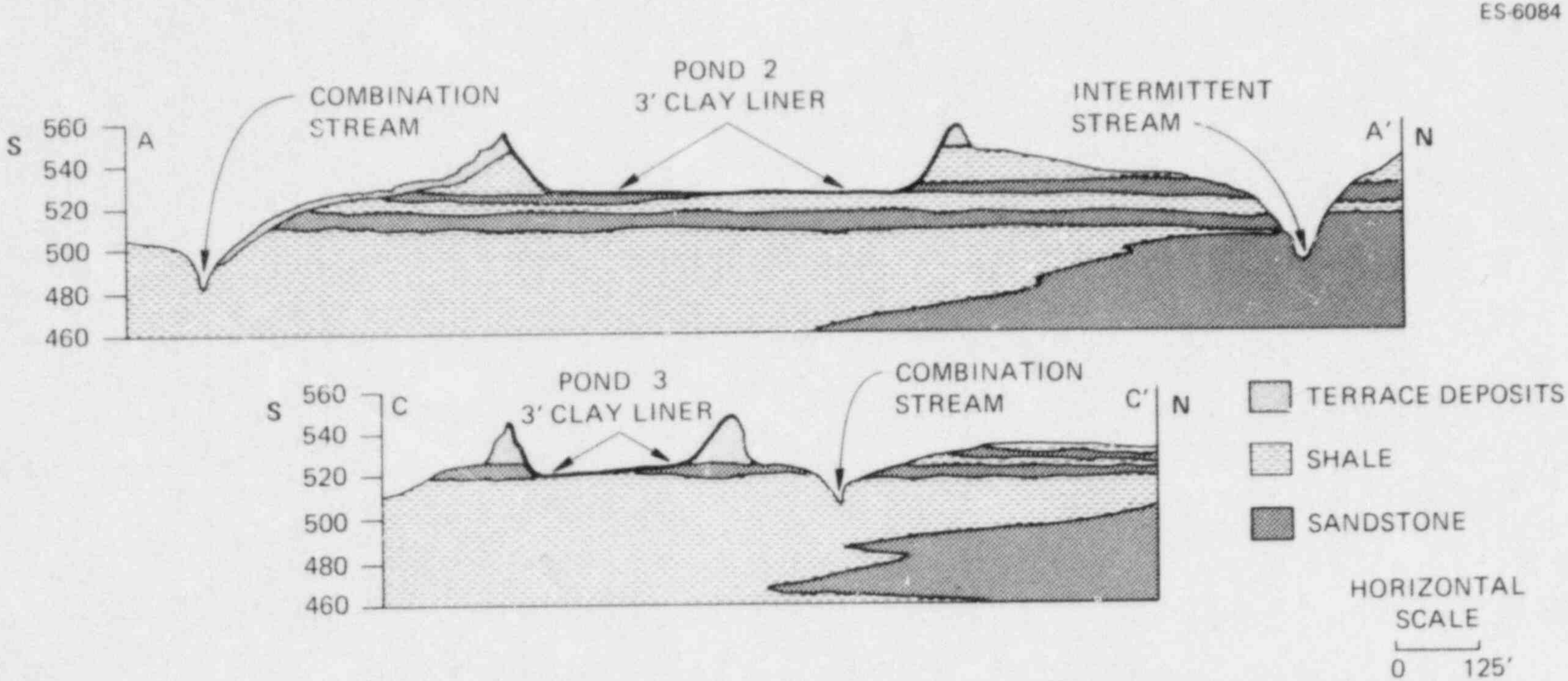

Fig. 3.2. Local geology for the site of the Sequoyah Fuels Corporation facility.

than 180 mg/L total hardness) but is suitable for irrigation and watering stock.

The hydrologic conditions in the immediate area of the SFC plant are typical of those described for the Atoka formation discussed below. This formation is considered to be a very poor aquifer because the soil cover is thin and has poor permeability, and the underlying sandstone and shale beds require fracturing to provide storage capacity. Water quality is poor and yields average only 0.03 L/sec (0.5 gpm). It is estimated that because of the very low permeability of the Atoka rocks, approximately 95% of the rainfall is lost by surface runoff.

The only local area capable of supporting a marginal water well is adjacent to the Carlisle School fault, where fracturing of the Atoka formation is sufficient to provide a reservoir of limited areal extent. The best water well in the plant site area is located in the belt of fracturing and has a depth of 26 m (84 ft), a static water level at 10 m (29 ft), and a yield of 0.06 L/sec (1 gpm). The water quality of this well is better than average for the Atoka formation, having approximately 460 mg/L total dissolved solids. In contrast, water wells drilled at the three former home sites west of State Highway 10 did not supply adequate water for domestic purposes.

The SFC facility does not use groundwater resources, but obtains water from the Tenkiller Reservoir located about 11 km (7 miles) to the north (see Sect. 2.2.1.14).

3.6 Geology, Mineral Resources, and Seismicity

3.6.1 Geology

3.6.1.1 Regional geology

The SFC site is located on the southwest flank of the Ozark Uplift, a major tectonic feature extending from east-central Missouri to northwest Arkansas and northeast Oklahoma. The Arkoma Basin lies immediately to the south and southeast, while the Quachita Mountains are about 80 km (50 miles) south of the plant. The regional dip in the plant area is 2-3° southwest into the Arkoma Basin.

3.6.1.2 Site geology

Only about 119 m (390 ft) of the Atoka formation are present beneath the plant. The base of the Atoka formation, at 119 m (390 ft) below the surface, rests on the unconformity at the top of the Wapanucka limestone. The Wapanucka appears on the surface about 16 km (10 miles) northeast of the plant site and the top of the Atoka, marked by the Hartshorne sandstone, and is about 10 km (6 miles) southwest of the facility. Regional dip is therefore generally southwest; this is also the approximate direction of thickening of the Atoka. Those members of the Atoka exposed at the plant are about in the middle of the formation. The Atoka is characterized by very irregularly bedded discontinuous units of sandstone, siltstone, and shale with subordinate thin limestones in the lower part. Channeling of one unit into another is common.

A Pleistocene terrace covers most of the hill beneath the Sequoyah facility. This terrace is up to 5 m (15 ft) thick and is a remnant of extensive terrace deposits laid down during high water stages of the Illinois and Arkansas Rivers. Downcutting by these streams has left this scrap of terrace high above the present valley. From its maximum thickness on the hilltop, the terrace thins rapidly in all directions (Fig. 3.2).

Three types of unconsolidated sediment make up the terrace: gravel, silt, and clay. Commonly the three varieties are intermixed. Pebbles of chert which comprise the gravel facies are scattered through silt or clay beds, and a silt and clay mixture is common. At a few places, there are pockets of nearly pure clay, pure silt and sand, or pure gravel.

3.6.1.3 Structural geology

The rocks underlying the SFC property are, for the most part, nearly flat lying. Jointing and fracturing are present but not prominent in most of the Atoka rocks in the area. The silty shales and shaly siltstones are much less conspicuously jointed than the purer clay shale, and the observable joints are wavy, irregular, and short. Most of the sandstone beds also lack prominent jointing; where observed, they are short and irregular.

The Carlisle School fault is the most prominent structural feature in the immediate area. The plane of the fault is not exposed, but its presence is revealed by vertical beds of sandstone which form low hummocky parallel ridges south of the Carlisle School. The ridges stretch for a couple of hundred meters across a pasture. They are about 30 m (150 ft) apart and are the surface indication of sandstone beds at 0.3 to 0.6 m (1 to 2 ft) thick. Deep weathering does not allow a more precise determination of the actual ridge-forming strata, but float in the area suggests the presence of at least two massive sandstone layers.

3.6.2 Mineral Resources

Minerals in the area consist of coal, limestone/sandstone, sand/gravel from the Arkansas River floodplain, and clay and shale. The nearest coal production is 22 km (14 miles) west at the town of Warner. Coal is being mined from a depth of 427 m (1400 ft) at Stigler in Haskell County, 29 km (18 miles) south of the site. The nearest coal deposits are located approximately 19 km (12 miles) southeast of the plant site, but these low-quality mines are currently inactive.

3.6.3 Seismicity

The area of East Central Oklahoma where the SFC facility is located lies in a quiet seismic region of the United States. Although distant earthquakes may produce shocks strong enough to be felt in this area, the region is considered to be one of minor seismic risk (Fig. 3.3).

The seismically active regions closest to the site are the El Reno-Nemaha Ridge area located in Oklahoma, Kansas, and Nebraska, and the New Madrid area in Missouri. The probability of serious damage to the SFC facility from earthquakes occurring in either area is remote.

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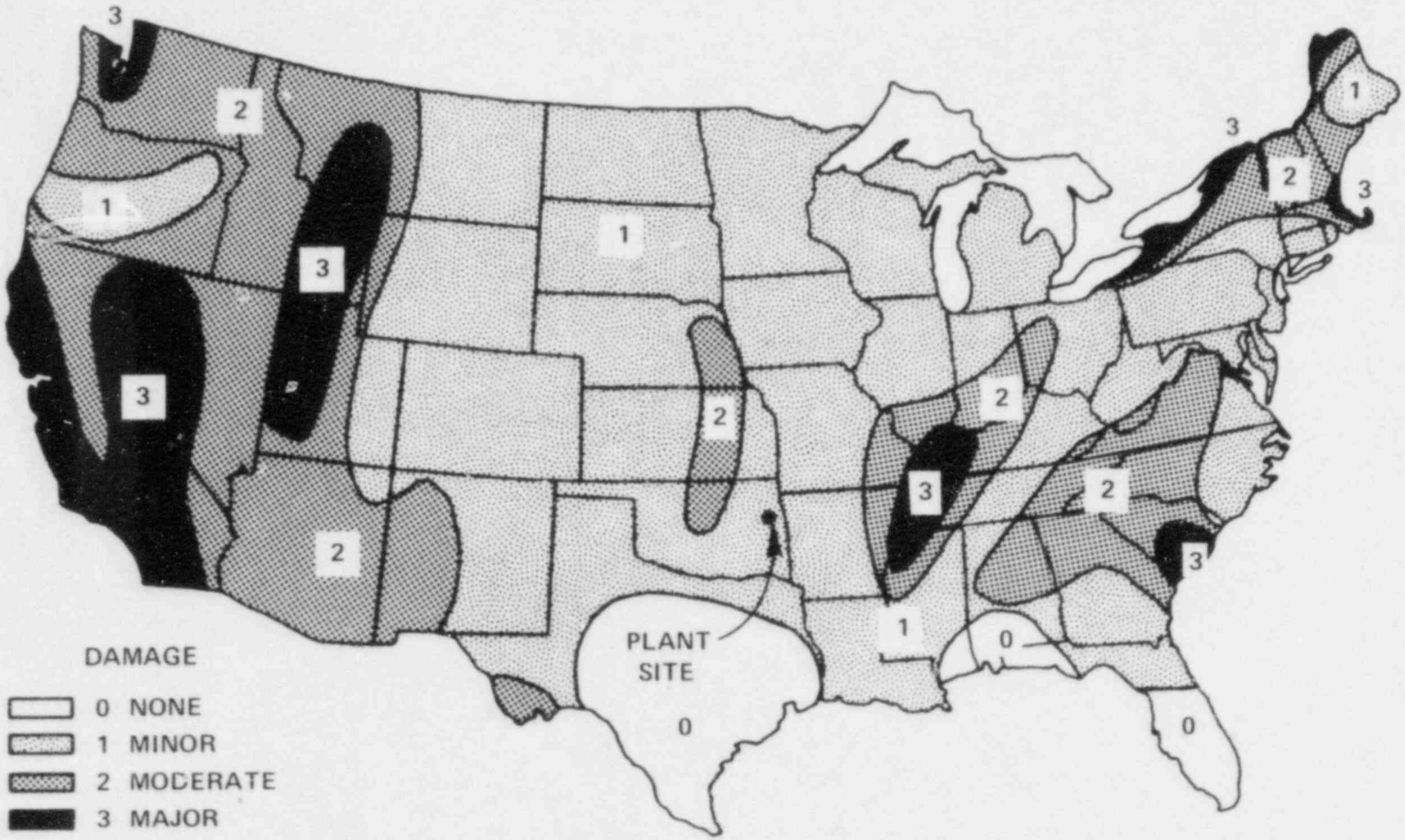

Fig. 3.3 Seismic risk map of the United States. Source: S. T. Algermissen, *United States Earthquakes*, Fig. 2.4, U.S. Government Printing Office, Washington, D.C., 1968.

A recent probabilistic acceleration map of the contiguous United States (Fig. 3.4) indicates that the horizontal acceleration at the project site, with 90% probability of not being exceeded in 50 years, is less than 5% of gravity, which will produce only a small earthquake. On the basis of the historic seismicity record[9] and the tectonic framework of the region, it is highly unlikely that a large-magnitude earthquake will affect the project site during its projected life.

3.7 Biota

3.7.1 Terrestrial

The site is located in the oak-hickory savannah region, which is characterized by various degrees of dominance of woodland and grassland. The region is within the transition area or ecotone between the eastern deciduous forest and the central prairies. The ecology of the area has been modified by grazing, by the clearing of forest for cultivation and pasture, and by the construction of reservoirs that destroyed bottomland forests. Plant and animal species occurring in the area are listed in Appendices A and B of ref. 12.

The site itself is primarily an upland area. The woodlands are dominated by several species of oaks and hickories. Forests along streams and in river bottomlands are dominated by species such as cottonwood, sycamore, sweetgum, red oak, and water oak. Numerous dirt roads or trails have been cleared through most of the woodlands on the site to allow the passage of the raffinate spraying equipment. Pastures and fields on the site are dominated by Bermuda grass, rye, and fescue.

The fauna of the site is dominated by both woodland and grassland species. Some 120 bird species breed in the region and a few hundred other species migrate through or overwinter in the area. Woodlands, brushlands, and wetlands usually support a larger number of bird species than do fields and pastures. About 65 species of mammals and 70 species of amphibians and reptiles occur in the region. Important game species that occur on the site include the bobwhite, white-tailed deer, and eastern cottontail. The Sequoyah National Wildlife Refuge is located to the south and west of the SFC site and is used by large numbers of waterfowl and wading birds during the spring and fall migratory periods.

3.7.2 Aquatic Biota

The Sequoyah facility is located on the Illinois River embayment of the Robert S. Kerr Reservoir. The Illinois River, which is spring-fed, traverses a rugged, relatively undeveloped portion of Oklahoma. Consequently, the water is of relatively good quality and carries a low-sediment load [10] (see Sect. 3.5.1). The reservoir provides habitat for a number of game-fish species including black bass, channel catfish, crappie, and walleye. Nongame fish species are found in the shallow, weedy, brushy flats of the river, and a "put-and-take" rainbow trout fishery exists in the Illinois River below Tenkiller Dam, upstream of the site.[10]

A study of the macrobenthic fauna of the Illinois River in the vicinity of the discharge of the combination (or effluent) stream was conducted for the applicant by Doris and Russell during 1978-1979 and by Russell during 1980-1981.[13,14]

ES-6083

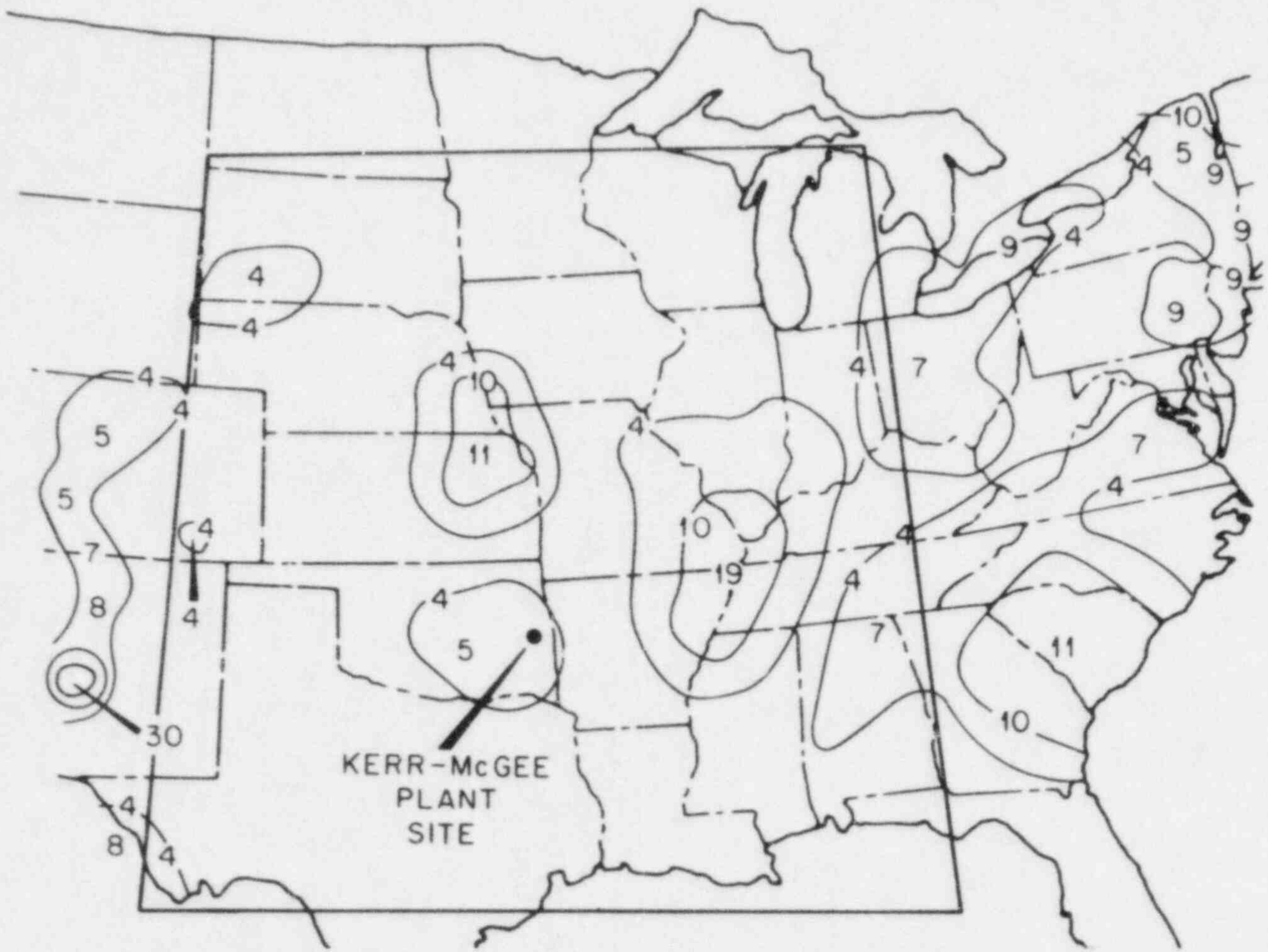

Fig. 3.4 Preliminary map of horizontal acceleration (expressed as percent of gravity) in rock with 90% probability of not being exceeded in 50 years. Source: S. T. Algermissen and D. M. Perkins, *A Probabilistic Estimate of Maximum Acceleration in Rock in the Contiguous United States*, Open File Report 76-416, U.S. Geological Survey, 1976.

Results of these studies showed that the benthic fauna in the river is dominated on a seasonal basis by aquatic worms and chironomid larvae, but the damsel fly nymph, Argia sp., was dominant in the combination stream. The combination stream was found to have a more stable, less fluctuating environment than the Illinois River in the vicinity of the plant.

3.7.3 Threatened and Endangered Species

Several species on the federal list of rare and endangered species (50 CFR 17.11 and 17.12, 1983) may occur in the Sequoyah County area. The gray bat occurs in the limestone cave region of Delaware and Adair Counties just to the north of Sequoyah County and may also occur in Cherokee, Mayes, and Sequoyah Counties.[15] Gray bats require caves for breeding and hibernation and are not likely to occur at the site but may occur in the hillier or more mountainous areas of Sequoyah County. The Indiana bat has been observed in Adair and LeFlore Counties[15] which adjoin Sequoyah County to the north and the south, respectively. Thus, this bat could also be expected in Sequoyah County. It typically raises its young in maternity colonies in woodlands along small streams and hibernates in caves during the winter. This bat species is unlikely to have maternity colonies at the site, although the small woodland stream at the northern border of the site may provide suitable habitat. In eastern Oklahoma, both the gray bat and Indiana bat are at the extreme western edge of their geographic ranges. The Ozark big-eared bat, a subspecies of the western big-eared bat (Plecotus townsendii), is endangered in Arkansas, Missouri, and eastern Oklahoma. It is known to occur in only a few caves in this tri-state area,[16] including only one cave in Oklahoma (Adair County), and is highly unlikely to occur at the site.

The bald eagle is a permanent resident along the Illinois and Arkansas Rivers near the site. Several bald eagle nests that were used during the 1980, 1981, and 1982 nesting seasons are present along the Robert S. Kerr Reservoir from about 5 to 32 river km (3 to 20 river miles) downstream from the SFC site. In addition, relatively large numbers of eagles, perhaps 200, winter in the three-county area around the site, primarily along the Illinois and Arkansas Rivers (Charles Scott, U.S. Fish and Wildlife Service, Tulsa, Okla., personal communication with R. Kroodsma, ORNL, Oak Ridge, Tenn., Nov. 9, 1983). The peregrine falcon does not nest in Oklahoma but may occur as a rare migrant or visitor near the site.

3.8 Radiological Characteristics (Background)

The total-body dose rate for the population in the vicinity of the plant site (Fort Smith, Ark. area) is approximately 106 millirem/year.[17] This dose rate includes 42.3 millirem/year from cosmic rays, 45.6 millirem/year from terrestrial sources, and 18 millirem/year from internal emitters.

REFERENCES FOR SECTION 3

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2. Kerr-McGee Nuclear Corporation, Applicant's Environmental Report, USAEC Docket No. 40-8027, Uranium Hexafluoride Plant, Supplemental, June 1972.

3. Kerr-McGee Nuclear Corporation, Sequoyah Facility License Renewal Application, License SUB-1010, Docket No. 40-8027, September 1982.

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6. D. H. Slade, ed., Meteorological and Atomic Energy, U.S. Atomic Energy Commission, Division of Technical Information, July 1968.

7. J. F. Sagendorf, A Program Evaluating Atmospheric Dispersion from a Nuclear Power Station, NOAA Technical Memo ERI-ARL-42, 1974.

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11. U.S. Geological Survey, Water Resources Data for Oklahoma, Vol. 1, Arkansas River Basin, U.S. Geological Survey Water Data Report OK-76-1, 1976.

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13. T. C. Doris and G. L. Russell, Benthic Macroinvertebrate Fauna of the Illinois River Below Tenkiller Reservoir Adjacent to the Effluent Outfall of the Sequoyah Facility, Gore, Oklahoma, October 1978 to December 1979, Docket 40-8027, 1980.

14. G. L. Russell, Benthic Macroinvertebrate Fauna of the Robert S. Kerr Reservoir Below Lake Tenkiller Adjacent to the Effluent Outfall of the Sequoyah UF_6 Facility, Gore, Oklahoma, October 1980-December 1981, Oklahoma State University, July 1982.

15. Rare and Endangered Species of Oklahoma Committee, "Rare and Endangered Vertebrates and Plants of Oklahoma," 1975.

16. M. J. Harvey, "Endangered Chiroptera of the Southeastern United States," Proc. 29th Ann. Conf. S.E. Assoc. Game and Fish Comm. 29: 429-433 (1975).

17. D. T. Oakley, Natural Radiation Exposure in the United States, ORP/SID 72-1, U.S. Environmental Protection Agency, June 1972.

4. ENVIRONMENTAL CONSEQUENCES OF PROPOSED LICENSE RENEWAL

4.1 Monitoring Programs and Mitigatory Measures

A monitoring program is conducted at onsite and offsite locations on a routine basis to monitor the effectiveness of the various emission control systems in minimizing the release of effluents to the environment. Where possible, environmental monitoring is conducted to provide "site-specific" data which would preclude the need to use conservative assumptions in the calculation of radiological exposure data.[1-3]

4.1.1 Effluent Monitoring Program

4.1.1.1 Radiological

Gaseous effluents

All stacks from which radioactive materials are vented to the outside atmosphere are monitored. Each emission source suspected of releasing trace quantities of uranium, except the main stack, is continuously sampled, and the sample filters are collected and analyzed daily. According to SFC, the main stack which has less than 1% of the total uranium release is sampled weekly. Since the effluents released from the main stack result from the plant's process operation, the staff require that the main stack be sampled continuously and analyzed for gross-alpha on a daily or weekly basis. This requirement conforms with the NRC's Regulatory Guide 4.16 on effluent monitoring from UF_6 production plants[32]. Most of the radioactivity is released through the HF scrubber exhaust (~50%) and the roof vents (~47%). The annual quantities of uranium emitted from the process stacks during 1980-1984 are shown in Table 2.2.

Liquid effluents

The combined liquid effluent stream consisting of the fluoride treatment effluent, the sanitary water treatment system discharge, and the overflow from the recirculating cooling water system and the by-passed plant intake water, is sampled continuously at the point where it leaves the immediate plant area (feature NE on Fig. 2.1). Daily grab samples are analyzed for uranium. Monthly composite samples are analyzed for uranium and ^{230}Th. The composite samples are analyzed quarterly for ^{226}Ra. If the limits established by the NPDES permit are exceeded, the four upstream waste systems contributing to the liquid effluents are sampled to determine the major contributor to the increased levels. In addition, these systems are sampled every two weeks and analyzed to pinpoint potential sources of contamination. The semi-annual release of gross-alpha and natural uranium at outfall 001 for the year 1980-1984 are shown in Table 2.5.

The high-nitrate raffinate from the UF_6 production process is treated to significantly reduce the dissolved metal concentration (see Sect. 2.2.2.2). The analysis of the treated raffinate before use as a liquid fertilizer on the

applicant's property is given in Table 2.3.

4.1.1.2 Nonradiological

Gaseous effluents

The applicant measures the emission rate from the nitrogen oxide emission control system stack (Sect. 2.2.2.1). In addition, periodic plume inspections are conducted pursuant to an Oklahoma State Air Pollution Control Permit, which requires visible emissions to be maintained below a 20% opacity level. Samples are collected daily from the HF off-gas scrubber and from the fluorine production cell exhausts and analyzed for fluoride. This information is used to assess the effectiveness of the installed effluent controls.

Liquid effluents

Daily grab samples of the combination (or effluent) stream (Fig. 2.2) at the plant discharge point (outfall 001) are analyzed for temperature, pH, nitrate, and fluoride. In addition, monthly composite samples are also analyzed for nitrate and fluoride. Typical values for these nonradioactive parameters are shown in Table 4.1. When concentrations of the chemicals in the discharge exceed NPDES permit or Oklahoma discharge permit limits, the four effluent sources are individually sampled and analyzed to determine the source of the

Table 4.1. Comparison of water quality parameters in the combined effluent discharge (or combination stream) with the NPDES permit limitations[a]

Parameter	Effluent range[b]	NPDES limits[c]	
		Average	Maximum
Flow, L/min	24-9000	d	d
pH	6.8-8.9	6.0 (minimum)	9.0
Temperature, °C	10-18	d	d
Total suspended solids, kg/d	7-117	340	680
Fluoride, kg/d	7-23	14	34
Nitrate (as N), mg/L	18-42	34	140
Alkalinity ($CaCO_3$), mg/L	99	d	d
Hardness ($CaCO_3$), mg/L	110	d	d

[a]The NPDES permit also limits the total suspended solids and 5-d biological oxygen demand from the sewage treatment effluent to the combined effluent stream to a daily average of 30 mg/L and a maximum of 45 mg/L.

[b]Source: Kerr-McGee Nuclear Corporation, Response to U.S. Nuclear Regulatory Commission Site Visit Information Requests, July 11, 12, and 20 and Aug. 19, 1983.

[c]Source: Oklahoma Waste Management Division, "NPDES permit for Discharge from the Kerr-McGee Sequoyah Facility," Dec. 23, 1982.

[d]Not applicable.

contamination. These four systems are also sampled biweekly and analyzed for the above-listed parameters to detect any possible source of contamination. In addition, the flow and other water quality parameters of the combined effluent stream are determined (Table 4.1). The combination stream flows to the Illinois River via a natural watercourse (Fig. 2.2).

The nonradioactive contaminants in the treated raffinate from the production facility are shown in Table 2.3.

4.1.2 Environmental Monitoring Program

4.1.2.1 Radiological

The radiological monitoring program for detection of contamination of the air, soil, vegetation and surface water is presented in Table 4.2 and the sampling locations are shown in Figure 4.1. Because of the previously identified groundwater contamination near raffinate pond 2 and the potential for groundwater contamination in the site areas where treated raffinate is spread, the complex groundwater monitoring program for sampling locations shown in Figs. 4.2 and 4.3 is presented separately in Table 4.3. A more detailed map is shown in Appendix C. The concentration detection limits and action levels for the monitoring program submitted by SFC are given in Table 4.4.

Air monitoring

Continuous air sampling is conducted at nine locations (A-I). Four locations (A-D) are near the restricted area fenceline surrounding the industrial area (Fig. 4.1). These locations are in approximately the direction of the cardinal points of the compass from the UF_6 production and storage area (Fig. 2-1). Air samples are collected daily and analyzed for gross-alpha. The results for the 1980-1984 period are provided in Table 4.5. Although the average concentrations at the sampling locations A-D are below the action level as specified in Table 4.4, the daily concentrations could exceed the action level. The licensee is not violating any radiation standards at the present time, however, if the action level is constantly exceeded, they should consider upgrading their stack effluents control system to reduce the emission of radioactivity and fluorides to the environment (see Sections 4.1.2.2 and 4.2).

Air samples obtained from stations E, F, G, H, and I are each composited quarerly and analyzed for uranium. The analysis of ^{230}Th, and ^{226}Ra are also performed for E and F. Samples collected at the nearest residence (J) are analyzed quarterly for uranium and uranium solubility and on a semiannual basis for particle size. The results (Tables 4.6 and 4.7) are used to determine the radiation exposure of the most exposed individual (see Section 4.2.5.1). The applicant was not required to provide solubility or particle size analysis for ^{230}Th or ^{226}Ra (Amendment 9, License SUB 1010) because their contribution in the air emissions is insignificant.

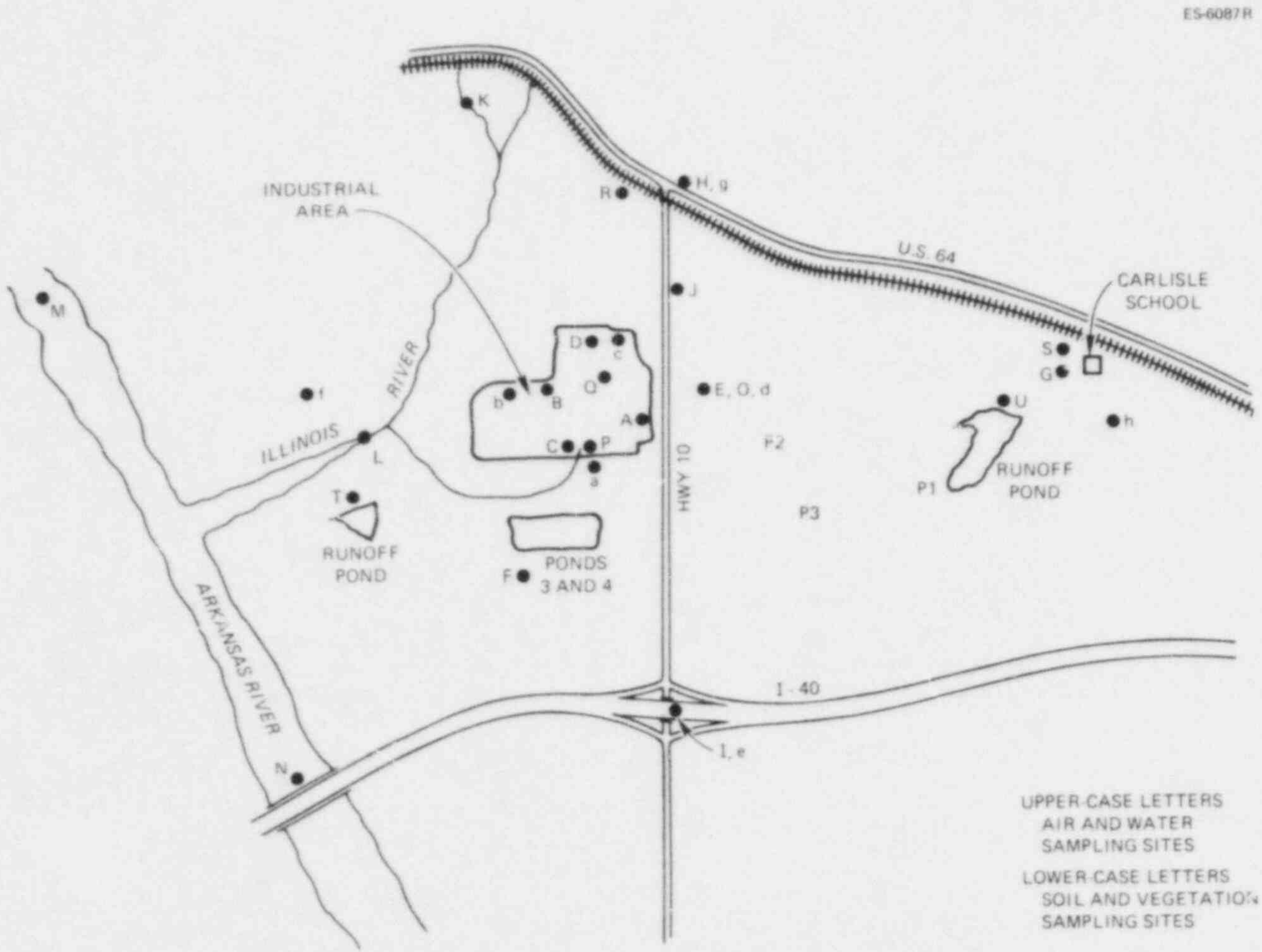

Fig. 4.1. Location of monitoring sites for air, surface water, soil, and vegetation. The letter identification of sample sites is used in Tables 4.2, 4.5, 4.8, 4.9, and 4.10.

Table 4.2. Environmental monitoring program for radiological material at or above the ground surface

Station identification[a]	Collection frequency	Sample type	Type of analyses
		Air particulates	
A, B, C, D,	Daily	Continuous	Gross alpha
E, F, G, H, I	Weekly	Continuous	Gross alpha: composite quarterly for U. ^{230}Th, and ^{226}Ra for E and F
J (nearest resident)	Weekly	Continuous	Gross alpha: composite quarterly for U and U solubility, and semiannually for particle size
		Surface water	
R	Weekly	Grab	U, ^{226}Ra, quarterly
K, L, S	Monthly	Grab	U, ^{226}Ra, quarterly
M, N	Quarterly	Grab	U, ^{226}Ra, quarterly
O, Q	Semiannually	Grab	U, ^{226}Ra, semiannually
T, U[b]	c	Grab	c
P[d]	Continuous		U, ^{230}Th, ^{226}Ra, quarterly
P1, P2, P3	c	Grab	c
		Soil	
a-h	Semiannually (Apr. and Oct)	Grab	U
		Vegetation	
a-h	Semiannually (Apr. and Oct.)	Grab	U

[a]Station identification correlates with use in the text and Fig 4.1.

[b]These two stations monitor the overflow from two runoff retention dams in the onsite raffinate disposal areas and correspond to outfalls 002 and 003. An NPDES permit requires additional analyses daily during periods of discharge.

[c]The retention ponds (T and U) and farm ponds (P1, P2, and P3) are sampled at the beginning of each fertilizer application season, every other month during fertilizer application, and one month after the last fertilizer application. Samples shall be individually analyzed for gross-alpha and for any element whose concentration in the raffinate fertilizer exceeds Livestock Enterprise Standards (Appendix II of License Amendment 26). If the gross-alpha exceeds 15 pCi/L, an analysis for uranium and ^{226}Ra shall be made.

[d]This station is the main plant liquid waste discharge, outfall 001.

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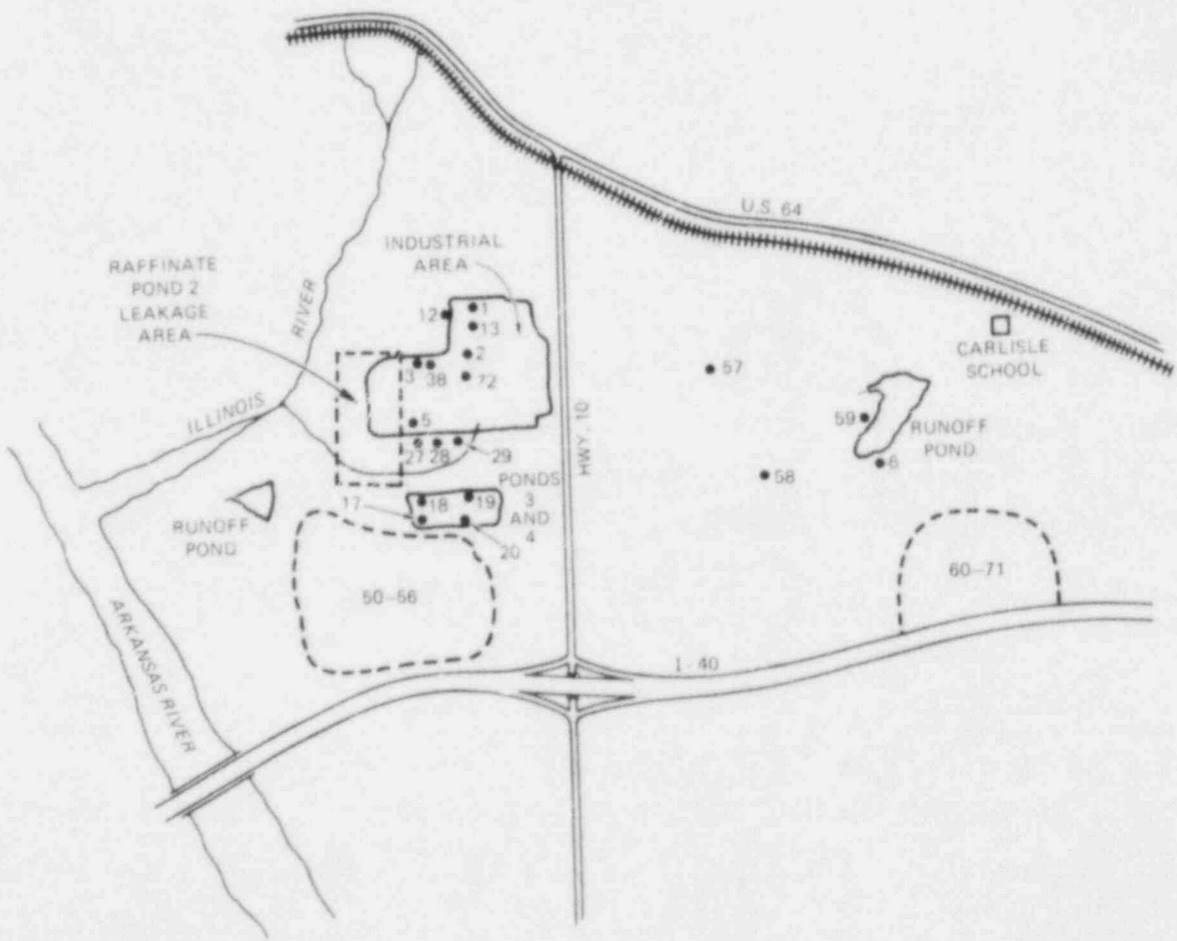

Fig. 4.2. Location of groundwater monitoring wells on the SFC site excluding wells associated with raffinate pond 2. The letter identification is used in Table 4.3.

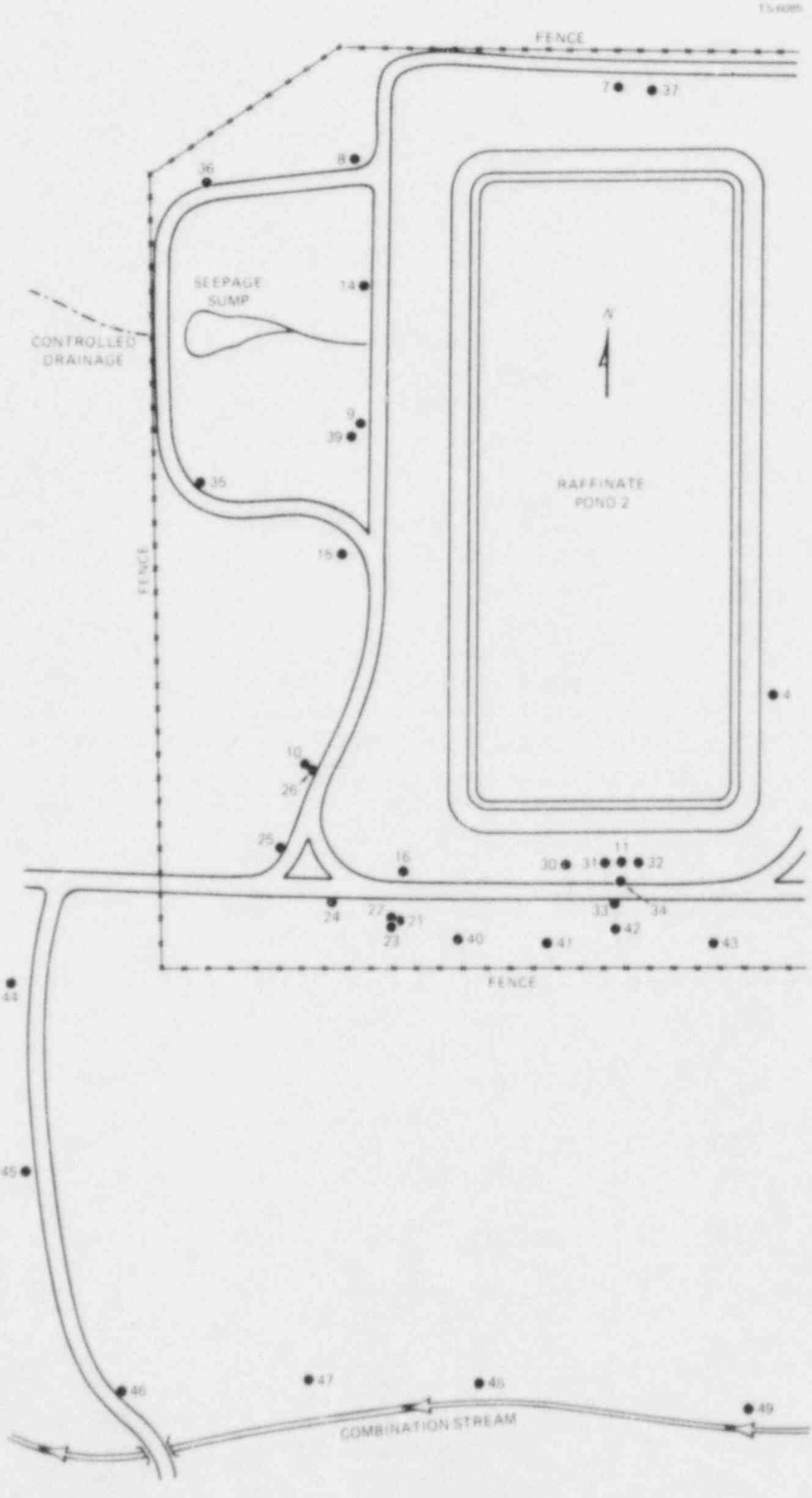

Fig. 4.3. Location of groundwater monitoring wells around raffinate pond 2. The letter identification is used in Table 4.3.

Table 4.3. Environmental monitoring program for radioactive and nonradioactive contamination in groundwater

Sample number[a]	Well identification[b]	Well location	Sample frequency	Sample analysis[c]
1	2301	West of holding basin (HB)	Quarterly	1, 2
2	2302	West of sewage lagoon (SL)	Monthly	1, 2
3	2303	North of clarifier A basin	Monthly	1, 2
4	2305	East of raffinate pond 2 (P2)	Weekly	2, 3, 5
5	2306	South of fluoride clarification basin (FCB)	Monthly	1, 2
6	2307	Fault well	Semiannually	1, 4, 6
7	2310	North of raffinate pond 2	Quarterly	1, 2
8	2311	West of raffinate pond 2	Quarterly	1, 2
9	2312	West of raffinate pond 2	Weekly	2, 3, 5
10	2313	West of raffinate pond 2	Quarterly	1, 2
11	2314	South of raffinate pond 2	Weekly	2, 3, 5
12	2315	West of holding basin	Monthly	1, 2
13	2316	West of holding basin	Quarterly	1, 2
14	2317	West of raffinate pond 2	Monthly	1, 2
15	2318	West of raffinate pond 2	Quarterly	1, 2
16	2319	South of raffinate pond 2	Quarterly	1, 2, 3
17	2321	Southwest corner raffinate pond 3	Quarterly	1, 2
18	2322	Northwest corner raffinate pond 3	Quarterly	1, 2
19	2323	Northeast corner raffinate pond 3	Quarterly	1, 2
20	2324	Southeast corner raffinate pond 3	Quarterly	1, 2
21	2325	Southwest corner raffinate pond 2	Monthly	1, 2
22	2326	Southwest corner raffinate pond 2	Monthly	1, 2
23	2327	Southwest corner raffinate pond 2	Monthly	1, 2
24	2328	Southwest corner raffinate pond 2	Monthly	1, 2
25	2329	Southwest corner raffinate pond 2	Monthly	1, 2

Table 4.3. (continued)

Sample number[a]	Well identification[b]	Well location	Sample frequency	Sample analysis[c]
26	2330	Southwest corner raffinate pond 2	Monthly	1, 2
27	F-1	South of fluoride settling basin (FSB)	Monthly	1, 2
28	F-2	South of fluoride settling basin (FSB)	Monthly	1, 2
29	F-3	South of fluoride settling basin (FSB)	Monthly	1, 2
30	T-1	South of raffinate pond 2	Weekly	2, 3, 5
31	T-2	South of raffinate pond 2	Weekly	2, 3, 5
32	T-4	South of raffinate pond 2	Weekly	2, 3, 5
33	T-5	South of raffinate pond 2	Weekly	2, 3, 5
34	ED-1	South of raffinate pond 2	Weekly	2, 3, 5
35	ED-5	West of raffinate pond 2	Monthly	1, 2
36	ED-6	West of raffinate pond 2	Quarterly	1, 2
37	ED-8	North of raffinate pond 2	Quarterly	1, 2
38	ED-10	North of raffinate pond 2	Monthly	1, 2
39	ED-11	West of raffinate pond 1	Monthly	1, 2
40	M-1	South of raffinate pond 2	Weekly	3
41	M-2	South of raffinate pond 2	Weekly	3
42	M-3	South of raffinate pond 2	Weekly	2, 3, 5
43	M-4	South of raffinate pond 2	Weekly	3
44	M-5	South of raffinate pond 2	Weekly	3
45	M-6	South of raffinate pond 2	Weekly	3
46	M-7	South of raffinate pond 2	Weekly	3
47	M-8	South of raffinate pond 2	Weekly	3
48	M-9	South of raffinate pond 2	Weekly	2, 3, 5
49	M-10	Soutn of raffinate pond 2	Weekly	3
50-56	FTP-1 to -7	160-acre raffinate treatment area	d	d
57-59	270-1 270-2 270-3	270-acre raffinate treatment area	d	d
60-71	S1 to S9 S10C to S12C	Proposed Sludge burial area	Annually	7

Table 4.3. (continued)

Sample number[a]	Well identification[b]	Well location	Sample frequency	Sample analysis[c]
72	2331	East of clarifier A basin (deep well for raffinate disposal)	Monthly	6

[a]Sample numbers do not correspond with applicant's identification but are shown in Figs. 4.2 and 4.3.

[b]Applicant's well identification.

[c]Numbers in this column refer to the following: 1 = uranium, nitrate, and fluoride; 2 = ^{226}Ra quarterly; 3 = uranium and nitrate weekly; 4 = ^{226}Ra; 5 = fluoride monthly; 6 = nitrate, Ca, Na, Cl, NH_4, and conductivity; and 7 = F, nitrate, NH_3 (N), pH, and conductivity.

[d]These wells are sampled at the beginning of each fertilizer application season, every other month during fertilizer application, and one month after the last fertilizer application. Samples shall be analyzed individually for nitrates, gross-alpha, and all elements whose concentration in the applied raffinate exceeds the concentrations stated for short-term use of irrigation waters. If the gross-alpha concentration in a monitoring well exceeds 15 pCi/L, an analysis for uranium and Ra-226 shall be conducted. If the nitrate concentration in a monitoring well exceeds 10 mg/L of if gross-alpha exceeds 15 pCi/L, the applicant shall take appropriate corrective action.

Table 4.4. Detection limits and action levels for environmental sample analyses at the Sequoyah facility

Sample Type		Analysis	Detection Limit	Action Level
Air	(1)	Gross Alpha	2.5×10^{-13} μCi/ml	2.5×10^{-12} μCi/ml
	(2)	Gross Alpha	3.6×10^{-14} μCi/ml	2.5×10^{-12} μCi/ml
		Fluoride	0.0005 μg/l	5.0×10^{-3} μg/l
	(3)	Uranium	2.7×10^{-16} μCi/ml	1.5×10^{-14} μCi/ml
	(4)	Uranium	1.0×10^{-16} μCi/ml	1.5×10^{-14} μCi/ml
Water	(5)	Gross Alpha	10. pCi/l	15 pCi/l
		Uranium	7 μg/l	225 μg/l
		Fluoride	0.1 mg/l	1. mg/l
		Nitrate	0.1 mg/l	10. mg/l
		Radium 226	0.01 pCi/l	1. pCi/l
		Thorium 230	0.001 pCi/l	0.1 pCi/l
Soil	(6)	Uranium	0.1 μg/gm	40. μg/gm
		Fluoride	10. μg/gm	350. μg/gm
Vegetation	(6)	Uranium	0.03 μg/gm	2.5 μg/gm (dry weight)
		Fluoride	2.0 μg/gm	40. μg/gm

(1) Fenceline stations (A, B, C, and D)
(2) Stations E, F, G, R, and I
(3) Stations E, F, G, H, and I -- Analyzed at Kerr-McGee Technical Center
(4) Station J (Nearest Resident)
(5) Samples on FTP and 270 Monitor Wells
(6) OffSite Samples Only

Table 4.5. Annual average uranium concentration in air samples from locations on and near the Sequoyah site

Sample location	Sample identification[a]	Uranium concentration (μCi/mL)				
		1980	1981	1982	1983	1984
East fence[b]	A E-1	1.9×10^{-12}	1.3×10^{-12}	1.2×10^{-12}	9.3×10^{-13}	9.3×10^{-13}
West fence[b]	B E-2	1.5×10^{-12}	1.7×10^{-12}	1.1×10^{-12}	9.8×10^{-13}	1.1×10^{-12}
South fence[b]	C E-3	2.0×10^{-12}	1.6×10^{-12}	1.4×10^{-12}	1.1×10^{-12}	1.0×10^{-12}
North fence[b]	D E-4	1.8×10^{-12}	1.4×10^{-12}	1.3×10^{-12}	1.2×10^{-12}	1.1×10^{-12}
Asphalt plant (330 m east)[c]	E 2103	7.2×10^{-15}	4.0×10^{-15}	3.8×10^{-15}	1.5×10^{-15}	5.8×10^{-15}
0.8 km southwest of plant[c]	F 2105	5.1×10^{-15}	3.4×10^{-15}	3.9×10^{-15}	1.0×10^{-15}	2.2×10^{-15}
Carlisle School	G 2106	$<3.5 \times 10^{-14}$ (d)	$<3.5 \times 10^{-14}$ (d)	$<3.5 \times 10^{-14}$ (d)	2.8×10^{-15} (c)	8.6×10^{-16} (c)
Highway 64 north[c]	H 2107	4.5×10^{-15}	2.6×10^{-15}	3.7×10^{-15}	1.8×10^{-15}	2.3×10^{-15}
I-40 (south)[d]	I 2108	$<3.5 \times 10^{-14}$	$<3.5 \times 10^{-14}$	$<3.5 \times 10^{-14}$	$<3.5 \times 10^{-14}$	$<3.5 \times 10^{-14}$
Nearest resident[c]	J 2109	1.3×10^{-14}	1.0×10^{-14}	8.0×10^{-15}	4.7×10^{-15}	7.6×10^{-15}

[a]Locations are shown on Fig. 4.1. Applicant's identification is E-1, E-2, E-3, E-4, 2103, 2105, 2106, 2107, 2108, and 2109, respectively.

[b]Derived from gross-alpha measurements obtained on samples collected daily or weekly.

[c]Direct analysis for uranium concentration.

[d]The uranium concentrations derived from gross-alpha measurement at these locations are not reliable because they are too near the detection limit for the procedure. The license has committed to analyze uranium concentration by letter dated March 15, 1985.

Table 4.6. Particle size analyses in percent of total radioactive material obtained from the nearest residence sample station at the Sequoyah facility

Particle size (μm)	1980 (%)	1981 (%)	1982 (%)	1983 (%)	1984 (%)
4.2 to 10.2	10.6	5.4	5.2	16.4	8.7
2.1 to 4.2	7.5	5.9	5.1	6.4	23.7
1.3 to 2.1	5.6	3.9	4.8	5.9	7.5
0.69 to 1.3	5.3	5.4	5.7	7.6	8.7
0.39 to 0.69	11.3	15.3	4.5	13.5	23.0
0.00 to 0.39	59.5	64.0	74.8	50.2	28.0

Source: Kerr-McGee Nuclear Corporation, Response to U.S. Nuclear Regulatory Commission Information Request, March 15, 1985.

Table 4.7. Solubility in lung fluid of radioactive material obtained from the nearest residence sampling station at the Sequoyah facility

Year	Quarter	Class D 0-10 d (% soluble)	Class W 10-100d (% soluble)	Class Y >100 d (% soluble)
1980	3rd	68	0	32
1980	4th	86	0	14
1981	1st	81	0	19
1981	2nd	73	0	27
1981	3rd	72	0	28
1981	4th	63	0	37
1982	1st	52	0	48
1982	2nd	57	0	43
1982	3rd	66	0	34
1982	4th	80	0	20
1983	1st	61	0	39
1983	2nd	80.7	19.3	0
1983	3rd	58.8	43.2	0
1983	4th	74.4	0	25.6
1984	1st	59.0	0	41
1984	2nd	51.0	0	49
1984	3rd	70.0	30.0	0
1984	4th	52.7	0	47.3

Sources: Kerr-McGee Nuclear Corporation, Responses to U.S. Nuclear Regulatory Commission Site Visit Information Requests, July 11, 12, and 20 and Aug. 19, 1983; also W. J. Shelley, Kerr-McGee Corporation, letter with attachments to Marc J. Rhodes, U.S. Nuclear Regulatory Commission, Docket No. 49-8027, Jan. 24, 1984, and letters to W.T. Crow dated March 15, June 21, 1985.

Surface water

Samples are collected from the Illinois and Arkansas Rivers and onsite ponds and runoff waters. The collection frequency, sample type, and types of analysis are given in Table 4.2. Typical monitoring results in terms of annual averages over 3 years (1980-1982) are shown in Table 4.8 for the environmental monitoring samples and for the facility effluent (outfall 001). More current data (1983, 1984) are shown in Appendix C. The discharge of the facility liquid effluent at 001 is well below the allowable concentration as specified in 10 CFR Part 20 (30,000 pC/l). However, the average quantity of uranium discharged into the Illinois River is about 3.3 Ci or 5,000 kg per year (Table 2.5). The staff is concerned with the discharge of this amount of uranium through a 5,000 ft. low-flow natural drainage combination stream and eventually into the Illinois River since elevated uranium concentration in sediment and soil has been found along the combination stream (see following discussion on soil and sediment). The staff requires that mitigating measures be taken to minimize the further accumulation of uranium along the combination stream. The staff is also concerned with the elevated uranium concentrations in several of the surface runoff areas during rainfall period (see data in Appendix C). Since the surface runoff is intermittent, the quantity of uranium eventually discharged into the Illinois River from past operations is unknown. Therefore, the staff requires that SFC propose an appropriate monitoring program to determine the total quantity of uranium discharged from these surface runoff drainage areas. As required by NRC regulation, SFC shall include in their semi-annual effluent report, the radioactivity from these runoffs in addition to the known points of discharge (i.e., 001). SFC shall also investigate the cause of these elevated uranium concentrations in the runoff and eliminate the sources.

Groundwater monitoring

There are monitoring wells located around pond 2, pond 3, the 160-acre raffinate treatment area, the 270-acre raffinate treatment area and the proposed sludge burial area. Monitoring data for radiological and nonradiological parameters are summarized in Appendix C.

The radiological monitoring data indicates that there is some contamination of groundwater detected from wells near pond 2. The data shown in Appendix C generally shows higher nitrate concentrations in wells near the south and west embankments of pond 2, with slightly higher concentrations for gross-alpha, uranium, and ^{226}Ra, as compared to values at wells further away. The nitrates concentration exceeds the action level in most wells. Because raffinate leakage causes contamination of soil and groundwater beneath and near pond 2, the staff has required that SFC decommission pond 2 and remove all the sludges in pond 2 to a plastic-lined pond for temporary storage (license amendment 28).

Monitoring data from the drain system under the settling basins (old pond 1) and pond 3 occasionally show minor leakage from the past years of operation. Some of the wells around the settling basins and pond 3 also show elevated levels of uranium and nitrate. One well, identified as FTP-2A, has shown elevated concentrations of uranium and nitrate exceeding the action levels in Table 4.4. This well was placed under the fertilizer application. Since this well is close to ponds 3 and 4, the staff will require SFC to investigate and verify that the elevated concentrations of uranium and nitrate are not the results of liquid seepage from pond 3 or pond 4. Also, data from Appendix C shows some

Table 4.8. Results of environmental sampling for radioactivity in surface waters at or near the Sequoyah facility

Location	Station identification[a]	Annual average concentration (pCi/L)				
		U-234	U-235	U-238U	Ra-226	Th-230
Facility effluent[b]	P	435	20.0	435	0.17	0.32
Illinois River (upstream)	K	3.4	0.16	3.4	0.10	
Illinois River (downstream)[c]	L	19.2	0.87	19.2	0.06	
Arkansas River (upstream)	M	4.7	0.21	4.7	0.18	
Arkansas River (downstream)	N	4.3	0.20	4.3	0.12	
Farm pond (east)	O	4.3	0.20	4.3	0.12	
Tenkiller Reservoir raw water supply	Q	3.3	0.15	3.3	0.04	
Salt Fork River	R	4.3	0.20	4.3	0.11	
Carlisle School pond	S	2.9	0.13	2.9	0.10	
Outfall 002[d]	T				0.28	
Outfall 003[d]	U				0.39	

[a]Locations are shown on Fig. 4.1.

[b]Outfall 001.

[c]Located about 100 m downstream of the confluence of the combination stream from the Sequoyah facility outfall with the Illinois River. The total uranium activity is equivalent to about 0.06 mg/L.

[d]Runoff from raffinate disposal areas identified as 160-acre (65-ha) and 270-acre (109-ha) treatment areas.

wells around pond 3 have been dry all the time. These wells were not installed at the depths as described in SFC's letter dated March 3, 1978. The staff will require the licensee to reevaluate the existing groundwater conditions in the area of the treated raffinate storage ponds and prepare and submit within 3 months of the renewal of this license, a report which describes these conditions and either justifies the current monitoring program or proposes a new program for groundwater monitoring.

For the fertilizer application areas, there are 7 wells (FTP series) installed at the 160-acre plot and 3 wells (270-GW series) installed at the 270-acre plot. These plots are used as test plots for the overall fertilizer program. Most of the wells show elevated nitrate, gross-alpha, and uranium concentrations from the past year operation (see Appendix C). By letter dated April 30, 1985, SFC submitted current monitoring well data on their 1984 fertilizer program. The results are shown in Table 4.9. Most of the wells in Table 4.9 show elevated nitrate and gross-alpha exceeding the action levels of 10 ppm for nitrate (N) and 15 pCi/l for gross-alpha. Some of the well data on gross-alpha are inconsistent with the uranium concentrations shown in Table 4.9., i.e. FTP-2A, gross-alpha 218 pCi/l, uranium 0.35 mg/l, gross-alpha 249 pCi/l, uranium 0.004 mg/l, 270 GW3, gross-alpha < 10 pCi/l, and uranium 0.27 mg/l. The staff also finds some data shown in Appendix C are inconsistent in some aspects. Therefore, the

staff requires SFC to follow the quality assurance program as specified in NRC's Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Program (Normal Operation) Effluent Streams and the Environment." By letter dated May 22, 1985, SFC informed NRC that they will phase out the fertilizer application at the 160-acre plot. The staff has reviewed the uranium concentrations in the raffinate used as fertilizer in the past years. The uranium concentrations vary substantially and generally with higher concentrations in earlier years (i.e. about 0.8 mg/l reported in 1975) and lower concentrations in current years (i.e. about 0.033 mg/l reported in 1984). For future fertilizer application, the staff will require that the average uranium concentration in the liquid raffinate be limited to below 0.1 mg/l. This is to further minimize the potential seepage of uranium into groundwater.

Wells around the proposed sludge burial area also show elevated concentrations of nitrate. The impact of nitrate in groundwater is discussed in Section 4.1.2.2.

Table 4.9. 1984 monitoring well data on the 160-acre and 270-acre plots

Location	Analysis	April	June	Aug.	Oct.
FTP-1A	NO_3-N mg/l	<0.1	0.5	1.1	0.8
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	0.023	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	0.12	<0.10	<0.10	<0.10
	Alpha pCi/l	<10	30.0	<10.0	24.0
	Ra-226 pCi/l	NR	0.18	NR	0.30
	U-238 mg/l	NR	0.005	NR	0.018
FTP-2A	NO_3-N mg/l	42.0	32.0	41.0	41.0
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	0.025	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.042	<0.038	<0.038	<0.069
	Se mg/l	0.14	<0.10	<0.10	<0.10
	Alpha pCi/l	218.0	240.0	224.0	157.0
	Ra-226 pCi/l	0.66	0.84	0.023	0.18
	U-238 mg/l	0.35	0.004	0.27	0.18
FTP-3A	NO_3-N mg/l	17	16	21	26
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	<0.017	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	0.043	<0.038	<0.038	<0.069
	Se mg/l	<0.10	<0.10	<0.10	<0.10
	Alpha pCi/l	<10	<10	<10	17.0
	Ra-226 pCi/l	0.39	0.53	NR	0.10
	U-238 mg/l	0.039	0.019	NR	0.001

NR = Not required, gross-alpha less than 15.0 pCi/l.

Table 4.9. (continued)

Location	Analysis	April	June	Aug.	Oct.
FTP-4A	NO_3-N mg/l	0.1	0.2	0.9	0.7
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	<0.017	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	<0.10	<0.10	<0.10	<0.10
	Alpha pCi/l	13.0	21.0	26.0	39.0
	Ra-226 pCi/l	0.13	0.24	0.08	0.03
	U-238 mg/l	0.021	0.020	0.007	0.022
FTP-5	NO_3-N mg/l	4.4	0.8	1.0	3.6
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	<0.017	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	<0.10	<0.10	<0.10	<0.10
	Alpha pCi/l	<10	<10	<10	22
	Ra-226 pCi/l	NR	NR	NR	0.07
	U-238 mg/l	NR	NR	NR	0.016
FTP-6	NO_3-N mg/l	2.0	1.6	1.3	0.4
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	0.019	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	0.039	<0.038	<0.038	<0.069
	Se mg/l	0.11	<0.10	<0.10	<0.10
	Alpha pCi/l	<10	<10	<10	<10
	Ra-226 pCi/l	NR	NR	NR	NR
	U-238 mg/l	NR	NR	NR	NR
FTP-7	NO_3-N mg/l	0.1	0.2	0.2	*0.4
	As mg/l	<0.11	<0.11	<0.11	0.15
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	<0.017	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	0.15	<0.10	<0.10	0.11
	Alpha pCi/l	<10	<10	<10	20
	Ra-226 pCi/l	NR	NR	NR	0.12
	U-238 mg/l	NR	NR	NR	0.017
270 GW1	NO_3-N mg/l	3.0	7.8	6.2	5.6
	As mg/l	<0.11	<0.11	<0.11	0.12
	Cd mg/l	<0.007	0.018	<0.007	<0.007
	Cu mg/l	0.019	<0.017	<0.017	<0.015

NR = Not required, gross-alpha less than 15.0 pCi/l

Table 4.9. (continued)

Location	Analysis	April	June	Aug.	Oct.
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	0.11	<0.10	<0.01	0.11
	Alpha pCi/l	<10	<10	<10	16
	Ra-226 pCi/l	NR	NR	NR	0.39
	U-238 mg/l	NR	NR	NR	0.008
270 GW2	NO_3-N mg/l	4.0	3.0	5.5	2.0
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	0.020	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	<0.038	<0.038	<0.038	<0.069
	Se mg/l	<0.10	<0.010	<0.10	<0.10
	Alpha pCi/l	<10	<10	13	34
	Ra-226 pCi/l	NR	NR	0.10	0.04
	U-238 mg/l	NR	NR	0.014	0.011
270 GW3	NO_3-N mg/l	16.9	8.2	0.4	*0.1
	As mg/l	<0.11	<0.11	<0.11	<0.11
	Cd mg/l	<0.007	<0.007	<0.007	<0.007
	Cu mg/l	0.020	<0.017	<0.017	<0.015
	Mo mg/l	<0.018	<0.018	<0.018	<0.018
	Ni mg/l	0.081	<0.038	<0.038	<0.069
	Se mg/l	<0.10	<0.10	<0.10	<0.10
	Alpha pCi/l	<10	<10	<10	20
	Ra-226 pCi/l	0.29	0.25	NR	0.47
	U-238 mg/l	0.27	0.011	NR	0.013

Table 4.9 - Notes

1. *No analysis result available, following month was reported.

2. FTP-1A showed elevated gross-alpha, however, the nitrate, Ra-226, and U analyses were in line.

   FTP-2A and 3A - This area is and has been excluded from the program for several years due to uranium and nitrate analyses.

   FTP-4A - This area will be excluded from the program although its analyses for Ra-226, N, and U are very low.

   FTP-5, 7; 270 GW1, 2, and 3 will be analyzed prior to the 1985 program. If the gross-alpha exceeds 15 pCi/l, appropriate corrective measures will be taken.

3. NR = Not required - gross-alpha less than 15.0 pCi/l.

Soil and vegetation monitoring

Eight environmental soil and vegetation samples (a-h) are collected semiannually, in April and October. These times represent the beginning and end of the growing season. The samples are collected from locations approximately 300 m (1000 ft) and 1830 m (6000 ft) from the plant in the direction of the cardinal points of the compass (Fig. 4.1). The samples are analyzed for uranium. Results of monitoring for the period 1979-1984 are shown in Appendix C. The background uranium concentration in soil is about 1-1.5 µg/g. Soil samples collected from locations 300 m from the plant show elevated uranium concentrations, in general, about 4-5 times higher than background. Soil samples collected 1830 m away show a very slight increase in uranium concentration. In a few soil samples, high uranium concentrations are reported and no explanation is given by SFC.

For a better quality control of SFC's monitoring program, the staff has required SFC to set an action level on every sampling media (see Table 4.4). If an action level is exceeded, SFC shall conduct an investigation and take mitigating measures if necessary. Except for a few samples, the above uranium concentrations in soil have not exceeded the action level of 35 pCi/g (52 µg/g).

For vegetation samples, the data shows that the uranium concentrations in vegetation exceed the action level of 2.5 µg/g most of the time at the four locations 300 m from the plant. Even up to 1830 m away from the plant, the uranium concentrations are still elevated. However, the uranium concentrations in vegetation from the SFC fertilizer program are generally much lower than the vegetation samples collected at these locations. In license amendment 17, the NRC prohibited the release of forage from SFC's fertilizer program if the forage contains more than 1.0 pCi/g Ra-226: 0.25 pCi/g Th-230 or 2.5 µg/g U measured on a dry basis. According to SFC, the reason for the major difference in both sets of data may be due to the degree of dryness in the analysis or the types of vegetation. To provide a more meaningful interpretation of the data in the future, the staff requires SFC to report the concentrations both in wet and dry basis such that a uniform comparison can be made. The staff also requires that within 3 months of the renewal of this license, SFC shall submit to NRC for review and approval a supplemental vegetation monitoring program to provide additional information for the radiological assessment on the ingestion pathway. The vegetation monitoring program shall include the sampling of food crops in the general area. The vegetation samples collected shall be analyzed for uranium, Ra-226, and Th-230. The licensee shall be able to use this data to assess the radiological impact to any member of the general public exposed from the ingestion pathway. A report of the findings shall be submitted to NRC for review. The program shall be initiated on the next growing season upon approval by NRC.

Sediment monitoring

Bottom sediment samples are taken at semiannual intervals from two locations along the combination stream and from the Illinois River above and below the confluence with the stream. Samples previously were analyzed for uranium and other heavy metals, ^{230}Th, ^{226}Ra, gross-alpha, and gross-beta;[6] however, Amendment 21 requires monitoring of ^{230}Th, ^{226}Ra, and uranium only. Data from 1978-1984 is shown in Appendix C. The results in Appendix C show that in general, the uranium concentrations in sediment along the effluent stream and the Port Read Bridge are elevated to the extent that the staff is concerned the soils along the combination stream banks and down at the Illinois River may be contaminated

to a level exceeding the 35 pCi/g or 52 μg/g. The average quantity of uranium discharged through the low-flow natural drainage combination stream to the Illinois River amounts to about 5,000 kg per year. A small fraction of this uranium, if deposited on the sediment along the low-flow stream, would result in these elevated concentrations of uranium in the sediment. The discharge of this quantity of uranium through a 5000-ft low-flow stream is undesirable. If the stream becomes dry after the plant ceases operation, the sediment or soil remaining at the stream bed will have to be cleaned up. This will unnecessarily increase the solid wastes that need to be disposed of eventually. The staff has requested SFC to provide a better system to transfer the liquid wastes from the plant to the Illinois River. The staff is also concerned with the potential accumulation of uranium in the sediment along the other intermittent runoff areas as discussed in the above section on surface water. The staff requires SFC to conduct a comprehensive radiological survey to determine the extent of uranium accumulation along the length of the effluent stream (001), at the confluence, along upstream and downstream of the Illinois River, and along the above intermittent runoff areas. The results of this survey and any recommendations for mitigation shall be reported to NRC.

4.1.2.2 Nonradiological

Air monitoring

The sampling locations (A-I) identified in Table 4.2 and shown in Fig. 4.1 for radioactive particulates are also monitored weekly for the presence of fluorides. The results of this monitoring for the years 1979-1984 indicate that the monthly average fluoride concentration in air at the fencelines (locations A-D in Fig. 4.1) occasionally exceed the action level of 5 $\mu g/m^3$ (Table 4.4). This action level is also set for weekly samples. If the weekly sample constantly exceeds the action level, SFC should consider upgrading their air effluent control system.

Surface water monitoring

Nonradiological monitoring of surface water is conducted at the sampling sites identified in Table 4.8 (see Sect. 4.1.1 for monitoring of the facility effluent). All of the surface water sites are monitored for fluorides and nitrates. The monitoring schedule is the same as for radiological pollutants (Table 4.2). Generally, the concentration of fluorides and nitrates in the surface water samples during the years 1980-1984 were less than 0.5 mg/L, which is below the applicant's action level (Table 4.4). In a few cases, the nitrate levels in the farm pond east of the plant (location O) and in the Salt Fork River (location R) were elevated (ranging from 3.5 to 40 mg/L), possibly due to runoff from the site areas fertilized with treated raffinate containing dissolved nitrates (discussed below and in Sects. 2.2.2.2 and 4.2.2). These elevated nitrate concentrations are of short duration following the application of the raffinate.

License amendment 26 specifies that samples from the two runoff retention ponds (locations T and U on Fig. 4.1) and three farm ponds (locations P1, P2, and P3 on Fig. 4.1) are to be obtained during the raffinate fertilization season and analyzed for those elements in the treated raffinate that exceed the Livestock Enterprise Water Standards[7]. From the treated raffinate composite analyses given in Table 2.3, these surface water samples will be analyzed for

copper, molybdenum, and selenium. Analysis of these surface waters during the 1982 fertilization season[5] indicated that the concentration of copper and molybdenum (less than 1 mg/L) were significantly less than the standards. Selenium was not included in the analysis.

The applicant also monitors the discharge from two runoff retention ponds (outfalls 002 and 003) in the onsite raffinate treatment areas (locations T and U) for pH and nitrate concentrations in conformance with the NPDES permit (Appendix B). Flow occurs only intermittently, generally following heavy rainfall. The pH has remained within the requirements of the permit. Nitrate concentrations have been acceptable in discharges from outfall 002 but slightly above the specified average concentration of 10 mg/L for outfall 003 (ref. 3). Compliance with the NPDES permit conditions should minimize impacts to water use as the result of runoff from the raffinate application areas. If the chemical concentrations in the ponds exceed discharge limitations (Appendix B), the applicant can reapply the water to the adjacent treatment area.

The applicant also monitored surface runoff from the industrial area during periods of rainfall during 1982 and 1983 in response to requests by the Oklahoma Water Resources Board. These measurements showed that nitrate concentrations exceed the applicant's action level (10 mg/L) in the surface runoff north and west of the solvent extraction (Sx) building and west of raffinate pond 2 (Fig. 2.1).

Groundwater monitoring

All groundwater monitoring wells are tested for nitrate, and fluoride is measured in many. Although no fluoride transport problems are evident, gross quantities of nitrate have been transported from the south end of pond 2. Groundwater concentrations of nitrates up to 4300 mg/L have been observed in wells within 60 m (200 ft) of pond 2, but these concentrations fall to less than 10% of this value in wells M-9 and M-10, which are about 230 m (750 ft) from pond 2 and near the combination stream channel. Some lesser transport has occurred west of pond 2. There is no evidence of groundwater transport of nitrate to the north or east. Because of the much larger distances involved and the direction of groundwater movement, this transport of nitrate poses no threat to offsite groundwater users. Eventually, the groundwater could seep to the surface and drain into the combination stream, and some nitrate could reach the Illinois River. However, this release would be expected to be very small and would not affect the water quality of the river.

Because the area is not suitable for productive wells, the staff considers that the only consequence of this groundwater nitrate contamination is to provide evidence that radionuclide transport may later be observed. The potential seepage of radionuclides to the subsurface soil in pond 2 is of the greatest concern since this will unnecessarily increase the volume of low-level waste that needs to be disposed of eventually. The staff has required SFC to decommission pond 2 and to remove all the sludge to a lined-pond for temporary storage. This will minimize the potential environmental impact during the interim period.

Soil and vegetation monitoring

To detect possible effects on livestock, cropland, and humans of fluoride emissions and the application of treated raffinate (Sect. 2.2.2.2), the NRC

has required that vegetation and soils be sampled for fluorides and heavy metals. In addition, the applicant monitors the amount of nitrogen and trace metals applied to the land in the raffinate treatment program. Total annual application of nitrogen is not to exceed 785 kg/ha (700 lb/acre) (license amendment 17).

Soils, vegetation, and the treated raffinate are sampled for the metals and specified isotopes (Table 4.10) according to the conditions and directions specified in Amendment 26 to NRC License SUB-1010 (Feb. 16, 1984). The concentration of metals in the raffinate and the amount of raffinate applied to the land are monitored to assure that the application of metals does not exceed recommended standards of the National Academy of Sciences[7] (see Sect. 4.2.2). Concentrations of metals in vegetation or forage are monitored immediately before and after harvest to ensure that the metal content of animal forage does not exceed the maximum tolerable dietary level. (See Sect. 4.2.2 where results of these monitoring programs are discussed.)

Fluoride concentrations are determined in soil and vegetation samples collected in April and October at 300 m (1000 ft) and 1800 m (6000 ft) from the plant in each of the four cardinal compass directions. Results of vegetation and soil monitoring are discussed in Sect. 4.2.2.

Ecological monitoring

During late 1978 through 1979, benthic macroinvertebrates were sampled extensively upstream and downstream of the site and in the vicinity of the effluent discharge to the Illinois River. Semiannual samples were subsequently taken during 1980 and 1981 at the same sites.[9] Although the number of species and individuals collected on a sampling data was variable,[9] the benthic macroinvertebrate fauna at all three sampling sites was similar when compared on a yearly basis. Sampling of benthic macroinvertebrates was discontinued after 1981 as the result of the above findings and is not required by the NRC (license amendment 21). No other monitoring of aquatic biota presently occurs because the plant effluents are considered too small to have a significant impact on the biota.

There is no routine monitoring of the species composition or population of terrestrial biota. Because facility operation and the application of raffinate on the forage land are expected to have only minor impact on terrestrial plants or animals (Sect. 4.2), monitoring of these wildlife habitats or animal populations is not necessary.

4.1.3 Mitigating Measures

The effluent and environmental monitoring program discussed above were designed to measure the impacts of emissions and effluents during normal plant operation or following an accident situation. The staff will require that the current monitoring program be continued during the next licensing period. In addition, the following requirements, as discussed in the previous sections, shall be added as license conditions for this license renewal action:

1. The licensee shall sample the main stack continuously and analyze for gross-alpha on a daily or weekly basis.

Table 4.10. Required sampling for metals in treated raffinate, soil, and vegetation

Element	Soil[a]	Vegetation[b,c]	Treated raffinate[d]
Arsenic	X	X	X
Barium			X
Boron	X	X	X
Cadmium			X
Chromium			X
Cobalt	X	X	X
Copper	X	X	X
Iron	X	X	X
Lead	X	X	X
Mercury	X	X	X
Magnesium			X
Manganese	X	X	X
Molybdenum	X	X	X
Nickel	X	X	X
Selenium			X
Uranium	X	X	X
Vanadium	X	X	X
Zinc	X	X	X
Th-230	X	X	X
Ra-226	X	X	X

[a]Soil samples representative of the major soil types in each fertilized area shall be collected and individually analyzed at least every other year for the elements indicated. Samples shall be collected after the final raffinate addition in the year sampled. Baseline soil samples shall be analyzed every other year prior to the use of raffinate fertilizer.

[b]Vegetation samples shall be collected from the 65-ha (160-acre) site and analyzed for the listed elements either just prior to or immediately after harvest. Vegetation analyses from the 65-ha treated area shall serve as an indicator of element concentrations at other raffinate-treated areas unless the raffinate application is greater (higher concentration of elements) or different crops are grown, in which case monitoring will also be required at the additional sites. The licensee shall develop and use a statistically sound sampling program to ensure that the results obtained are representative of the vegetation harvested.

[c]Samples of vegetation like that grown using treated raffinate but grown in areas not fertilized with treated raffinate shall be obtained and analyzed every other year for the elements and isotopes listed to provide baseline information.

[d]A representative composite sample of treated raffinate shall be collected during the application season and analyzed for the elements indicated once each year.

Source: Amendment 26 to NRC Materials License SUB-1010, Docket 40-8027, Oct. 7, 1977.

2. The average uranium concentration in the raffinate used in the fertilizer program shall not exceed 0.1 mg/l.

3. Within 3 months of the renewal of this license, the licensee shall reevaluate the existing groundwater conditions in the area of the treated raffinate storage ponds and prepare and submit for NRC review a report which describes these conditions and either justifies the current monitoring program or proposes a new program for groundwater monitoring.

4. Within 3 months of the renewal of this license, SFC shall submit to NRC for review and approval a supplemental vegetation monitoring program to provide additional information for the radiological assessment on the ingestion pathway. The vegetation monitoring program shall include the sampling of food crops in the general area. The vegetation samples collected shall be analyzed for uranium, Ra-226, and Th-230. The licensee shall be able to use this data to assess the radiological impact to any member of the general public exposed from the ingestion pathway. A report of the findings shall be submitted to NRC for review. The program shall be initiated on the next growing season upon approval by NRC (Section 4.1.2.1). The licensee shall report the concentrations of radionuclides in vegetation on a dry basis and supply the percentage of moisture.

5. The licensee shall investigate and verify that the elevated uranium and nitrate concentrations found in well FTP-2A are not the results of liquid seepage from pond 3 or pond 4. A report of the investigation shall be submitted to NRC within 6 months from the date of the license renewal.

6. The licensee shall propose an appropriate surface water monitoring program to determine the total quantity of uranium discharged to the environs from the runoff drainage ditches which are not included in the NPDES permit. The proposed program shall be submitted to NRC for review and approval within 3 months from the date of the license renewal. (Sect 4.1.2.1). The licensee shall investigate the cause of some of the elevated uranium concentrations in the above runoffs. A report shall be submitted to NRC within 3 months from the date of the license renewal. The report shall describe what mitigating measures, if any, were taken to eliminate the source(s).

7. The licensee shall conduct a comprehensive soil/sediment radiological survey to determine the extent of urnaium accumulation along the length of the effluent stream (001), at the confluence, along upstream and downstream of the Illinois River, and along the intermittent runoff areas identified in Condition 6. The results of this survey and any recommendations for mitigation shall be reported to NRC within 12 months from the date of the license renewal.

8. The licensee shall follow the quality assurance program as specified in NRC's Regulatory guide 4.15, "Quality Assurance for Radiological Monitoring Program (Normal Operation) Effluent Streams and Environment."

9. If the radioactivity in plant gaseous effluents exceeds 30,000 μCi per calendar quarter, the licensee shall, within 30 days, prepare and submit to the Commission a report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce release rates. If the parameters important to a dose assessment change,

a report shall be submitted with 30 days which describes the changes in parameters and includes an estimate of the resultant change in dose commitment.

10. The licensee shall conduct a dose assessment on a quarterly basis using site specific information and methodology in Appendix A of the Environmental Assessment. If the quarterly dose commitment to a maximally-exposed individual in the general public exceeds 6.25 mrem for any organs, a report shall be submitted to the Commission within 30 days of the determination of the quarterly dose. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10. If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exeeding the limits specified in 40 CFR 190.10.

4.2 Direct Effects and Their Significance

4.2.1 Air Quality

Fluorides

Atmospheric emissions of fluoride from the SFC plant result in elevated levels of fluoride in air, soils, and vegetation in the vicinity of the plant. From 1980-1984, annual fluoride concentrations in air generally exceed 1.5 $\mu g/m^3$ at four locations along the security fence surrounding the plant facilities and 0.5 $\mu g/m^3$ at four locations 0.8 to 1.7 km (0.5 to 1.1 miles) from the plant (Appendix C). As indicated in Fig. 4.4, these fluoride concentrations may produce signs of fluoride injury (e.g., browning of leaf margins) in relatively sensitive species of plants such as corn and sorghum.[12,13] At these levels, however, greatly reduced productivity or death of plants is unlikely. Currently, the State of Oklahoma does not have ambient air quality standards for fluoride (see Table 3.1).

Annual fluoride concentrations in vegetation from 1980 through 1984 exceeds 40 ppm at four sites about 300 m (1000 ft) from the plant and below 40 ppm at three sites about 1800 m (6000 ft) from the plant (Appendix C). The fluoride concentrations at 300 m are approaching or above tolerance levels for cattle and other livestock[14] (Table 4.11), while the concentrations at 1800 m are about half of the lowest tolerance levels. The low fluoride levels at 1800 m indicate that noticeable effects on cattle would not be expected unless the fluoride levels in their drinking water approached the tolerance levels for water (Table 4.11). As indicated in Sect. 4.1.2.2, fluoride concentrations in surface waters at the site are less than 0.5 mg/L, indicating that fluoride intake by cattle from both forage and water should not result in noticeable symptoms of fluorosis.

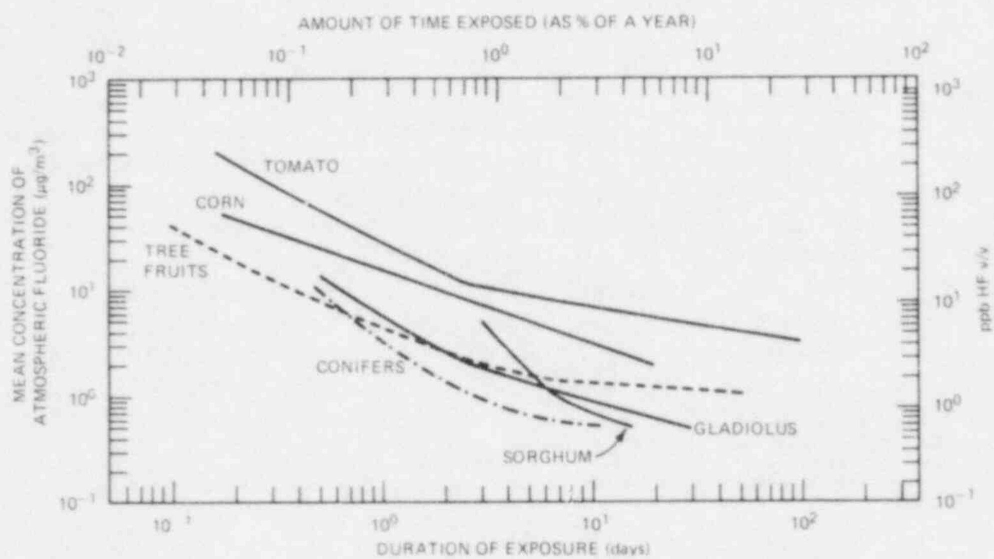

Fig. 4.4 Atmospheric fluoride concentration and exposure time relationship (air quality criteria) for observation of significant effects of fluoride on different plant species. Source: D. C. McCune. "Fluoride Criteria for Vegetation Reflect the Diversity of Plant Kingdom," Environ. Sci. Technol. 3:720 ff (1969)./fB

Plants generally do not accumulate significant quantities of fluoride from soils.[12] However, liming of acid soils can be used to minimize fluoride content of crops when necessary.

Nitrogen oxides

As discussed in Sect. 2.2.2.1, the nitrogen oxide emissions have been measured between 1 and 10 kg per day depending on the UF_6 production rate. There is no requirement for offsite ambient monitoring of NO_x from the State. Using the maximum release rate of 10 kg/day and the annual average x/Q value in Appendix A, the staff estimates that the annual average concentration of NO_x at the nearest residence to be about 0.2 μg/m³ which is well below the standard of 100 μg/m³. Correspondence from the State dated June 10, 1985, indicates SFC is in full compliance with all applicable state and federal regulations.

4.2.2 Land Use

General

Land uses on the SFC site, which are described in Sect. 3.4.1, are expected to continue as they are without any significant changes, as no significant land use

Table 4.11. Fluoride tolerance levels in feed and water for domestic animals based on clinical signs and lesions[a]

Species	Feed[b] (ppm)	Water[c] (mg/L)
Cattle		
Dairy and beef heifers	30	2.5-4.0
Dairy, mature	40	3-6
Beef, mature	50	4-8
Finishing	100	12-15
Sheep, breeding	60	5-8
Lambs, feeder	150	12-15
Horses	60	4-8
Swine, growing	70	5-8
Turkeys, growing	100	10-12
Chickens, growing	150	10-13
Dogs, growing	50	3-8

[a]Values should be reduced proportionally when both water and feed contain appreciable amounts of fluorides.

[b]A suggested guide when fluoride in the feed is essentially the sole source of fluoride, tolerances are based on sodium fluoride or other fluorides of similar toxicity.

[c]The average ambient air temperatures and the physical and biological activity of the animals influence the amount of water consumed and hence the wide range of tolerance levels suggested. For active animals in a warm climate, the lower values should be used as critical-level indicators.

Source: U.S. Environmental Protection Agency, Reviews of the Environmental Effects of Pollutants: IX. Fluoride, EPA-600/1-78-050, Cincinnati, Ohio, 1980.

changes on the site are requested by the applicant as part of this license renewal application.

Raffinate application

Potential impacts of raffinate application on soil quality include elevated levels of nitrogen and trace elements that could be detrimental to plant and animal life. The potential for adverse impacts on soil quality exists on SFC property at the Sequoyah site and at Rabbit Hill but not on other privately-owned or publicly-owned lands in the vicinity. However, annual monitoring and controlled application of raffinate by limiting both the annual nitrogen use (Sect. 4.1.2.2) and trace element accumulation (described below) should prevent the occurrence of serious impacts on soil quality. Moreover, possible impacts on soil quality resulting from excessive addition of nitrogen and trace elements are expected to be reversible through a combination of the following: (1) delay of further raffinate applications, (2) adjustments in soil pH by the application of lime, and (3) removal and destruction of plant crops.

Table 4.12. Comparison of trace elements in raffinate applications with recommended limits for irrigation water applied continuously (more than 20 years)

Trace element	Concentration in 1982 raffinate[a] (mg/L)	Total application in 1982[b] (g/acre)	Recommended maximum concentration in irrigation water for continuous use[c] (mg/L)	Recommended maximum annual application in irrigation water[d] (g/acre)
Aluminum			5.0	18,500
Arsenic	0.10	1.1	0.10	370
Beryllium			0.10	370
Boron	0.09	1.0	0.75	2,775
Cadmium	0.15	1.7	0.010	37
Chromium	0.01	0.1	0.10	370
Cobalt	0.22	2.4	0.050	185
Copper	5.35	59	0.20	740
Fluoride				3,700
Iron	0.08	0.9	5.0	18,500
Lead	0.04	0.4	5.0	18,500
Lithium				9,250
Manganese	8.2	91	0.20	740
Molybdenum	17.8	197	0.010	37
Nickel	8.45	94	0.20	740
Selenium	0.25	2.8	0.020	74
Vanadium	0.03	0.3	1.10	370
Zinc	1.95	22	2.0	7,400

[a]Average concentration of trace elements in raffinate applied at Sequoyah site and Rabbit Hill. Source: W.J. Shelley, Kerr-McGee Nuclear Corporation, letter with enclosure, 1982 Completion Report (Related to Treated Raffinate Disposal), to R.G. Page, U.S. Nuclear Regulatory Commission Docket 40-8027, Apr. 26, 1983.

[b]Calculated total trace elements assuming a liquid volume application that provides 785 kg/ha (700 lb/acre) of nitrogen when raffinate has a nitrogen concentration of 28.7 g/L (the average for 1982 raffinate).

[c]National Academy of Sciences-recommended maximum concentration of trace elements in irrigation water based on an assumed annual application of 3 acre-ft of irrigation water per acre of land.

[d]Total annual trace element applied per acre with 3 acre-ft of irrigation water having the recommended maximum trace element concentration.

The total amount of metals as trace elements applied in 1982 per acre from treated raffinate is shown in Table 4.12. This amount can also be compared in Table 4.12 to the recommended maximum annual trace elements using 3 acre-ft of irrigation water per year which is based on the National Academy of Sciences' (NAS) recommendations for trace element concentrations in irrigation water that is used continuously (i.e., more than 20 years).[7] These NAS recommendations are designed to prevent a long-term buildup of metals in soils to concentrations that would be detrimental to plant and animal life. The recommended maximum annual application of trace elements from irrigation water was specified as the permitted application rate in license amendment 17. Short-term exposures to relatively high concentrations of metals in soils (e.g., concentrations that might occur for a short period of time immediately after an application of raffinate) are usually of little consequence in contrast to buildups and exposures over the long term.

Except for molybdenum, the application of metals on the applicant's property in 1982 was far below the recommended maximum annual application (Table 4.12), indicating that long-term buildup should not be a significant problem. However, the 1982 application of molybdenum was far above the recommended maximum. Following a request from the applicant, the NRC issued license amendment 18 to exempt the first 3 X 10^6 gal of treated raffinate used as fertilizer from the requirements of amendment 17, thus permitting molybdenum applications to the soil to exceed the recommended application levels.

Subsequently, the staff calculated the maximum trace element concentrations in irrigation water and cumulative loading in soils from NAS recommendations for use of irrigation water over an intermediate period of 20 years.[7] If the cumulative loadings do not exceed those specified in license amendment 20 (Table 4.13), no significant long-term impacts should occur during the 20-year period as a result of raffinate application. Note that the annual raffinate application of molybdenum (197 g/acre) for a nitrogen application of 785 kg/ha is currently only slightly above the NAS-recommended annual maximum of 185 g/acre over a 20-year period (Table 4.11) and should therefore, have no significant impact over the short term.

The first 3 x 10^6 gal that are exempted from the requirement of amendment 17 constitute a small portion of the treated raffinate currently in storage on the Kerr-McGee site. The applicant is pursuing methods to reduce the molybdenum content of the current inventory of treated raffinate and to increase the molybdenum removal efficiency of the raffinate treatment system.

Annual average concentrations of metals in harvested lots of vegetation (forage) were below recommended maximum dietary levels for domestic animals[11] (Table 4.14). Ten of the 31 harvested lots of forage from the Sequoyah site, however, contained higher concentrations of molybdenum than recommended. These lots were not released for sale. Continued use of raffinate-treated vegetation for forage should have no significant impact on cattle or humans provided that the current monitoring program is continued and forage having high-trace element concentrations is not released for sale.

Table 4.13. Twenty-year cumulative loadings of trace elements permitted by condition 3b of license amendment 20

Trace element	Recommended maximum concentrations in irrigation water for 20 years use[a] (mg/L)	Calculated maximum annual application of trace elements from irrigation water (g/acre)	Maximum cumulative loading permitted over 20 years[b]	
			lb/acre	kg/ha
Aluminum	20	74,000	3,260	3,657
Arsenic	2.0	7,400	326	365
Beryllium	0.5	1,850	82	92
Boron	2.0	7,400	326	365
Cadmium	0.05	185	8.2	9.2
Chromium	1.0	3,700	163	183
Cobalt	5.0	18,500	814	912
Copper	5.0	18,500	814	912
Fluoride	15.0	55,500	2,445	2,743
Iron	20.0	74,500	3,260	3,657
Lead	10.0	37,000	1,630	1,829
Lithium	2.5	9,250	407	456
Manganese	10.0	37,000	1,630	1,829
Molybdenum	0.05	185	8.2	9.2
Nickel	2.0	7,400	326	365
Selenium	0.02	74	3.3	3.7
Tin				
Titanium				
Tungsten				
Vanadium	1.0	3,700	163	183
Zinc	10.0	37,000	1,630	1,829

[a]National Academy of Sciences' recommendations for up to 20 years of irrigation based on the application of 3 acre-ft of irrigation water per acre per year.

[b]These loadings, calculated by the NRC staff, are direct extrapolations from the National Academy of Sciences' recommendations for up to 20 years of irrigation.

Table 4.14. Concentration (ppm) of metals in forage from raffinate-treated areas compared with recommended limits

Trace element	Year			Sequoyah	Rabbit Hill	Rabbit Hill pretreatment baseline	Rabbit Hill 1982 control[b]	Maximum tolerable dietary level[c]
	1977	1978	1979					
Arsenic				0.88 (0.2-4.0)				50
Boron	3.3	6.2	5.8	13 (0.5-35)	18	20	5	150
Cobalt				0.27 (0.03-0.5)	10			
Copper	7 9	8.8	6.5	6.1 (2.8-16)	8.1	7.1	2.1	100
Iron	252	578	88	85 (6.5-180)	110	121	95	1000
Manganese	246	360	95	174 (46-425)	137	128	46	1000
Molybdenum	3.3	0.19	5.9	7.2 (0.33-31)	3.2	1.1	0.55	10
Nickel	25	4.6	3.7	2.5 (0.4-20)	1.6	1.9	0.7	50
Lead	4.2		1.5	0.61 (0.04-2.0)	0.15	0.30	0.10	30
Uranium	0.35	0.27	0.7	0.24 (0.02-1.0)	0.13	0.34	0.2	
Zinc	36	37	20	24	30	36	18	500

[a]Range of metal concentrations for the 31 harvested lots are given in parentheses to illustrate the large variation characteristic of the metal data in this table.

[b]The control area was treated with commercial fertilizer rather than raffinate.

[c]National Academy of Sciences, Mineral Tolerance of Domestic Animals, Washington, D.C., 1980.

Source: U.S. Nuclear Regulatory Commission, Environmental Impact Appraisal of the Proposed Amendments for the Use of Raffinate Related to Source Material License (SUB-1010) for Kerr-McGee Nuclear Corporation.

Uranium Hexafluoride Facility, Sequoyah, Oklahoma, Docket No. 40-8027, March 1982; W. J. Shelley, Kerr-McGee Nuclear Corporation, letter with enclosure, 1982 Completion Report (Related to Treated Raffinate Disposal), to R. G. Page, U.S. Nuclear Regulatory Commission, Docket 40-8027, Apr. 26, 1983.

4.2.3 Water Use

4.2.3.1 Surface water

Based on the surface water and sediment monitoring information provided for nonradiological parameters, no significant impacts of plant operation on the surface water environment has been observed. Continued monitoring and compliance with applicable NPDES permits (Appendix B) should ensure minimal impacts from discharge of contaminated water to the Illinois River.

4.2.3.2 Groundwater

As indicated in Sect. 3, there is no use of groundwater at the plant site. The monitoring program has not detected any serious contamination of groundwater resources beyond a small zone near pond 2, which is far removed from nearby potential residential users of the groundwater.

Although the SFC facility is not expected to have any impact on use of groundwater, the staff will require that the current monitoring program be continued.

4.2.4 Ecological

4.2.4.1 Terrestrial ecology

Because no major expansion of the existing SFC facilities is proposed, there will be no loss of terrestrial habitat or reductions in wildlife populations because of construction-related activities or conversion of wildlife habitat to industrial uses. Continued operation of the facility has little potential to adversely affect terrestrial biota beyond the previously experienced impacts from construction. Certain species of plants that are sensitive to fluoride might experience slightly reduced productivity and might become less abundant in the area near the industrial area, and certain species of herbivorous animals might experience minor levels of fluorosis. Such effects, however, would be unlikely to occur in areas further from the industrial area or on property off the site (see Sect. 4.2.2 for a more detailed discussion of fluoride effects and tolerance levels of biota).

Effects of the application of raffinate to forested lands and lands used as pasture or for growing hay or seed crops was evaluated in a previous licensing action (Sect. 4.2.2). Although the raffinate application has the potential to adversely affect biota due to elevated levels of nitrogen and trace elements, proper application and the required monitoring of trace elements (Sect. 4.1) should prevent the occurrence of significant impacts on plant and animal populations (Sect. 4.2.2).

Several species on the federal list of rare and endangered species (50 CFR Parts 17.11 and 17.12, 1983) may occur in the Sequoyah County area, including the gray bat, Indiana bat, Ozark big-eared bat, bald eagle, and peregrine falcon. There is apparently no habitat in the immediate vicinity of the site that is important to any of these species, and none of the species other than the bald eagle is known to occur regularly in the area (Sect. 3.7.3). Therefore, continued operation of the SFC facility should result in no impacts to these species. The bald eagle, which began nesting in the area in 1975 for the first time in recent years, has several active nests along the Robert S. Kerr Reservoir from 5 to 32 river kilometers (3 to 20 river miles)

downstream from the site (Charles Scott, U.S. Fish and Wildlife Service, Tulsa, Okla., personal communication to R. Kroodsma, ORNL, Oak Ridge, Tenn., Nov. 9, 1983). Operations at the SFC facility, including noise and liquid and gaseous effluents, should have no impact on any eagles nesting in the area.

4.2.4.2 Aquatic

Because releases of chemicals, such as fluoride and nitrate, from the Sequoyah site are within NPDES limitations (Sect. 4.1.1), there should be minimal effects on aquatic biota from operation of the plant. Dilution of the effluent from the plant and from the raffinate application areas by the Illinois River should further minimize any impacts on aquatic biota from operation of the Sequoyah facility. Any accidental chemical releases of the plant effluent may have a short-term negative impact on the benthic biota of the river in the vicinity of the outfall. However, this impact is not considered significant because of the ability of benthic populations to recolonize after short-term perturbations. The radiological discharges in the plant effluent (outfall 001) are not expected to impact the aquatic biota in the Illinois or Arkansas Rivers.

4.2.5 Radiological Impacts

The radiological impacts of the SFC plant were assessed by calculating the maximum dose to the individual living at the nearest residence and to the local population living within an 80-km (50-mile) radius of the plant site.

Except where specified, the term "dose" as referred to in this report is actually a 50-year dose commitment for all internal exposures, that is, the total dose to the reference organ that will accrue from one year of intake of radionuclides during the remaining lifetime (50 years) of the individual. It is assumed that the individual spends 80% of his time at the reference location and that 10% of the food consumed is produced at the site. The dose reflects the annual release of radionuclides from the combined effluents. Where possible, site-specific data are used for estimating dose.

4.2.5.1 Doses from airborne releases

Emissions from building exhaust stacks are monitored continuously, and the average semiannual release rates for natural uranium and gross-alpha over the period 1980 through 1984 are shown in Table 2.2. These release rates, converted to ^{226}Ra, ^{230}Th, ^{234}U, ^{235}U, and ^{238}U, are used to estimate the dose to the population within an 80-km (50-mile) radius of the plant site.

The nearest residence is about 730 m (2400 ft) NNE of the release stacks. At this point, a continuous air sampler monitors the radioactivity of the air. As discussed in Sect. 4.1.2.1, the activity median aerodynamic diameter (AMAD) or particle size of the aerosol distribution is determined (Table 4.6) and simulated lung fluid solubility tests are run to determine the respiratory clearance class[15] (Table 4.7). This determination is based on the lung model for inhaled particles proposed by the task group of the International Commission on Radiological Protection.[16,17] The "site-specific" average concentrations of radionuclides for the measured radioactivity at the nearest residence, as shown in Table 4.15, are used to determine the dose to the maximum exposed individual. The population dose is determined using the average radionuclide releases shown in Table 4.16.

Table 4.15. Average air concentrations of radionuclides at the nearest residence[a] resulting from stack effluent releases of the Sequoyah facility

Radionuclides	μCi/ml		
	Class D	Class W	Class Y
^{226}Ra		1.0×10^{-18}	
^{230}Th		2.0×10^{-18}	1.0×10^{-18}
^{234}U	2.8×10^{-15}	2.0×10^{-16}	1.3×10^{-15}
^{235}U	1.3×10^{-16}	9.0×10^{-18}	7.0×10^{-17}
^{238}U	2.8×10^{-15}	2.0×10^{-16}	1.3×10^{-15}

[a]Nearest residence is approximately 730 m NNE of the plant stack.

Source: Values are based on radioactivity measurements for 1980-1984. Solubility classes for uranium at the nearest residence were determined by the applicant. Radium and thorium concentrations were estimated by the staff on the basis of experience.

Table 4.16. Annual average release of radionuclides in the stack effluents of the Sequoyah facility[a]

Radionuclides	Release rates (Ci/year)		
	Class D	Class W	Class Y
^{226}Ra		1.4×10^{-5}	
^{230}Th		2.9×10^{-5}	1.4×10^{-5}
^{234}U	2.6×10^{-2}	2.0×10^{-3}	1.1×10^{-2}
^{235}U	1.3×10^{-3}	9.0×10^{-5}	5.0×10^{-4}
^{238}U	2.6×10^{-2}	2.0×10^{-3}	1.1×10^{-2}

[a]Values are based on the annual releases of natural uranium from 1980-1984. Solubility classes for uranium were determined by the applicant at the nearest residence. Radium and thorium releases were estimated by the staff.

Doses were estimated using the AIRDOS-EPA computer code.[18] The methodology (Appendix A) is designed to estimate (1) the rates of deposition on ground surfaces, (2) ground surface concentrations, (3) intake rates via inhalation of air and ingestion of meat, milk, and vegetables, and (4) radiation doses to man from the airborne releases of radionuclides. The highest estimated doses to the maximally-exposed individual and to the population living within an 80-km (50-mile) radius of the site are calculated with the code.

Meteorological dispersion factors, χ/Q, were estimated using the Gaussian plume model and diffusion coefficients for Pasquill-type turbulence.[19,20] The χ/Q values are summarized in Appendix A. Since the actual air concentration of radionuclides are obtained by measurement at the site of the maximally-exposed individual, the meteorological dispersion and dilution values are used only to determine the concentration of airborne radionuclides to which the local population is exposed.

Radionuclide concentrations in meat, milk, and vegetables consumed by man are estimated by coupling the output of the atmospheric transport models with NRC Regulatory Guide 1.109.[21] Since onsite measurements are not made, the average windspeed data for each directional segment and for each stability class are based on the nearest weather station data collected from 1955-1974 at Fort Smith, Arkansas (64 km SE of the site). Other parameters used in the dose calculations are given in Appendix A.

Dose to the maximally-exposed individual

The 50-year dose commitments to the maximally-exposed individual living at the nearest residence (730 m NNE of the plant site) from the UF_6 conversion plant from airborne radioactive effluents with an average particle size of 0.3 μm are shown in Table 4.17. The total-body dose of 0.9 millirem resulted primarily from the inhalation (93%) and ingestion (7%) pathways. Most of the total-body dose was due to the ^{234}U (53%) and ^{238}U (46%) released (see Table 4.18). The highest organ dose of 15 millirem was to the lungs and resulted primarily from the ^{234}U (53%) and ^{238}U (47%) almost entirely via the inhalation pathway. The dose to the bone of about 6 millirem was due for the most part from the inhalation of ^{234}U (41%) and ^{238}U (57%).

The doses are compared to EPA standards for the uranium fuel cycle facilities (40 CFR Part 190), the total-body dose is only about 4% of the limit of 25 millirem/year. The dose to the bone of 6 millirem is about 25% of the standard. The highest organ dose of 15 millirem to the lungs is about 60% of the applicable EPA standard of 25 millirem/year. The individual doses calculated are based on the exposure of an adult. If child is exposed at the nearest residence, the staff estimates that the lung dose could be increased by a factor of about 1.8. The estimate is based on the different lung mass and inhalation rate of a child and an adult. The staff has required that the licensee inform NRC if significant parameters used for dose calculations have changed and may affect compliance of the EPA standards (license amendment 9). The dose calculated is the average dose for the past 5 years (1980-1984). The variation from each year ranges from 1.56 to 0.56 times of the average, based on the concentrations measured each year.

In license amendment 9, the staff has set a limit on the overall emission rate of 45,000 μCi per calendar quarter for corrective actions and reporting requirements. This limit was derived from the dose calculation based on available meteorological information from Fort Smith, Arkansas (about 40 miles from the plant), and estimation of solubility classification and particle sizes not based on measurements. Since site-specific data are available at present, the staff revises the conditions as follows to ensure compliance of the EPA's environmental radiation standards for the continued operation:

1. If the radioactivity in plant gaseous effluents exceeds 30,000 μCi per calendar quarter, the licensee shall, within 30 days, prepare and submit to the Commission a report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce release rates. If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describes the changes in parameters and includes an estimate of the resultant change in dose commitment.

2. The licensee shall conduct a dose assessment on a quarterly basis using site-specific information and methodology in Appendix A of the Environmental Assessment. If the quarterly dose commitment to a maximally-exposed individual in the general public exceeds 6.25 mrem for any organ, a report shall be submitted to the Commission within 30 days. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10. If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

The dose from the ingestion of vegetables shown in Table 4.17 is based on the air releases of uranium particulates and its deposition on soil and uptake by vegetables. Site-specific data on edible food crops is not available. However, the staff is concerned with the high-uranium concentrations in vegetation within about 300 m from the plant site. This could reflect a similar situation in the food crops grown in the general areas. Therefore, the staff recommends SFC to conduct a comprehensive monitoring program on vegetation as described in Sect. 4.1.3.

Table 4.17. Fifty-year dose commitments[a] to the maximally-exposed individual from the airborne effluents of the Sequoyah facility

Pathway	Dose (millirem)			
	Total body	Bone	Lungs	Kidney
Immersion in air	8.8×10^{-8}	1.2×10^{-7}	8.0×10^{-8}	7.8×10^{-8}
Exposure to surface	3.3×10^{-3}	4.1×10^{-3}	2.8×10^{-3}	2.6×10^{-3}
Inhalation[b]	8.2×10^{-1}	5.2	1.5×10^{1}	8.5×10^{-1}
Ingestion[c]	5.7×10^{-2}	7.8×10^{-1}	1.7×10^{-3}	1.6×10^{-1}
Total	8.8×10^{-1}	6.0	1.5×10^{1}	1.0

[a]Fifty-year dose commitment from the intake of radionuclides resulting from one year of plant operation for 0.3 μm particle size.

[b]Based on an inhalation rate of 8000 m^3/year and 80% occupancy.

[c]Based on a maximum intake rate for adults of 280 kg/year of vegetables, 310 L/year of milk, and 110 kg/year of meat (NRC Regulatory Guide 1.109). It is assumed that only 10% of the food intake is actually produced at the nearest residence.

Table 4.18. Major contribution (in percent) to dose to the maximally exposed individual from the airborne effluents of the Sequoyah facility

Radionuclide	Percentage contribution to dose			
	Total body	Bone	Lungs	Kidney
^{226}Ra	<0.1	<0.1	<0.1	<0.1
^{230}Th	0.1	0.2	<0.1	<0.1
^{234}U	53.0	40.9	52.6	51.5
^{235}U	0.6	1.7	<0.1	2.3
^{238}U	46.2	57.1	47.3	46.2

Dose to the population within 80 km of the plant site

The 1980 population within an 80-km (50-mile) radius of the plant site is shown in Tables 3.2 and 3.3. A total of approximately 425,000 persons live within this area. The population dose commitments from the routine annual releases of radionuclides (Table 4.15) are shown in Table 4.19. The total-body dose of 2.4 man-rem is only about 0.005% of the population dose of 4.6×10^4 man-rem resulting from the natural background radiation dose rate of 106 millirem/year.

Table 4.19. Fifty-year dose commitments[a] from the airborne effluents to the population[b] living within 80 km of the Sequoyah facility

Pathway	Dose (man-rem)			
	Total body	Bone	Lungs	Kidney
Immersion in air	1.2×10^{-7}	1.6×10^{-7}	1.1×10^{-7}	$1.1 \times 10^{-}$
Exposure to surface	1.7×10^{-2}	2.2×10^{-2}	1.5×10^{-2}	1.4×10^{-2}
Inhalation[c]	7.8×10^{-1}	3.7	1.7×10^{1}	8.1×10^{-1}
Ingestion[d]	1.6	2.1×10^{1}	3.8×10^{-2}	4.7
Total	2.4	2.5×10^{1}	1.7×10^{1}	5.5

[a]Fifty-year dose commitment from the intake of radionuclides resulting from one year of plant operation.

[b]Based on the 1980 population of 429,300 persons.

[c]Based on an inhalation rate of 8000 m^3/year.

[d]Based on an average intake rate for adults of 103 kg/year of vegetables, 110 L/year of milk, and 95 kg/year of meat (NRC Regulatory Guide 1.109).

4.2.5.2 Doses from aqueous releases

The methodology for calculating the 50-year dose commitments to man from the release of radionuclides to the aquatic environment is described in detail in ref. 22. The three exposure pathways considered in dose determination are water ingestion, fish ingestion, and submersion in water (swimming). Internal and external dose conversion factors are discussed in Appendix A, dietary intake rates are found in Regulatory Guide 1.109 (Appendix A, Table A.4), and release rates and concentrations of radionuclides after mixing with the Arkansas River below the plant discharge are shown in Table 4.20. Actually, the plant liquid effluent discharges into the Illinois River only 1000 m upstream from its confluence with the Arkansas River; thus, the dilution, assuming complete mixing, by the average annual flow of the Arkansas River near this point was used in determining the concentration of radionuclides in the water.

Dose to the maximally-exposed individual

The 50-year dose commitments for individuals exposed to various aquatic pathways associated with the Arkansas River are shown in Table 4.21. Of the total-body dose of 0.062 millirem, 78% is due to the consumption of water from the river and 22% to the ingestion of fish. Essentially all of the dose was due to the ^{234}U (52%) and ^{238}U (48%) radionuclides.

Actually, the Arkansas River water is not used by the maximally-exposed individual as a source of drinking water and maximum use of the river for water, fish, and recreational purposes would not contribute significantly to the total individual dose.

Table 4.20. Annual average radionuclide release rate[a] in the plant liquid effluent and concentrations of radionuclides in the Arkansas River below the plant site

Radionuclides	Release rates (mCi/year)	Concentration in the Arkansas River[b] (μCi/mL)
^{226}Ra	2.0×10^{2}	9.6×10^{-15}
^{230}Th	6.0×10^{2}	2.9×10^{-14}
^{234}U	1.6×10^{6}	7.8×10^{-11}
^{235}U	1.2×10^{5}	5.9×10^{-12}
^{238}U	1.6×10^{6}	7.8×10^{-11}

[a]Based on annual release rates from 1980-1984.

[b]Annual flow of the Arkansas River from 1965-1970 is 2.09×10^{16} mL/year (23,383 ft^3/s).

Table 4.21. Maximum 50-year dose commitments from the use of the Arkansas River below the liquid effluent discharge[a]

Pathway	Dose (millirem)			
	Total body	Bone	Lungs	Kidney
Submersion in water[b]	5.6×10^{-6}	7.5×10^{-6}	4.8×10^{-6}	5.1×10^{-6}
Consumption of fish[c]	1.8×10^{-2}	2.4×10^{-1}	5.3×10^{-2}	5.2×10^{-4}
Consumption of water[d]	6.0×10^{-2}	8.3×10^{-1}	1.8×10^{-1}	1.8×10^{-3}
Total	6.2×10^{-2}	1.1	2.3×10^{-1}	2.3×10^{-3}

[a]Assumes full mixing of the effluent discharge with the river.

[b]Assumes swimming in the water 1% of the year.

[c]Assumes intake of 21 kg/year of fish.

[d]Assumes intake of 730 L of drinking water.

The doses are small fractions of the EPA standards for the uranium fuel cycle of 25 millirem/year to the total body, 75 millirem/year to the thyroid, and 25 millirem/year to the other organs (40 CFR Part 190). The highest organ dose of 1.1 millirem to the bone is about 4.4% of the EPA standard. Additionally, the total-body dose of 0.062 millirem is only about 0.06% of the natural background dose (106 millirem/year to the individual living in this area of Oklahoma, near Fort Smith, Arkansas).

Population dose commitment from liquid effluents

None of the municipalities on the Arkansas River downstream from the plant discharge take their drinking water from the river. Assuming that the city of Fort Smith, Arkansas (a 1980 metropolitan area population of 202,000), located 64 km (40 miles) from the plant site, uses the river as the sole source of all its drinking water, the population total-body dose for the city would be about 16 man-rem. This dose is based on the concentration of radionuclides in Table 4.20 and assumes that no further downstream dilution occurs. This population dose is a very small percentage of the comparable dose of 2.16×10^4 man-rem from all sources of natural background radiation for the area and would not noticeably add to the background dose.

4.3 Indirect Effects and Their Significance

4.3.1 Socioeconomic Effects

As discussed in Sect. 3.3, employment at the SFC facility is not a major factor in the economy of the local region. Neither continued operation nor discontinuance would have a significant impact on socioeconomic conditions.

4.3.2 Potential Effects of Accidents

The applicant has identified a spectrum of accidents from probable minor events to unlikely major accidents in his "Radiological Contingency Plan"

submitted on March 11, 1982. This plan, which includes procedures for minimizing and mitigating the potential impacts of radiological and other accidents, was approved by NRC in License SUB-1010, amendment 14, on March 25, 1982. The accidents with potential offsite consequences were identified as follows:

- rupture of waste retention pond embankment,
- acid storage tank rupture,
- fire in the solvent extraction circuit, and
- rupture or valve failure of a hot UF_6 product cylinder.

The staff does not consider gross failure of the raffinate storage ponds or the raffinate sludge pond as credible. The only mechanism would be a major earthquake, and the plant is located where the horizontal acceleration has a 90% probability of not exceeding 0.04 gravities in 50 years[23] which would not cause dike failure. The other accidents are unlikely but possible and are discussed below.

4.3.2.1 Plant accidents involving radioactive materials

Minor accidents involving radioactive material

Most of the incoming uranium concentrate (nominally U_3O_8) is received in 0.2-m^3 (55-gal) drums. This sand-like material is sampled and weighed for inventory using a falling stream sampling system. Minor shipments of uranium concentrate, as slurry, are received both in drums and tank trailers. All of these concentrates are dissolved by nitric acid to form uranyl nitrate solution. Impurities are removed in a solvent extraction step, and then, moisture is removed by evaporation to achieve uranyl nitrate hexahydrate (UNH) which is thermally decomposed to uranium trioxide. The uranium trioxide is then reduced to uranium dioxide. The uranium dioxide is then hydrofluorinated to UF_4. All process off-gas is treated and filtered as described in Sect. 2.2.1 to decrease any impact from atmospheric releases of contaminants. There is a potential for spillage of the above low-specific activity solids during sampling, transport, or maintenance activities. No offsite consequences would be expected. Any spills are promptly collected and the affected area decontaminated.

Accidents with potential offsite consequences

During the solvent extraction purification step, a fire in the area might involve the uranium-loaded hexane-TBP solvent. Any such fire would normally be quenced by the water-foam deluge system which is thermally or manually activated from the control room. If system failure were to occur, the uranium-loaded solvent, after equipment breach, would continue to burn but would be contained by a curbed concrete pad within the building. Only small amounts of uranium would be expected to be carried from the building, entrained with soot from the fire. Sampling to determine the extent of offsite contamination, if any, would be carried out immediately after fire suppression. No offsite effects of consequence would be expected, but a major onsite cleanup would be necessary.

The only radiological accident with potentially major offsite consequences also results in hydrogen fluoride release. The applicant has identified this accident as rupture or valve failure of a hot UF_6 product cylinder within the Main Process Building. The staff notes that UF_6 release is also possible in the process system from UF_4 fluorination through product cylinder fill albeit, the only process vessels with UF_6 quantities approaching that of a product cylinder are the primary cold traps. The staff considers process equipment failure (including the cold traps) much more unlikely than cylinder failures because of construction, fixed location, and potential for isolation. Therefore, the staff has chosen to evaluate the potential consequences of accidents involving hot [93°C (200°F)] product cylinders.

Although a large UF_6 release from a cylinder at the SFC facility is unlikely, such an accident conceivably can occur. At least two such accidents have been recorded: one in 1977 at a French facility[24] and another in 1978 at the gaseous diffusion plant in Portsmouth, Ohio.[25] The applicant's administrative controls make the catastrophic breach of a liquid UF_6 cylinder very unlikely; however, if such a rupture ever occurred, it would most likely happen inside the Main Process Building where all sampling, weighing, and vertical lifting takes place. A cylinder could rupture if dropped during this indoor handling, but this is very unlikely with the handling equipment in use. The cylinders are moved to an outside storage area until the UF_6 has cooled and solidified before shipment. The most plausible accident scenario resulting in a UF_6 release while outside would be that of a passing vehicle striking a UF_6 cylinder in the storage area while the UF_6 is still liquid. This potential outdoor release could result in severe offsite exposures, and its consequences are described in detail below.

For the outdoor release assessment, the staff chose a scenario similar to the accident that occurred at the gaseous diffusion plant in Portsmouth, Ohio. That incident involved the rupture of a filled liquid 14-ton cylinder in an outdoor storage area. The accident was caused by the failure of a straddle carrier, which allowed the cylinder to drop about 20 to 25 cm (8 to 10 in.) and rupture below the liquid level. As a result, approximately 9500 kg of UF_6 (equivalent to 6400 kg of natural uranium) were released in less than 5 min. On the basis of the amount of UF_6 remaining in the cylinder afterwards and the quantities of uranium either recovered or released via a drainage ditch, it was estimated that about 4800 kg of uranium was dispersed in the air. A release of this magnitude could be expected at Sequoyah if a cylinder containing liquid UF_6 in the outdoor storage area were struck and ruptured by a passing vehicle.

To conservatively assess the effects of such a release at Sequoyah, the accident is assumed to occur under adverse meteorological conditions including an F type of atmospheric stability and a light wind blowing at 1 m/s. With a ground-level release and a dilution effect caused by building wake turbulence, the χ/Q at the nearest residence in the predominant wind direction (about 730 m away) is estimated to be 5×10^{-4} s/m^3 (NRC Regulatory Guide 3.34, July 1979). If these atmospheric conditions were all in effect at the time of release, uranium and HF in about a 3 to 1 ratio could move downwind in a narrow, unwavering plume. The plume would be a dense white cloud which would be highly visible at the nearest residence during the day. The average concentrations of uranium and HF as the plume passes through the nearest residence location would be 8×10^3 mg/m^3 and 2.6×10^3 mg/m^3, respectively. Because HF

is a corrosive vapor that causes severe respiratory discomfort, a person would try to escape from the plume if at all possible; however, if someone could not escape, exposure to these high concentrations for even a short period might cause a fatality. For HF, the level recognized to be dangerous to life for brief exposures is 40 mg/m^3 (ref. 26), and exposure to 100 mg/m^3 of HF for 1 min is considered epidemiologically significant.[27] Thus, exposure to the calculated HF concentration at the nearest residence for less than 1 min could be fatal. Exposures to the plume for less than a minute could also result in a fatal uranium intake of 160 mg.[28]

It must be emphasized that the probability of such accidents is very low and that the hazards and risks of a large UF_6 spill at the Sequoyah facility are not uncommon to the operation of other large chemical plants. This plant has been converting uranium to UF_6 since 1970, and there have been no substantial liquid UF_6 releases. Nevertheless, history has shown that massive releases can and do occur. The potential consequences of such a release outside at the Sequoyah facility are clearly unacceptable. Therefore, the NRC will closely examine SFC's handling of liquid UF_6 cylinders as well as their ability to mitigate offsite consequences of a large UF_6 spill.

Conditions for handling liquid cylinders will then be incorporated as an amendment to SFC's renewed license in order to further reduce the likelihood of such a release.

4.3.2.2 Plant accidents involving nonradioactive material

The plant consumes relatively large quantities of chemicals annually (Table 2.1). Laboratory chemicals (not listed in Table 2.1) are bought and used in such small quantities that no offsite risk is expected.

Aqueous H_2SO_4, HF, and HNO_3 are corrosive acids that, if spilled, can cause onsite problems until neutralized and cleaned up. There is no potential for such spills causing offsite consequences.

Both anhydrous hydrogen fluoride and anhydrous ammonia stored onsite as liquids can be classified as hazardous as can fluorine gas produced onsite to convert UF_4 to UF_6. The potential consequences of accidents with these materials is discussed below.

Hydrogen fluoride (HF)

Anhydrous HF is a colorless liquid widely used in industrial processes. Its boiling point of 19°C (67°F) makes any plant release at ambient conditions below this temperature of negligible consequence offsite. At the SFC site, HF is stored in three tanks, each of 57-m^3 (15,000-gal) capacity. Incoming HF is transferred into these tanks using pressurized nitrogen. The storage tanks are bermed to contain moderate spills. In the opinion of the staff, no catastrophic failure of tankage can be expected. Leaking valves or transfer line failures are postulated to be the worst credible accident. If such an accident occurred at 27°C (80°F), 6% of the HF released would flash to vapor. To approach the potential consequences of the nominal UF_6 accident, the release rate would have to be over 300 kg/min or about 0.32 m^3/min. This rate is not possible through the valves or transfer line at 35 psig, so the postulated UF_6 accident is also the worst HF release accident.

Four criteria have been selected to gauge the environmental effects of accidental releases of HF. These are as follows:

1. air concentrations not exceeding 0.25 mg/m^3 (0.3 ppm), which is in the range where exposures of the order of 1 h can cause damage to vegetation;[29]

2. concentrations up to 2 mg/m^3 (2.5 ppm), which is the threshold limit value for an 8-h work day recommended by the American Conference of Governmental Hygienists;[30]

3. concentrations up to 7 mg/m^3 (8.5 ppm), which is the emergency exposure limit for 60 min recommended by the NAS;[31] and

4. concentrations not exceeding 40 mg/m^3 (50 ppm), which is extremely dangerous for even very short exposures.[26]

Experimental data and occupational experience indicate that man is susceptible to irritation from gaseous HF. At 10 mg/m^3, the mucosa are irritated; at 26 mg/m^3, the severity of the irritation increases; at 100 mg/m^3, a stinging sensation of the skin is added, and other irritations are so severe as to make exposure for more than 1 min intolerable. For this reason, it is unlikely that persons able to escape would remain in the toxic cloud for any length of time.

In Sect. 4.3.2.1, an HF concentration of 2600 mg/m^3 was calculated at the distance of the nearest residence. An individual exposed to this concentration will make every effort to flee. Even at low concentrations, the UO_2F_2 forms a dense white cloud and avoidance is possible. The effective plume width is about 60 m (197 ft), so only tens of seconds are required for escape. A nonambulatory individual would be at severe health risk. With the meteorology discussed in Sect. 4.3.2.1, the HF plume would not dilute to the 1-h emergency exposure limit of 7 mg/m^3 until about 10,000 m (33,000 ft) from the plant. Thus, many individuals may have to evacuate from the area to avoid severe discomfort. In addition, the natural environment in a large area would suffer varying degrees of damage to replaceable vegetation, and animal life could be severely harmed.

The staff emphasizes that, while credible, the accident described above is extremely unlikely in view of the precautions used in UF_6 transfer and mitigation measures available to interrupt release after initiation. The total release may be only a fraction of that postulated.

Ammonia (NH_3)

Ammonia is a colorless gas easily liquified under pressure. Its boiling point of -33.4°C (-28°F) makes it much more volatile than HF. It is widely used in industry and hundreds of thousands of tons are used annually as fertilizer. It is transferred to and stored onsite in a manner similar to that described above for HF.

The staff has chosen for analysis an accident involving leaking valves or transfer line breakage since no catastrophic tankage failure appears credible.

For comparative purposes, the staff has used the same accident conditions needed to make the HF leak comparable to the UF_6 release case. For NH_3, about

20% flashes to vapor, so the release rate becomes 34 kg (75 lb) per minute or about 0.034 m^3 (10 gal) per minute.

At the nearest residence, the corresponding concentration becomes about 137 mg/m^3 of NH_3.

The exposure criteria utilized to assess the impact are as follows:

- 13.8 mg/m^3 (20 ppm)-first perceptible odor (threshold limit value for NH_3 = 25 ppm),
- 27.6 mg/m^3 (40 ppm)-a few individuals may suffer slight eye irritation,
- 69 mg/m^3 (100 ppm)-noticeable irritation of eyes and nasal passages after a few minutes of exposure,
- 276 mg/m^3 (400 ppm)-severe irritation of the throat, nasal passages, and upper respiratory tract, and
- 1173 mg/m^3 (700 ppm)-severe eye irritation, no permanent effect if the exposure is limited to less than one-half hour.

The accident would result in discomfort to an individual at the nearest residence but would cause no permanent damage.

Fluorine

Fluorine is a pale yellow corrosive gas which reacts with practically all organic and inorganic substances. It is produced in the plant by electrolysis of potassium hydrogen fluoride, and the process inventory is very small as it reacts with UF_4 to produce UF_6 in the fluorinator. Should an equipment leak occur, production can be stopped by switching off the electrolysis current. Fluorine gas has a characteristic pungent odor detectable as low as 20 ppb, so leaks are easily detectable. The potential offsite effects of fluorine production and loss are small compared to previously discussed materials.

4.3.2.3 Transportation accidents

Incoming raw materials

Incoming anhydrous ammonia, nitric acid, anhydrous hydrofluoric acid, and sulfuric acid are normally shipped to the plant by common carrier or vendor trucks meeting Department of Transportation specifications. These shipments generally originate in Oklahoma or Arkansas and travel over Interstate Highway 40. Table 2.1 lists the types of inbound chemicals.

The commodities shipped to the Sequoyah facility are commercial chemicals routinely used in a wide variety of industrial and agricultural applications. Anhydrous ammonia and lime are particularly important to agriculture and move in large quantities to the farms in Oklahoma. Packaging and transportation of these chemicals require no special provisions beyond those now employed except for changes which may evolve from possible future regulations promulgated by the Department of Transportation in its continuing program to improve transportation safety.

The shipping volume of these chemicals to Sequoyah represents a small fraction of the total industrial traffic on Interstate 40. Under normal conditions, this shipping volume has an insignificant effect on the environment.

While the hazardous nature of some of these chemicals is well known, actual experience at Sequoyah with the more hazardous of the process chemicals used (HF and NH_3) demonstrates that transportation can be carried out safely. The current federal programs to improve rail and highway safety should ensure that continued operation of the facility will not have a significant adverse impact on the environment or the safety of the public.

Empty UF_6 cylinders are returned from enrichment facilities at the rate of about 20 cylinders per week. Returned cylinders may contain small amounts of residual UF_6, and transport vehicles are placarded as required by federal regulations for such radioactive materials.

Uranium ore concentrates are shipped to the plant site by trailer and truck. Containers and vehicles are properly labeled and placarded in accordance with Department of Transportation regulations. An accident severe enough to rupture one of the 0.2-m^3 (55-gal) drums would result in little, if any, dispersion of the material because of the high density and low solubility. Any spilled material would be picked up and re-drummed with little significant impact upon the environment. Material shipped as slurry poses even less hazard.

Outgoing shipments

The UF_6 product is packaged in NRC-approved steel cylinders with capacities of 9.1 or occasionally 12.7 net metric tons (10 or 14 net tons). After the cylinders are filled with UF_6 in liquid form, the product is allowed to cool and solidify for a minimum of 5 d before shipment. The shipments are normally made by sole-use vehicle. When loaded, the containers are inspected to ensure that they have been properly prepared for shipment and fully comply with applicable regulations governing their use in transportation. Transport vehicles are placarded in accordance with Department of Transportation regulations. UF_6 is shipped primarily to the DOE gaseous diffusion plants at Paducah, Kentucky; Portsmouth, Ohio; and Oak Ridge, Tennessee.

Shipments of UF_6 via highway transportation are carried out by qualified private or contract carriers and by experienced specialized common carriers duly franchised by the Department of Transportation. The vehicle trailers are specifically designed for attachment of the UF_6 cylinders to its chassis with a center of gravity as low as practical. These units are used exclusively for UF_6 shipments and return of the empty cylinders.

In all cases, UF_6 truck shipments are routed to avoid heavily populated and congested areas as well as tunnels, bridges, and toll roads which prohibit such shipments.

On the basis of past experience, an insignificant environmental impact will result from transportation operations or from infrequent transportation accidents involving UF_6.

Sequoyah Fuels Corporation has joined with other chemical companies as a participant in the activities of the National Chemical Transportation Emergency

Center (CHEMTREC), which functions in the interest of promoting safety and minimizing the danger to life and property in case of transportation emergencies involving hazardous chemicals. In addition, transportation accidents involving the plant's product shipments are coordinated through a company-wide emergency system, designed specifically to cope with the hazards of the particular material should an emergency occur.

4.3.2.4 Conclusions

The conclusion of the staff is that, while potentially hazardous chemicals are received and used in the operation of the SFC plant, the risks of accidents are no greater than in many other industrial operations. Operational safety is emphasized and is borne out by the applicant's previous operating history.

4.3.3 Possible Conflicts Between the Proposed Action and the Objectives of Federal, Regional, State, and Local Plans and Policies

At this time, the staff is not aware of any conflict between the proposed action and the objectives of federal, regional, state (Oklahoma), or local plans, policies, or controls for the action proposed as long as proper agencies are contacted, proper applications are submitted, and proper monitoring and mitigatory measures are taken to protect the environment and public health and safety.

4.3.4 Effects on Urban Quality, Historical and Cultural Resources, and Society

The environmental effects of the proposed license renewal action as discussed above are considered to be insignificant. The facility has not affected historical or cultural resources. The short-term social effects during operation are and will be minimal, and there will be minimal effects after decommissioning and reclamation.

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Appendix A

METHODOLOGY AND ASSUMPTIONS FOR CALCULATING RADIATION DOSE COMMITMENTS FROM THE RELEASE OF RADIONUCLIDES

Appendix A

METHODOLOGY AND ASSUMPTIONS FOR CALCULATING RADIATION DOSE COMMITMENTS FROM THE RELEASE OF RADIONUCLIDES

A.1 Methdology and Assumptions for Airborne Releases

A.1.1 Methodology

The radiation dose commitments resulting from the atmospheric releases of radionuclides are calculated using the AIRDOS-EPA computer code.[1] The methodology is designed to estimate the radionuclide concentrations in air; rates of deposition on ground surfaces; ground-surface concentrations; intake rates via inhalation of air and ingestion of meat, milk, and fresh vegetables; and radiation doses to man from the airborne releases of radionuclides. With the code, the highest estimated dose to an individual at the nearest residence and the doses to the population living within an 80-km radius of the plant site can be calculated. The doses may be summarized by radionuclide, exposure mode, or significant organ of the body.

Many of the basic incremental parameters used in AIRDOS-EPA are conservative; that is, values are chosen to maximize intake by man. Many factors that would reduce the radiation dose, such as shielding provided by dwellings and time spent away from the reference location, are not considered. It is assumed that an individual lives at the reference location 80% of the time. Moreover, in estimating the doses to individuals via ingestion of vegetables, beef, and milk, only 10% of the food consumed by the individual is assumed to be produced at the reference location specified in the calculation. Thus, the dose estimates calculated by these methods are likely to be higher than the doses that would actually occur.

Meteorological dispersion factors, χ/Q, were estimated using the Gaussian plume model and diffusion coefficients for Pasquill-type turbulence.[2,3] Radionuclide concentrations in meat, milk, and vegetables consumed by man are estimated by coupling the output of the atmospheric transport models with the terrestrial food chain model in NRC Regulatory Guide 1.109.[4] The combined models are described in ORNL/TM-6100.[5]

A.1.2 Radiation exposure pathways and dose conversion factors

Environmental transport links the source of release to the receptor by numerous exposure pathways. Figure A.1 is a diagram of the most important pathways that result in the exposure of man to radioactivity released to the environment. The resulting radiation exposures may be either external or internal. External exposures occur when the radiation source is outside the irradiated body, and internal exposures are those from radioactive materials within the irradiated body. Factors for converting the radiation exposures to estimates of dose are calculated using the latest dosimetric criteria of the International Commission on Radiological Protection (ICRP) and other recognized authorities.

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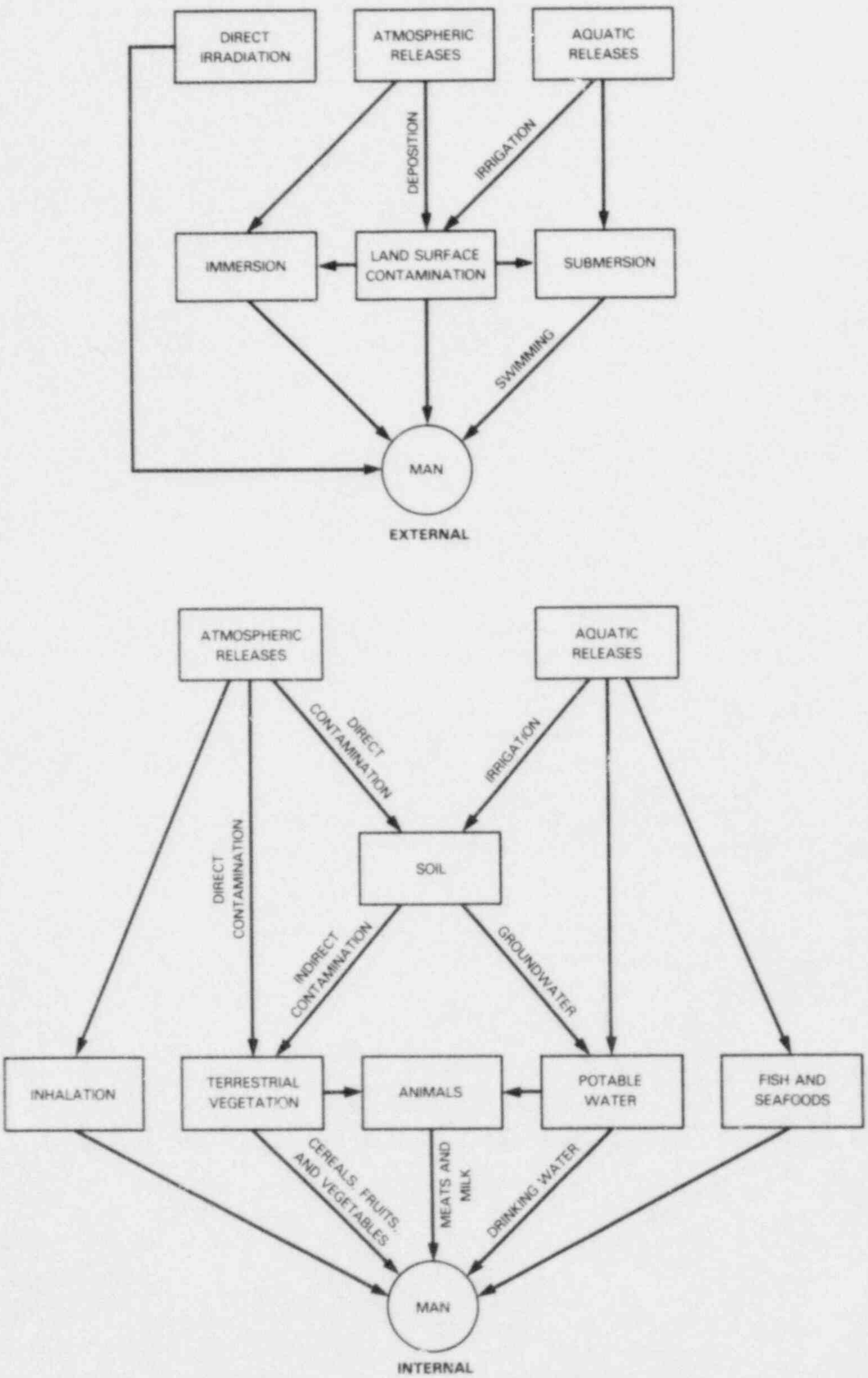

Fig. A.1. Pathways for exposure to man from releases of radioactive effluents.

External dose conversion factors. Releases of radioactive gases and particulates to the atmosphere may result in external doses by exposure to and/or immersion in the plume and by exposure to contaminated land surfaces. The dose conversion factors are summarized by Kocher in ORNL/NUREG-79,[6] and those used in this report are shown in Table A.1.

Table A.1. Dose conversion factors for external exposure pathways

Radionuclide	Organ			
	Total body	Bone	Kidney	Lungs
	Exposure to ground surfaces (millirem/year per μCi/cm²)			
226Ra	6.8×10^3	9.2×10^3	5.8×10^3	6.2×10^3
230Th	7.8×10^2	6.6×10^2	3.3×10^2	3.8×10^2
234U	7.1×10^2	3.0×10^2	1.0×10^2	1.7×10^2
235U	1.5×10^5	2.1×10^5	1.3×10^5	1.4×10^5
238U	5.7×10^2	2.1×10^2	5.9×10^1	1.2×10^2
	Immersion in air (millirem/year per μCi/cm³)			
226Ra	3.1×10^7	4.1×10^7	2.6×10^7	2.8×10^7
230Th	1.7×10^6	2.4×10^6	1.3×10^6	1.4×10^6
234U	6.8×10^5	7.1×10^5	3.7×10^5	4.1×10^5
235U	6.8×10^8	9.4×10^8	5.9×10^8	6.3×10^8
238U	4.6×10^5	4.5×10^5	22×10^5	2.5×10^5
	Submersion in water (millirem/year per μCi/cm³)			
226Ra	6.8×10^4	9.2×10^4	5.9×10^4	6.3×10^4
230Th	4.1×10^3	5.7×10^3	3.1×10^3	3.3×10^3
234U	1.7×10^3	1.7×10^3	8.9×10^2	9.8×10^2
235U	1.5×10^6	2.1×10^6	1.3×10^6	1.4×10^6
238U	1.1×10^3	1.1×10^3	5.3×10^2	6.1×10^2

Source: D. C. Kocher, Dose-Rate Conversion Factors for External Exposure to Photons and Electrons, ORNL/NUREG-79, Oak Ridge National Laboratory, August 1981.

Internal dose conversion factors. Factors for converting internal radiation exposure to estimates of dose have been computed based on recent models[7,8] and are summarized by Dunning et al. in ORNL/NUREG/TM-190/V3.[9] The dose conversion factors used in this report are presented in Tables A.2 and A.3. These factors are input data into the AIRDOS-EPA computer code, which is used to calculate the dose from inhaled and ingested radionuclides.

A.1.3 Radiation dose to the individual

Internal exposure continues as long as radioactive material remains in the body, which may be longer than the duration of the individual's residence in the contaminated environment. The best estimates of the internal dose resulting from an intake are obtained by integrating over the remaining lifetime of the exposed individual; such estimates are called dose commitments. The remaining lifetime is assumed to be 50 years for an adult.

Table A.2. Dose conversion factors for inhalation exposure pathways - AMAD = 0.3 μm

Radionuclide	Committed dose equivalent (rem/μCi)			
	Total body	Bone	Kidney	Lungs
		Class D		
234U	6.4	8.7×10^{1}	1.9×10^{1}	1.6
235U	5.8	7.9×10^{1}	1.7×10^{1}	1.4
238U	5.7	7.8×10^{1}	1.7×10^{1}	1.4
		Class W		
226Ra	5.4	4.9×10^{1}	6.7×10^{-1}	9.5×10^{1}
230Th	6.4×10^{1}	8.4×10^{2}	2.9	9.3×10^{1}
		Class Y		
230Th	6.4×10^{1}	5.0×10^{2}	1.8	9.1×10^{2}
234U	2.9×10^{1}	1.3×10^{1}	2.8	9.3×10^{2}
235U	2.6×10^{1}	1.2×10^{1}	2.5	8.4×10^{2}
238U	2.5×10^{1}	1.1×10^{1}	2.5	8.3×10^{2}

Source: D. E. Dunning, Jr., G. G. Killough, S. R. Bernard, J. G. Pleasant and P. J. Walsh, Estimates of Internal Dose Equivalent to 22 Target Organs for Radionuclides Occuring in Routine Releases from Nuclear Fuel Cycle Facilities, Vol. III, ORNL/NUREG/TM-190/V3, Oak Ridge National Laboratory, October 1981.

Table A.3. Dose conversion factors for ingestion exposure pathways

Radionuclide	Committed dose equivalent (rem/μCi)			
	Total body	Bone	Kidneys	Lungs
		Classes D and W		
226Ra	3.4	4.3×10^{1}	5.9×10^{-1}	5.9×10^{-1}
230Th	9.2×10^{-2}	1.2	4.3×10^{-3}	4.6×10^{-3}
234U	5.8×10^{-1}	7.8	1.7	1.7×10^{-2}
235U	5.2×10^{-1}	7.1	1.5	1.6×10^{-2}
238U	5.1×10^{-1}	7.0	1.5	1.5×10^{-2}
		Class Y		
230Th	9.2×10^{-2}	1.2	4.3×10^{-3}	4.6×10^{-3}
234U	2.4×10^{-2}	3.1×10^{-1}	6.7×10^{-2}	6.9×10^{-4}
235U	2.2×10^{-2}	2.8×10^{-1}	6.1×10^{-2}	7.4×10^{-4}
238U	2.1×10^{-2}	2.8×10^{-1}	6.0×10^{-2}	6.1×10^{-4}

Source: D. E. Dunning, Jr., G. G. Killough, S. R. Bernard, J. G. Pleasant, and P. J. Walsh, Estimates of Internal Dose Equivalent to 22 Target Organs for Radionuclides Occuring in Routine Releases from Nuclear Fuel Cycle Facilities, Vol. III, ORNL/NUREG/TM-190/V3, Oak Ridge National Laboratory, October 1981.

External doses are assumed to be annual doses. The dose rate above the contaminated land surface is estimated for a height of 1 m. Following the initial deposition of radionuclides, the potential for exposure of man may persist, depending on the influence of environmental redistribution, long after the plume leaves the area. Concentrations of radionuclides at the point of deposition normally are reduced by infiltration of radionuclides into the soil, by loss of soil particles due to erosion, and by transport in surface water and in groundwater. When the effects of these processes cannot be quantified, a conservative estimate of dose due to external exposure to contaminated surface is obtained by assuming that the radionuclide concentrations are diminished by radioactive decay only.

The dose is estimated for individuals at the nearest site boundary or at the nearest residence. The intake parameters used for individual dose determination are shown in Table A.4.

Table A.4. Intake parameters (adult) used in lieu of site-specific data

Pathway	Maximum exposed individual[a]	Average exposed individual[b]
Vegetables, kg/year	28[c]	190
Milk, L/year	31	110
Meat, kg/year	11	95
Drinking water, L/year	73	370
Fish, kg/year	2	6.9
Inhalation, m3/year[d]	6400	8000

[a]From NRC Regulatory Guide 1.109, these quantities are based on the assumption that 10% of the total food consumed is produced at a nearby residence.

[b]Used for calculating population doses.

[c]This value includes leafy vegetables.

[d]These values assume 80% occupancy at a nearby residence.

A.1.4 Radiation dose to the population

The total dose received by the exposed population is estimated by the summation of individual dose estimates within the population. The area within the 80-km (50-mile) radius of the site is divided into 16 sectors (22.5 each) and into a number of annuli. The average dose for an individual in each division is estimated, that estimate multiplied by the number of persons in the division, and the resulting products are summed across the entire area. The unit used to express the population dose is man-rem. For this report, the population dose estimates are calculated for a population composed entirely of adults. The parameters used for calculating population doses are shown in Table A.4.

A.2 Methodology and Assumptions for Aqueous Releases

The methodology used for calculating the 50-year dose commitments to man from the release of radionuclides to an aquatic environment is described in detail in ORNL-4992.[10] Reference 10 also gives sample problems and bioaccumulation factors for radionuclides in freshwater fish. AQUAMAN is a computer code[11] that can also be used for calculating similar dose commitments from exposures to aquatic pathways. Three exposure pathways are considered in dose determination: water ingestion, fish ingestion, and submersion in water (swimming). The internal dose conversion factors for converting exposure to dose are discussed in Sect. A.1.2, and the factors are shown in Table A.3. The external dose conversion factors are shown in Table A.1. Intake parameters are shown in Table A.4.

A.3 Atmospheric Dispersion

The atmospheric dispersion model used in estimating the atmospheric transport to the terrestrial environment is discussed in detail in NRC Regulatory Guide 1.111 (Rev. 1). For particulate release, the meteorological χ/Q values are used in conjunction with dry deposition velocities and scavenging coefficients to estimate air concentrations and steady-state ground concentrations. The atmospheric dispersion model estimates the concentration of radionuclides in air at ground surfaces as a function of distance and direction from the point of release. Averages of annual meteorological data from the site or from the nearest weather station if suitable are supplied as input for the model. Radioactive decay during the plume travel is taken into account in the AIRDOS-EPA code.[1] Daughters produced during plume travel are calculated and added to the source term.

The area surrounding the plant site is divided into 16 sectors by compass direction (Sect. 3.3). The meteorological χ/Q values are calculated for the midpoint of each sector defined by the radial distances of 0.8, 2.4, 4.0, 5.6, 7.2, 12.0, 24.0, 40.0, 56.0, and 72.0 km (Table A.5). Concentrations in the air for each sector are used to calculate dose via inhalation and submersion in the air. The ground deposits result in external gamma dose and, in addition, are assimilated into food and contribute dose upon ingestion via the food chain.

The meteorological data required for the calculations are joint frequency distributions of wind velocity and direction summarized by stability class. Meteorological data (Tables A.6 and A.7) from the nearest weather station (Fort Smith, Arkansas) are used to calculate the concentrations of radionuclides at a reference point per unit of source strength. Depletion of the airborne plume as it is blown downwind is accounted for in the AIRDOS-EPA code by taking into account the deposition on surfaces by dry deposition, scavenging, and radioactive decay. Other parameters used in determining air concentration are shown in Table A.8.

Table A.5. Ground-level χ/Q values for particulates at various distances in each compass direction

Distance (m)	χ/Q toward indicated direction (s/m³)							
	N	NNW	NW	WNW	W	WSW	SW	SSW
805	0.156E-05	0.702E-06	0.691E-06	0.756E-06	0.908E-06	0.675E-06	0.108E-05	0.928E-06
2414	0.837E-06	0.379E-06	0.399E-06	0.332E-06	0.378E-06	0.254E-06	0.459E-06	0.395E-06
4023	0.453E-06	0.205E-06	0.217E-06	0.176E-06	0.199E-06	0.132E-06	0.242E-06	0.209E-06
5632	0.290E-06	0.131E-06	0.139E-06	0.111E-06	0.125E-06	0.828E-07	0.153E-06	0.132E-06
7240	0.202E-06	0.908E-07	0.959E-07	0.766E-07	0.862E-07	0.571E-07	0.106E-06	0.913E-07
12068	0.941E-07	0.419E-07	0.440E-07	0.352E-07	0.393E-07	0.263E-07	0.487E-07	0.422E-07
24135	0.293E-07	0.126E-07	0.129E-07	0.105E-07	0.115E-07	0.806E-08	0.148E-07	0.130E-07
40225	0.112E-07	0.465E-08	0.456E-08	0.387E-08	0.413E-08	0.307E-08	0.555E-08	0.492E-08
56315	0.515E-08	0.206E-08	0.192E-08	0.171E-08	0.180E-08	0.142E-08	0.252E-08	0.227E-08
72405	0.250E-08	0.969E-09	0.836E-09	0.798E-09	0.845E-09	0.707E-09	0.121E-08	0.112E-08

Distance (m)	S	SSE	SE	ESE	E	ENE	NE	NNE
805	0.105E-05	0.693E-06	0.759E-06	0.531E-06	0.492E-06	0.645E-06	0.152E-05	0.182E-05
2414	0.421E-06	0.239E-06	0.271E-06	0.224E-06	0.257E-06	0.307E-06	0.739E-06	0.703E-06
4023	0.221E-06	0.123E-06	0.140E-06	0.118E-06	0.139E-06	0.165E-06	0.397E-06	0.367E-06
5632	0.139E-06	0.771E-07	0.881E-07	0.750E-07	0.886E-07	0.105E-06	0.252E-06	0.232E-06
7240	0.965E-07	0.533E-07	0.610E-07	0.520E-07	0.615E-07	0.731E-07	0.175E-06	0.161E-06
12068	0.448E-07	0.248E-07	0.284E-07	0.242E-07	0.286E-07	0.343E-07	0.815E-07	0.758E-07
24135	0.140E-07	0.794E-08	0.910E-08	0.755E-08	0.870E-08	0.108E-07	0.252E-07	0.248E-07
40225	0.545E-08	0.318E-08	0.363E-08	0.292E-08	0.325E-08	0.423E-08	0.967E-08	0.101E-07
56315	0.258E-08	0.158E-08	0.177E-08	0.137E-08	0.146E-08	0.199E-08	0.449E-08	0.505E-08
72405	0.132E-08	0.857E-09	0.934E-09	0.686E-09	0.690E-09	0.989E-09	0.222E-08	0.272E-08

Table A.6. Frequencies of wind directions and true-average wind speeds

Wind toward[a]	Frequency	Wind speeds for each stability class (m/s)						
		A	B	C	D	E	F	G
1	0.110	1.88	2.35	3.29	4.80	3.68	1.40	0.0
2	0.046	1.17	2.20	3.11	4.27	3.32	1.25	0.0
3	0.039	1.11	2.07	2.72	3.07	2.67	1.23	0.0
4	0.041	1.74	1.98	2.82	3.24	2.78	1.27	0.0
5	0.048	1.62	2.04	2.96	3.40	2.90	1.15	0.0
6	0.040	1.84	2.41	3.36	3.81	3.00	1.33	0.0
7	0.063	1.80	2.71	3.07	3.66	3.26	1.33	0.0
8	0.061	1.86	2.38	3.64	4.60	3.56	1.34	0.0
9	0.069	1.17	2.09	3.62	4.91	3.75	1.36	0.0
10	0.053	1.38	2.65	3.83	5.63	4.03	1.40	0.0
11	0.052	1.24	1.97	3.14	5.53	3.90	1.49	0.0
12	0.038	1.80	2.50	3.35	5.42	3.82	1.43	0.0
13	0.035	1.35	2.52	3.66	5.12	3.55	1.35	0.0
14	0.050	1.68	2.81	4.11	5.35	3.55	1.49	0.0
15	0.114	1.99	2.64	3.97	5.19	3.86	1.36	0.0
16	0.141	1.97	2.81	4.06	5.55	3.94	1.53	0.0

[a]Wind directions are numbered counterclockwise starting at 1 for due north.

Table A.7. Frequency of atmospheric stability classes for each direction

Sector[a]	Fraction of time in each stability class						
	A	B	C	D	E	F	G
1	0.0105	0.0540	0.0918	0.3725	0.1461	0.3251	0.0
2	0.0063	0.0813	0.0718	0.3745	0.1307	0.3354	0.0
3	0.0175	0.0986	0.1024	0.2466	0.0937	0.4412	0.0
4	0.0239	0.1272	0.1334	0.3130	0.0962	0.3063	0.0
5	0.0204	0.1319	0.1498	0.3386	0.0834	0.2760	0.0
6	0.0193	0.1113	0.1678	0.4080	0.0807	0.2129	0.0
7	0.0198	0.1081	0.1364	0.3848	0.0822	0.2686	0.0
8	0.0143	0.0694	0.1176	0.4765	0.0845	0.2376	0.0
9	0.0042	0.0665	0.0985	0.4989	0.1199	0.2121	0.0
10	0.0074	0.0458	0.0985	0.5032	0.1129	0.1322	0.0
11	0.0186	0.0515	0.1072	0.5420	0.1074	0.1734	0.0
12	0.0176	0.0664	0.1191	0.5057	0.0677	0.2234	0.0
13	0.0217	0.0903	0.1207	0.3778	0.0788	0.3108	0.0
14	0.0153	0.0724	0.1393	0.4280	0.0858	0.2593	0.0
15	0.0051	0.0658	0.1402	0.4037	0.1246	0.2606	0.0
16	0.0007	0.0386	0.1102	0.5209	0.1588	0.1707	0.0

[a]Wind directions are numbered counterclockwise starting at 1 for due north.

Table A.8. Other parameters used in determining exposure to air concentrations of radionuclides released in the building vent effluents

Parameters	Quantity or dimensions
Number of stacks	1
Release height, m	30
Diameter, m	1.07
Effluent velocity, m/s	14.4
Temperature (annual average for area), °C	17
Rainfall (annual average), cm/year	109.2
Height of lid (annual average), m	938
Population within 80 km of radius of site, persons	429,255

REFERENCES FOR APPENDIX A

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2. D. H. Slade, ed., Meteorology and Atomic Energy, pp. 97-104, U.S. Atomic Energy Commission, July 1968.

3. J. F. Sangendorf, A Program Evaluating Atmospheric Dispersion from a Nuclear Power Station, NOAA Technical Memo ERL-ARL-42, 1974.

4. U.S. Nuclear Regulatory Commission, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Regulatory Guide 1.109, Office of Standards Development, Washington, D.C., 1977.

5. J. C. Pleasant, INGDOS-A Conversational Computer Code to Implement U.S. Nuclear Regulatory Commission Guide 1.109 Models for Estimating the Annual Doses from Ingestion of Atmospherically Released Radionuclides in Food, ORNL/TM-6571, Oak Ridge National Laboratory, 1979.

6. D. C. Kocher, Dose-Rate Conversion Factors for External Exposure to Photons and Electrons, ORNL/NUREG-79, Oak Ridge National Laboratory, August 1981.

7. ICRP Task Group on Lung Dynamics, "Deposition and Retention Models for Internal Dosimetry of the Human Respiratory Tract," Health Phys. 12, 173-207 (1966).

8. I. G. Eve, "A Review of the Physiology of the Gastrointestinal Tract in Relation to Radiation Doses from Radioactive Materials," Health Phys. 12, 131-62 (1966).

9. D. E. Dunning, Jr., G. G. Killough, S. R. Bernard, J. C. Pleasant, and P. J. Walsh, Estimates of Internal Dose Equivalent to 22 Target Organs for Radionuclides Occurring in Routine Releases from Nuclear Fuel-Cycle Facilities, Vol. III, ORNL/NUREG/TM-190/V3, Oak Ridge National Laboratory, October 1981.

10. G. G. Killough and L. R. McKay, eds., A Methodology for Calculating Radiation Doses from Radioactivity Released to the Environment, ORNL-4992, Oak Ridge National Laboratory, March 1976.

11. D. L. Shaeffer and E. L. Etnier, AQUAMAN-A Computer Code for Calculating Dose Commitments to Man from Aqueous Releases of Radionuclides, ORNL/TM-6618, Oak Ridge National Laboratory, February 1979.

Appendix B

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR KERR-McGEE NUCLEAR CORPORATION SEQUOYAH FACILITY

Permit No. OK0000191
Application No. OK0000191

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Kerr-McGee Nuclear Corporation
P. O. Box 25861
Oklahoma City, Oklahoma 73125

is authorized to discharge from a facility located at Sequoyah Uranium Hexaflouride Facility, Gore (Sequoyah County), Oklahoma

to receiving waters named the headwaters of the Robert S. Kerr Reservoir on the Arkansas River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on January 24, 1983

This permit and the authorization to discharge shall expire at midnight, January 23, 1988

Signed this 23rd day of December 1982

Myron O. Knudson

Myron O. Knudson, P.E.
Director, Water Management Division (6W)

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Outfall 001

During the period beginning the effective date and lasting through the expiration date of this permit

the permittee is authorized to discharge from Outfall(s) serial number(s) 001 - combined waste (cooling water, boiler water, process water, treated sanitary wastewater, and excess bypass water.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations			
	kg/day(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow-m^3/Day(MGD)	N/A	N/A	*	*
Temperature (°C)	N/A	N/A	* (*°F)	* (*°F)
Total Suspended Solids	340(750)	(680(1500)	N/A	N/A
Flouride	14(30)	34(75)	N/A	N/A
Nitrate (as N)	34(75)	140(300)	N/A	N/A
Oil & Grease	N/A	N/A	N/A	15 mg/l

Effluent Characteristic	Monitoring Requirements	
	Measurement Frequency	Sample Type
Flow-m^3/Day(MGD)	Continuous	Record
Temperature (°C)	3/Day**	In Situ
Total Suspended Solids	3/Week	Composite
Flouride	3/Week	Composite
Nitrate (as N)	3/Week	Composite
Oil & Grease	3/Week	Grab

* Report
** 1 per 8-hour shift

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 3/day** by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at the flow measuring devide located downstream of the last collection point and upstream of the point where the effluent leaves the restricted area..

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Outfall 01A

During the period beginning the effective date and lasting through the expiration date of this permit

the permittee is authorized to discharge from outfall(s) serial number(s) 01A - treated sanitary wastewater

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow-m^3/Day(MGD)	N/A	N/A	*	*
Total Suspended Solids	N/A	N/A	30 mg/l	45 mg/l
Biochemical Oxygen Demand (BOD_5)	N/A	N/A	30 mg/l	45 mg/l

Effluent Characteristic	Monitoring Requirements Measurement Frequency	Sample Type
Flow-m^3/Day(MGD)	Daily	Estimate
Total Suspended Solids	1/Week	Grab
Biochemical Oxygen Demand (BOD_5)	1/Week	Grab

* Report

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): prior to commingling with combined wastes (Outfall 001).

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Outfall 002

During the period beginning the effective date and lasting through the expiration date of this permit

the permittee is authorized to discharge from outfall(s) serial number(s) 002 - surface runoff from an ammonium-nitrate byproduct test plot.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow-m^3/Day(MGD)	N/A	N/A	*	*
Total Suspended Solids	N/A	N/A	45 mg/l	90 mg/l
Ra 226, Dissolved	N/A	N/A	3 pci/l	5 pci/l
Ra 226, Total	N/A	N/A	10 pci/l	30 pci/l
NH_3	N/A	N/A	2.5 mg/l	N/A
Nitrate (as N)	N/A	N/A	10 mg/l	N/A

Effluent Characteristic	Monitoring Requirements Measurement Frequency	Sample Type
Flow-m^3/Day(MGD)	Daily	Estimate
Total Suspended Solids	1/Day**	Composite
Ra 226, Dissolved	1/Day**	Composite
Ra 226, Total	1/Day**	Composite
NH_3	1/Day**	Composite
Nitrate (as N)	1/Day**	Composite

* Report
** During periods of discharge

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/day** by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): where excess runoff is discharged to the unnamed watercourse from the dam retention pond.

PART I
REQUIREMENTS FOR NPDES PERMITS

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Outfall 003

During the period beginning the effective date and lasting through the expiration date of this permit

the permittee is authorized to discharge from outfall(s) serial number(s) 003 - surface runoff from an ammonium-nitrate byproduct test plot.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day(lbs/day)		Other Units (Specify)	
	Daily Avg	Daily Max	Daily Avg	Daily Max
Flow-m^3/Day(MGD)	N/A	N/A	*	*
Total Suspended Solids	N/A	N/A	45 mg/l	90 mg/l
Ra 226, Dissolved	N/A	N/A	3 pci/l	5 pci/l
Ra 226, Total	N/A	N/A	10 pci/l	30 pci/l
NH_3	N/A	N/A	2.5 mg/l	N/A
Nitrate (as N)	N/A	N/A	10 mg/l	N/A

Effluent Characteristic	Monitoring Requirements Measurement Frequency	Sample Type
Flow-m^3/Day(MGD)	Daily	Estimate
Total Suspended Solids	1/Day**	Composite
Ra 226, Dissolved	1/Day**	Composite
Ra 226, Total	1/Day**	Composite
NH_3	1/Day**	Composite
Nitrate (as N)	1/Day**	Composite

* Report
** During periods of discharge

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/day** by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): where excess runoff is discharged to Salt Branch Creek from the dam retention pond.

SECTION B. SCHEDULE OF COMPLIANCE

The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

NONE

PART II
STANDARD CONDITIONS FOR NPDES PERMITS

SECTION A. GENERAL CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions

The Clean Water Act provides that any person who violates a permit condition implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing sections 301, 302, 306, 307, or 308 of the Clean Water Act is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

5. Toxic Pollutants

Notwithstanding paragraph A.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the permittee so notified.

The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" section B, paragraph 3.b. and "Upsets" section B, paragraph 4.b., nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs c and d of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in section D, paragraph 6 (24-hour notice).

d. Prohibition of bypass.

(1) Bypass is prohibited and the Director may take enforcement action against a permittee for bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The permittee submitted notices as required under paragraph 3.c. of this section.

(2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph d.(1). of this section.

4. Upset Conditions

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph c of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the specific cause(s) of the upset;

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset as required in section D, paragraph 6.

(4) The permittee complied with any remedial measures required under section A, paragraph 3.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than $\pm$ 10% from true discharge rates throughout the range of expected discharge volumes. Guidance in selection, installation, calibration and operation of acceptable flow measurement devices can be obtained from the following references:

a. "A Guide to Methods and Standards for the Measurement of Water Flow", U. S. Department of Commerce, National Bureau of Standards, NBS Special Publication 421, May 1975, 97 pp. (Available from the U. S. Government Printing Office, Washington, D. C. 20402. Order by SD catalog No. C13.10:421).

b. "Water Measurement Manual", U. S. Department of Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1974, 327 pp. (Available from the U. S. Government Printing Office, Washington, D. C. 20402. Order by Catalog No. I27.19/2:W29/2, Stock No. S/N 24003-0027).

c. "Flow Measurement in Open Channels and Closed Conduits, U. S. Department of Commerce, National Bureau of Standards, NBS Special Publication 484, October 1977, 982 pp. (Available in paper copy or microfiche from National Technical Information Service (NTIS), Springfield, VA 22151. Order by NTIS No. PB-273 535/5ST).

d. "NPDES Compliance Sampling Manual", U. S. Environmental Protection Agency, Office of Water Enforcement, Publication MCD-51, 1977, 140 pp. (Available from the General Services Administration (CFFS), Centralized Mailing Lists Services, Building 41, Denver Federal Center, Denver, CO 80225).

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties for Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

5. Reporting of Monitoring Results

Monitoring results must be reported on a Discharge Monitoring Report (DMR) form (EPA No. 3320-1). Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a DMR form postmarked no later than the 28th day of the month following the completed reporting period. The first report is due April 28, 1983. Duplicate copies of DMR's signed and certified as required by section D, paragraph 11, and all other reports required by Section D. Reporting Requirements, shall be submitted to the Regional Administrator and the State at the following addresses:

Myron O. Knudson, P.E.
Director, Water Management Division
Environmental Protection Agency
Region VI
First International Building
1201 Elm Street
Dallas, Texas 75270

James R. Barnett, Acting Director
Oklahoma Water Resources Board
1000 N. E. 10th Street
Oklahoma City, Oklahoma 73105

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

8. Retention of Records

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Record Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

SECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

This permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

4. Monitoring Reports

Monitoring results shall be reported at the intervals and in the form specified in section C, paragraph 5 (Monitoring).

5. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

6. Twenty Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

The following shall be included as information which must be reported within 24 hours:

a. Any unanticipated bypass which exceeds any effluent limitation in the permit.

b. Any upset which exceeds any effluent limitation in the permit.

c. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in Part III of the permit to be reported within 24 hours.

7. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under section D, paragraphs 1, 4, 5, and 6, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph 6.

8. Changes in Discharges of Toxic Substances

The permittee shall notify the Director as soon as it knows or has reason to believe:

a. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in the permit, if that discharge will exceed the "notification levels" described in 40 CFR 122.61.

b. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

9. Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

10. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

11. Signatory Requirements

All applications, reports or information submitted to the Director shall be signed and certified.

a. All permit applications shall be signed as follows:

(1) For a corporation: by a principal executive officer of at least the level of vice-president;

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

b. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above.

(2) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. A duly authorized representative may thus be either a named individual or any individual occupying a named position; and

(3) Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

12. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution

control agency and the Regional Administrator. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

13. Penalties for Falsification of Reports

The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

PART III
OTHER CONDITIONS

A. The "daily average" concentration means the arithmetic average (weighted by flow value) of all the daily determinations of concentration made during a calendar month. Daily determinations of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during that calendar day.

The "daily maximum" concentration means the daily determination of concentration for any calendar day.

B. "Composite sample" means a sample consisting of a minimum of three (3) grab samples of effluent collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow over a normal operating day.

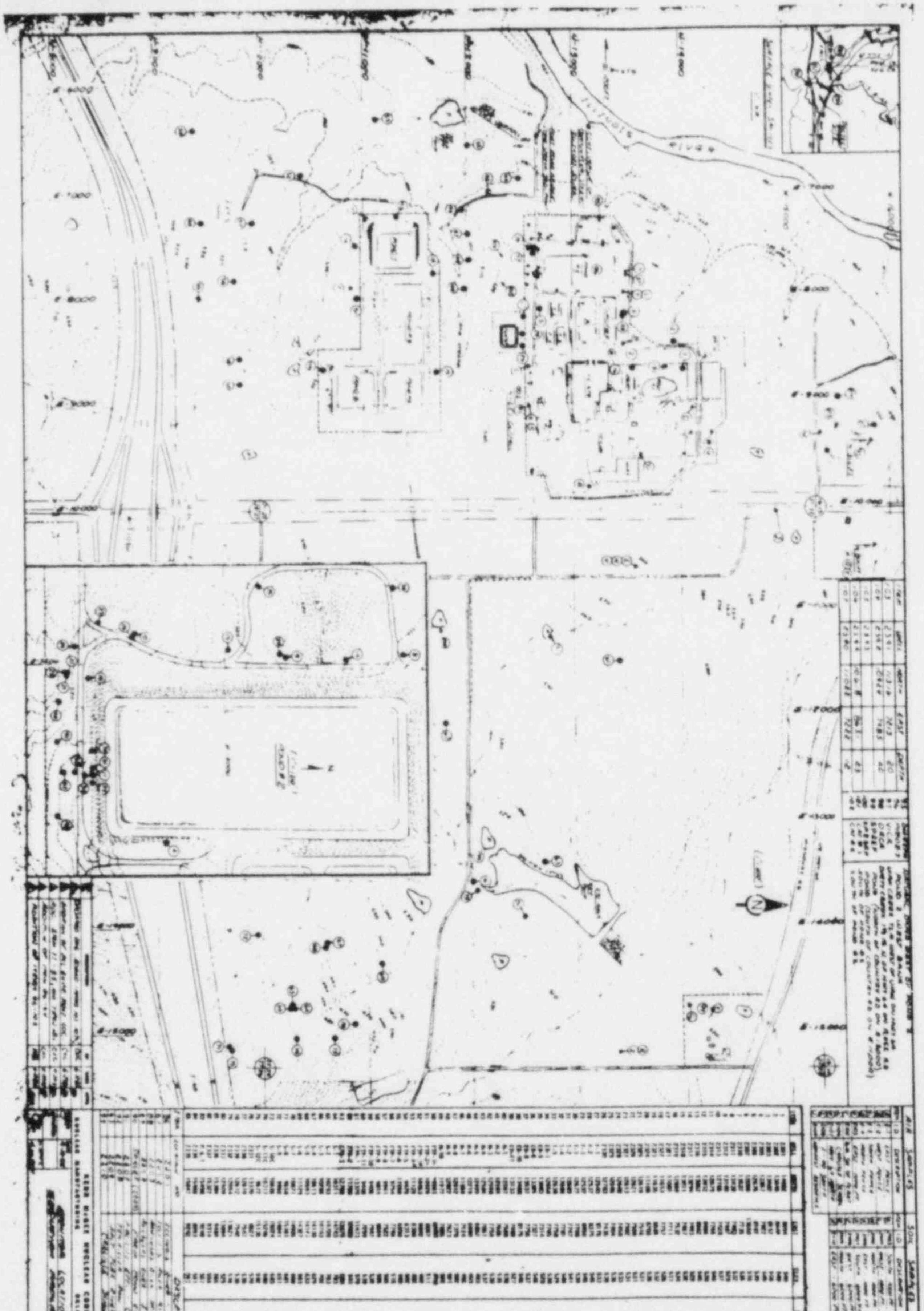
C. Test Procedures

The effluent characteristics "soluble radium 226" and "total radium 226" shall be measured by Method 706 "Radium 226 in Water" in accordance with the procedures discussed for soluble radium 226 and total radium 226 in Standard Method for the Examination of Water and Wastewater, 14th Edition, 1975, pg. 667, or an equivalent method.

Appendix C

SEQUOYAH ENVIRONMENTAL SURVEILLANCE DATA

LOCATION AND IDENTIFICATION OF SAMPLING STATIONS



1982 MONITORING DATA ON SURFACE WATER, WELL WATER, SOIL AND VEGETATION

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE: SURFACE WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2201	NO3(N)	mg/l	.3	.3	.4	.4	.5	.7	2.8	.2	2.2	.2	.2	.3	.2- 2.8	0.7	0.8
	FLUORIDE	mg/l	.1	.2	.4	.2	.1	.1	.3	.1	.2	.3	.2	.1	.1- .4	0.2	0.1
	GROSS A	pCi/l	10	10	10	10	10	10	10	10	10	10	10	10	10- 10	5.	0.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	8	43	10	7	22	16	7	6	7	8	7	7	7- 43	11.	11.
	RA-226	pCi/l		.16						.04			.58		.04- .58	0.26	0.23
2202	NO3(N)	mg/l	.6	.6	.4	.6	.4	.7	.8	.4	.3	.2	.4	.5	.2- .8	0.5	0.2
	FLUORIDE	mg/l	.2	.2	.2	.2	.3	.1	.2	.1	.1	.2	.3	.1	.1- .3	0.2	0.1
	GROSS A	pCi/l	102	133	109	45	10	10	66	170	30	140	172	204	10- 204	98.	65.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	23	20- 23	11.	4.
	URANIUM	ug/l	168	22	7	35	21	7	64	167	31	157	16	234	7- 234	77.	78.
	RA-226	pCi/l		.26						.04			.06		.04- .26	0.12	0.10
2203	NO3(N)	mg/l		.6			.1			.1			.2		.1- .6	0.2	0.2
	FLUORIDE	mg/l		.2			.3			.3			.3		.2- .3	0.3	0.0
	GROSS A	pCi/l		10			10			16			10		10- 16	8.	5.
	GROSS B	pCi/l		20			20			20			20		20- 20	10.	0.
	URANIUM	ug/l		20			24			8			29		8- 29	20.	8.
	RA-226	pCi/l		.17			.20			.15			.10		.10- .20	0.16	0.04
2204	NO3(N)	mg/l		.7			.1			.1			.1		.1- .7	0.2	0.3
	FLUORIDE	mg/l		.2			.3			.3			.4		.2- .4	0.3	0.1
	GROSS A	pCi/l		10			10			24			12		10- 24	12.	8.
	GROSS B	pCi/l		20			20			20			20		20- 20	10.	0.
	URANIUM	ug/l		29			19			11			8		8- 29	17.	8.
	RA-226	pCi/l		44			.39			.09			.38		.09- .44	0.33	0.14
2205	NO3(NO	*****						16					0		0- 16	8.	8.
	FLUORIDE	mg/l						.3							.3- .3	0.3	0.0
	GROSS A	pCi/l						10					28		10- 28	17.	12.
	GROSS B	pCi/l						20					20		20- 20	10.	0.
	URANIUM	ug/l						21					15		15- 21	18.	3.
	RA-226	pCi/l											.48		.48- .48	0.48	0.00
2207	NO3(N)	mg/l													-	0.0	0.0
	FLUORIDE	mg/l													-	0.0	0.0
	GROSS A	pCi/l	955	1200	1740	1020	670	750	785	820	930	1300	1500	1890	670- 1890	1130.	385.
	GROSS B	pCi/l	157	207	194	143		375	220	140	169	220	380	405	140- 405	237.	95.
	URANIUM	ug/l	1350	1370	1000	1130	780	900	1120	1030	1280	1600	1880	260	260- 1880	1208.	431.
	RA-226	pCi/l		.52			.05			.19			.24		.05- .52	0.25	0.17
	TH-230	pCi/l	.171	.150	.133	.077	.071	.800	.105	.101	.110	.330	.287		.071- .800	0.212	0.202

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE: WELL WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2301	NO3(N)	mg/l		140.0			88.0			76.0			41.0		41.0-140.0	86.3	35.5
	FLUORIDE	mg/l		1.2			.2			1.3			1.3		.2- 1.3	1.0	0.5
	GROSS A	pCi/l		212			160			86			80		80- 212	135.	55.
	GROSS B	pCi/l		20			28			20			20		20- 28	15.	8.
	URANIUM	ug/l		19			232			90			10		10- 232	88.	89.
	RA-226	pCi/l		12			.80			.12			.14		.12- .80	0.29	0.29
	DTW	ft.		1.7			2.8			2.7			2.3		1.7- 2.8	2.4	0.4
2302	NO3(N)	mg/l	67.0	68.0	68.0	60.0	52.0	57.0	62.0	60.0	65.0	51.0	57.0	10.0	10.0- 68.0	56.4	15.0
	FLUORIDE	mg/l	.8	.6	.6	.5	.5	.5	.6	.4	.5	.5	.5	.5	.4- .8	0.5	0.1
	GROSS A	pCi/l	12	17	16	10	10	16	18	27	18	14	17	10	10- 27	14.	6.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	18	28	46	22	35	32	14	18	18	12	31	10	10- 46	24.	10.
	RA-226	pCi/l		30			.30			.22			1.08		.22- 1.08	0.48	0.35
	DTW	ft.	1.1	.7	1.2	1.3	1.0	.6	1.3	1.4	1.1	1.8	1.8	10.8	.6- 10.8	2.0	2.7
2303	NO3(N)	mg/l	69.0	76.0	77.0	65.0	76.0	64.0	70.0	61.0	71.0	62.0	59.0	11.0	11.0- 77.0	63.4	16.9
	FLUORIDE	mg/l	.7	.5	.7	.5	.5	.6	.6	.2	.5	.5	.5	.5	.2- .7	0.5	0.1
	GROSS A	pCi/l	10	21	11		10	10		10	11	10	10	10	10- 21	8.	5.
	GROSS B	pCi/l	20	20	20		20	20		20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	15	19	25	15	17	25	13	15	14		15	10	10- 25	17.	4.
	RA-226	pCi/l		.35			.24			.11			.74		.11- .74	0.36	0.24
	DTW	ft.	5.2	4.8	5.3	6.3	5.4	6.3	7.3	8.3	8.4	8.7	9.2	2.2	2.2- 9.2	6.4	1.9
2305	NO3(N)	mg/l	11.0	21.5	25.5	31.5	18.0	2.5	24.5	32.0	33.0	29.0	29.0	4.5	2.5- 33.0	21.8	10.2
	FLUORIDE	mg/l	.4	.3	.4	.3	.4	.4	.4	.4	.9	.4	.4	.3	.3- .9	0.4	0.2
	GROSS A	pCi/l	10	10	10	10	10	14	10	10	10	10	10	10	10- 14	6.	2.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	18	19	13	16	14	31	7	8	12	21	14	27	7- 31	16.	7.
	RA-226	pCi/l		.29			.06			.09			.48		.06- .48	0.23	0.17
	DTW	ft.	19.8	11.5	14.4	19.6	14.0	11.9	20.1	21.1	19.8	19.7	20.2	20.2	11.5- 21.1	17.7	3.5
2306	NO3(N)	mg/l	1.2	.7	.2	.2	1.0	1.4	7.0	.5	1.0	3.8	.3	10.9	.2- 10.9	2.3	3.2
	FLUORIDE	mg/l	.2	.2	3.0	.3	.3	.2	.3	.3	.4	.3	.4	.2	.2- 3.0	0.5	0.8
	GROSS A	pCi/l	15	10	10	10	10	10	10	14		10	10	10	10- 15	7.	4.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20		20	20	20	20- 20	10.	0.
	URANIUM	ug/l	9	14	20	7	8	21	7	7	7	7	12	15	7- 21	10.	6.
	RA-226	pCi/l		.39			.33			.20			.23		.20- .39	0.29	0.08
	DTW	ft.	4.4	4.2	4.3	4.6	4.8	4.5	8.8	12.6	13.2	13.5	13.8	4.3	4.2- 13.8	7.8	4.1
2307	NO3(N)	mg/l						.1					.5		.1- .5	0.3	0.2
	FLUORIDE	mg/l						.3							.3- .3	0.3	0.0
	GROSS A	pCi/l						19					14		14- 19	17.	3.
	GROSS B	pCi/l						20					20		20- 20	10.	0.
	URANIUM	ug/l						52					23		23- 52	38.	15.
	RA-226	pCi/l											.43		.43- .43	0.43	0.00
	DTW	ft.						.7					9.8		.7- 9.8	5.3	4.6

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE: WELL WATER

PAGE 2 OF 8

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2310	NO3(N)	mg/l		DRY			DRY			DRY			320.0		320.0-320.0	320.0	0.0
	FLUORIDE	mg/l		DRY			DRY			DRY			.6		.6- .6	0.6	0.0
	GROSS A	pCi/l		DRY			DRY			DRY			25		25- 25	25.	0.
	GROSS B	pCi/l		DRY			DRY			DRY			20		20- 20	10.	0.
	URANIUM	ug/l		DRY			DRY			DRY			13		13- 13	13.	0.
	RA-226	pCi/l		DRY			DRY			DRY			.87		.87- .87	0.87	0.00
	DTW	ft.		DRY			DRY			DRY			24.0		24.0- 24.0	24.0	0.0
2311	NO3(N)	mg/l		55.0			38.0			DRY			DRY		38.0- 55.0	46.5	8.5
	FLUORIDE	mg/l		.3			.4			DRY			DRY		.3- .4	0.4	0.0
	GROSS A	pCi/l		10			10			DRY			DRY		10- 10	5.	0.
	GROSS B	pCi/l		20			20			DRY			DRY		20- 20	10.	0.
	URANIUM	ug/l		17			7			DRY			DRY		7- 17	10.	7.
	RA-226	pCi/l		.35			.31			DRY			DRY		.31- .35	0.33	0.02
	DTW	ft.		3.1			3.9			DRY			DRY		3.1- 3.9	3.5	0.4
2312	NO3(N)	mg/l	800.0	640.0	550.0	700.0	480.0	310.0	540.0	580.0	50.0	500.0	470.0	11.0	11.0-800.0	469.3	228.7
	FLUORIDE	mg/l	.1	.7	.8	.7	1.0	1.2	.9	.7	.7	.8	.6	.6	.1- 1.2	0.7	0.3
	GROSS A	pCi/l	13	21	10	10	20	20	18	12	16	23	21	11	10- 23	15.	6.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	7	7	17	8	18	28	12	15	17	28	12	7	7- 28	14.	8.
	RA-226	pCi/l		.31			.24			.39			.82		.24- .82	0.44	0.23
	DTW	ft.	9.8	5.7	8.0	9.2	7.8	6.1	9.4	10.6	11.3	11.8	12.8	13.5	5.7- 13.5	9.7	2.4
2313	NO3(N)	mg/l					17.0			2.0			5.0		2.0- 17.0	8.0	6.5
	FLUORIDE	mg/l					.8			1.4			1.2		.8- 1.4	1.1	0.2
	GROSS A	pCi/l					10			15			10		10- 15	8.	5.
	GROSS B	pCi/l					20			20			20		20- 20	10.	0.
	URANIUM	ug/l					7			7			10		7- 10	6.	3.
	RA-226	pCi/l					.26			.14			.44		.14- .44	0.28	0.12
	DTW	ft.					5.6			10.6			18.5		5.6- 18.5	11.6	5.3
2314	NO3(N)	mg/l	740.0	800.0	960.0	780.0	780.0	625.0	525.0	600.0	500.0	520.0	1425	525.0	500.0- 1425	731.7	250.8
	FLUORIDE	mg/l	.5	1.2	1.4	.4	1.8	1.3	1.0	1.4	1.1	1.2	1.2	1.3	.4- 1.8	1.1	0.4
	GROSS A	pCi/l	10	10	10	10	10	13	10	26	10	11	10	10	10- 26	8.	6.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	9	11	13	9	11	56	18	9	11	14	13	9	9- 56	15.	13.
	RA-226	pCi/l		.41			.37			.40			72		.37- .72	0.48	0.14
	DTW	ft.	14.3	13.1	11.7	14.5	13.9	12.8	14.3	14.5	14.4	14.8	15.2	13.2	11.7- 15.2	13.9	1.0
2315	NO3(N)	mg/l	31.0	29.0	29.0	24.0	25.0	21.0	20.0	13.0	10.0	11.0	3.0	10.0	3.0- 31.0	18.8	8.8
	FLUORIDE	mg/l	.2	.3	.3	.3	.4	.3	.3	.3	.3	.3	.4	.6	.2- .6	0.3	0.1
	GROSS A	pCi/l	10	10	10	10	10	10	10	12	10	10	10	10	10- 12	6.	2.
	GROSS B	pCi/l	10	20	20	20	20	20	20	20	20	20	20	20	10- 10	10.	0.
	URANIUM	ug/l	0	14	9	16	16	50	21	9	9	12	8	7	0- 50	14.	12.
	RA-226	pCi/l	.28	.29			.12			.06			.18		.06- .29	0.19	0.09
	DTW	ft.	4.3	4.3	4.3	4.1	3.9	4.6	4.6	3.7	2.8	3.3	3.4	3.3	2.8- 4.6	3.9	0.6

SAMPLE TYPE: WELL WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2316	NO3(N)	mg/l		12.0			11.0			11.0			5.0		5.0- 12.0	9.8	2.8
	FLUORIDE	mg/l		.2			.2			.2			.2		2- .2	0.2	0.0
	GROSS A	pCi/l		10			10			10			10		10- 10	5.	0.
	GROSS B	pCi/l		20			20			20			20		20- 20	10.	0.
	URANIUM	ug/l		13			10			19			16		10- 19	15.	3.
	RA-226	pCi/l		.20			.12			.12			.62		12- .62	0.27	0.21
	DTW	ft.		15.2			13.3			12.4			11.7		11.7- 15.2	13.2	1.3
2317	NO3(N)	mg/l	95.0	91.0	131.0	155.0	173.0	131.0	68.0	79.0	90.0	110.0	111.0	10.0	10.0-173.0	103.7	40.9
	FLUORIDE	mg/l	.3	.4	.4	.7	.7	.6	.4	.5	.6	.7	.5	.5	.3- .7	0.5	0.1
	GROSS A	pCi/l	10	10	10	14	10	10	10	10	10	10	10	10	10- 14	6.	2.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	5	41	13	7	5	7	7	8	7	21	5	7	5- 41	9.	11.
	RA-226	pCi/l		.59			1.06			.23			.36		.23- 1.06	0.56	0.32
	DTW	ft.	3.5	3.5	3.3	4.3	3.4	4.8	7.8	11.8	16.3	18.1	16.5	18.2	3.3- 18.2	9.3	6.1
2318	NO3(N)	mg/l	43.0	33.0	31.0	31.0	16.0	9.0	3.0	6.0	7.0	7.0	6.0	13.0	3.0- 43.0	17.1	13.0
	FLUORIDE	mg/l	.8	.2	.8	.5	.6	.6	.6	.7	.6	.7	.6	.6	.2- .8	0.6	0.1
	GROSS A	pCi/l	10	10	10	10	10	20	11	10	10	15	10	10	10- 20	8.	5.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	8	15	7	16	10	17	30	9	12	7	11	7	7- 30	12.	7.
	RA-226	pCi/l		.66			.17			.20			.47		.17- .66	0.38	0.20
	DTW	ft.	10.3	3.6	3.8	9.5	4.4	3.8	1.9	9.0	11.7	13.3	12.8	1.4	1.4- 13.3	7.1	4.2
2319	NO3(N)	mg/l	1300	700	3400	3000	3600	2000	2600	2700	2600	2500	3100	4300	700- 4300	2650.0	939.4
	FLUORIDE	mg/l		.8	.7	.3	.9	24.1	16.7	19.4	.2	30.0	.8	1.0	.2- 30.0	8.6	11.0
	GROSS A	pCi/l	44	110	136	94	160	178	10	140	90	110	95	200	10- 200	114.	52.
	GROSS B	pCi/l	20	62	64	28	60	73	20	37	43	80	39	87	20- 87	49.	25.
	URANIUM	ug/l	8	16	16	7	9	9	8	7	7	9	8	12	7- 16	9.	4.
	RA-226	pCi/l	5.07	14.30	13.00		10.90			4.90			7.03		4.90-14.30	9.20	3.73
	DTW	ft.		3.6	6.8	10.1	5.0	4.7	9.8	13.0	15.0	18.8	19.0	1.9	1.9- 19.0	9.8	5.7
2321	NO3(N)	mg/l		22.0			10.0			12.0			7.0		7.0- 22.0	12.8	5.6
	FLUORIDE	mg/l		2			.5			.5			.5		.2- .5	0.4	0.1
	GROSS A	pCi/l		18			18			10			10		10- 18	12.	7.
	GROSS B	pCi/l		20			20			20			20		20- 20	10.	0.
	URANIUM	ug/l		9			33			35			36		9- 36	28.	11.
	RA-226	pCi/l		.32			.11			04			.49		04- .49	0.24	0.18
	DTW	ft.		15.6			13.8			13.8			14.8		13.8- 15.6	14.5	0.8
2322	NO3(N)	mg/l		DRY			DRY			DRY			DRY		-	0.0	0.0
	FLUORIDE	mg/l		DRY			DRY			DRY			DRY		-	0.0	0.0
	GROSS A	pCi/l		DRY			DRY			DRY			DRY		-	0.	0
	GROSS B	pCi/l		DRY			DRY			DRY			DRY		-	0.	0
	URANIUM	ug/l		DRY			DRY			DRY			DRY		-	C.	0
	RA-226	pCi/l		DRY.			DRY			DRY			DRY		-	0.00	* 0.00
	DTW	ft		DRY			DRY			DRY			DRY		-	0.0	0.0

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2323	NO3(N)	mg/l		2.0			DRY			.8			DRY		.8- 2.0	1.4	0.6
	FLUORIDE	mg/l		.2			DRY			.2			DRY		.2- .2	0.2	0.0
	GROSS A	pCi/l		20			DRY			16			DRY		16- 20	18.	2
	GROSS B	pCi/l		20			DRY			20			DRY		20- 20	10.	0
	URANIUM	ug/l		7			DRY			29			DRY		7- 29	16.	13
	PA-226	pCi/l		3.19			DRY			.12			DRY		.12- 3.19	1.65	1.54
	DTW	ft.		19.5			DRY			19.9			DRY		19.5- 19.9	19.7	0.2
2324	NO3(N)	mg/l		1.6			DRY			.8			.7		.7- 1.6	1.0	0.4
	FLUORIDE	mg/l		.7			DRY			.8			.4		.4- .8	0.6	0.2
	GROSS A	pCi/l		19			DRY			26			23		19- 26	23.	3.
	GROSS B	pCi/l		20			DRY			20			20		20- 20	10.	0
	URANIUM	ug/l		26			DRY			65			34		26- 65	42.	17.
	PA-226	pCi/l		.26			DRY			.12			.90		.12- .90	0.43	0.34
	DTW	ft.		27.1			DRY			28.6			27.6		27.1- 28.6	27.8	0.6
2325	NO3(N)	mg/l			790.0	860.0	1120	1240	1470	1920	2040	2160	2640	1930	790.0- 2640	1617.0	581.2
	FLUORIDE	mg/l			1.9	1.0	4.0	4.7	5.6	6.9	5.8	2.6	.7	1.8	.7- 6.9	3.5	2.1
	GROSS A	pCi/l			10	10	11	17	16	10	17	18	16	15	10- 18	13.	5.
	GROSS B	pCi/l			20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l			39	8	18	27	19	75	16	15	19	23	8- 75	26.	18.
	RA-226	pCi/l			.36		.33			.36			.43		.33- .43	0.37	0.04
	DTW	ft.			17.3	17.5	16.8	17.4	17.8	18.5	8.8	18.1	18.4	18.5	8.8- 18.5	16.9	2.8
2326	NO3(N)	mg/l			54.0	113.0	100.0	74.0	122.0	DRY	DRY	DRY	DRY	204.0	54.0-204.0	111.2	47.5
	FLUORIDE	mg/l			.5	.3	1.1	.9	1.1	DRY	DRY	DRY	DRY	2.6	.3- 2.6	1.1	0.7
	GROSS A	pCi/l			20	10	10	10	10	DRY	DRY	DRY	DRY	10	10- 20	8.	6.
	GROSS B	pCi/l			20	20	20	20	20	DRY	DRY	DRY	DRY	20	20- 20	10.	0.
	URANIUM	ug/l			16	7	7	14	20	DRY	DRY	DRY	DRY	9	7- 20	11.	6.
	RA-226	pCi/l			.25		.34			DRY	DRY	DRY	DRY		.25- .34	0.30	0.05
	DTW	ft.			6.8	13.0	8.5	6.7	14.8	DRY	DRY	DRY	DRY	5.5	5.5- 14.8	9.2	3.5
2327	NO3(N)	mg/l			930.0	1150	1450	1540	1460	1840	2020	1960	2410	1930	930.0- 2410	1669.0	421.7
	FLUORIDE	mg/l			.8	.9	1.7	2.3	4.3	4.4	2.9	2.7	1.0	1.5	.8- 4.4	2.3	1.3
	GROSS A	pCi/l			15	10	10	16	13	10	10	18	21	14	10- 21	12.	6.
	GROSS B	pCi/l			20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l			16	16	25	48	197	30	16	16	20	32	16- 197	42.	53.
	RA-226	pCi/l			.32		.34			.55			.36		.32- .55	0.39	0.09
	DTW	ft.			23.0	22.8	22.4	22.3	21.8	22.9		21.6	21.4	21.8	21.4- 23.0	22.2	0.6
2328	NO3(N)	mg/l			650.0	1080	1130	1440	1270	760	1200	1560	1810	560	560- 1810	1146.0	382.1
	FLUORIDE	mg/l			1.2	.5	4.0	2.9	2.4	3.9	3.4	3.0	3.3	1.5	.5- 4.0	2.6	1.1
	GROSS A	pCi/l			18	10	10	18	12	27	17	14	20	10	10- 27	14.	7.
	GROSS B	pCi/l			20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l			23	10	18	67	71	25	19	20	24	20	10- 71	30.	20.
	PA-226	pCi/l			.60		.45			.36			5.66		.36- 5.66	1.79	2.24
	DTW	ft.			20.7	20.3	20.3	19.4	19.6	20.9	21.7	21.3	21.6	21.5	19.4- 21.7	20.7	0.8

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE WELL WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2330	NO3(N)	mg/l			7.4	6.9	9.4	9.4	12.4	12.3	12.2	12.4	1.3	9.9	1.3- 12.4	9.4	3.3
	FLUORIDE	mg/l			.8	.2	.5	.9	.9	.7	.7	.4	.8	2.7	.2- 2.7	0.9	0.6
	GROSS A	pCi/l			15	10	10	21	10	23	10	12	28	10	10- 28	12.	8.
	GROSS B	pCi/l			20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l			26	31	38	45	27	60	25	19	20	19	19- 60	31.	13.
	RA-226	pCi/l			.20		.10			.15			.17		.10- .20	0.16	0.04
	DTW	ft.			24.9	24.5	24.1	24.0	24.2	24.6	24.6	24.8	25.3	24.5	24.0- 25.3	24.6	0.4
2329	NO3(N)	mg/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	9.7	9.7- 9.7	9.7	0.0
	FLUORIDE	mg/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	.8	.8- .8	0.8	0.0
	GROSS A	pCi/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	10	10- 10	5.	0.
	GROSS B	pCi/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	20	20- 20	10.	0.
	URANIUM	ug/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	10	10- 10	10.	0.
	RA-226	pCi/l				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY		-	0.00	0.00
	DWT	*****				DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	20	20- 20	20.	0.
ED-1	NO3(N)	mg/l	420.0	440.0	520.0	510.0	500.0	570.0	640.0	550.0	60.0	560.0	560.0	525.0	60.0-640.0	487.9	140.6
	FLUORIDE	mg/l	1.9	1.5	.9	.9	1.1	1.1	1.1	1.2	1.2	.2	.9	1.1	.2- 1.9	1.1	0.4
	GROSS A	pCi/l	29	47	47	42	36	46	10	32	37	19	31	26	10- 47	33.	12.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	49	44	50	31	49	21	26	28	21	27	26	30	21- 50	34.	11.
	RA-226	pCi/l		.72			.99			1.22			1.62		.72- 1.62	1.14	0.33
	DTW	ft.	23.0	22.5	24.3	25.3	25.4	26.7	27.2	27.6	28.3	28.3	28.9	29.2	22.5- 29.2	26.4	2.2
ED-5	NO3(N)	mg/l	5.0	1.5	.8	1.0	3.0	1.5	3.4	.3	.2	.2	.9	6.2	.2- 6.2	2.0	1.9
	FLUORIDE	mg/l	.6	.6	.4	.3	.3	.3	.3	.5	.6	.4	1.1	.3	.3- 1.1	0.5	0.2
	GROSS A	pCi/l	10	10	10	10	10	10	10	13	10	10	10	13	10- 13	6.	3.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	14	13	17	16	27	18	9	25	10	17	25	10	9- 27	17.	6.
	RA-226	pCi/l		.22			.12			.09			.27		.09- .27	0.18	0.07
	DTW	ft.	1.6	1.3	1.8	5.0	3.7	3.1	8.3	12.8	16.8	18.4	19.8	1.0	1.0- 19.8	7.8	6.9
ED-6	NO3(N)	mg/l		DRY			DRY			DRY			DRY		-	0.0	0.0
	FLUORIDE	mg/l		DRY			DRY			DRY			DRY		-	0.0	0.0
	GROSS A	pCi/l		DRY			DRY			DRY			DRY		-	0.	0.
	GROSS B	pCi/l		DRY			DRY			DRY			DRY		-	0.	0.
	URANIUM	ug/l		DRY			DRY			DRY			DRY		-	0.	0.
	RA-226	pCi/l		DRY			DRY			DRY			DRY		-	0.00	0.00
	DTW	ft.		DRY			DRY			DRY			DRY		-	0.0	0.0
ED-8	NO3(N)	mg/l		2.4			2.4			3.6			2.0		2.0- 3.6	2.6	0.6
	FLUORIDE	mg/l		1.2			1.0			1.3			.9		.9- 1.3	1.1	0.2
	GROSS A	pCi/l		18			10			14			15		10- 18	13.	5.
	GROSS B	pCi/l		20			20			20			20		20- 20	10.	0
	URANIUM	ug/l		21			28			24			24		21- 28	24.	2.
	RA-226	pCi/l		.38			.16			.06			.24		.06- .38	0.21	0.12
	DTW	ft.		22.9			24.3			24.8			23.6		22.9- 24.8	23.9	0.7

SAMPLE TYPE: WELL WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
LD-10	NO3(N)	mg/l	2.8	2.5	2.9	2.3	2.0	2.4	2.6	3.0	3.0	2.8	2.7	2.5	2.0- 3.0	2.6	0.3
	FLUORIDE	mg/l	1.6	1.5	1.1	1.3	1.2	1.5	1.2	1.4	1.4	1.3	.5	1.5	.5- 1.6	1.3	0.3
	GROSS A	pCi/l	28	34	32	36	34	32	49	41	32	26	32	22	22- 49	33.	7
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0
	URANIUM	ug/l	91	24	48	18	63	39	25	28	19	14	28	21	14- 91	35.	22.
	RA-226	pCi/l		.29			.27			.08			.41		.08- .41	0.26	0.12
	DTW	ft.	21.8	22.2	22.2	23.8	22.8	25.8	23.0	23.0	22.7	22.3	22.3	21.6	21.6- 25.8	22.8	1.1
SD-11	NO3(N)	mg/l	2.0	1.3	1.1	1.0	.6	2.2	2.1	1.9	1.7	1.4	1.9	1.6	.6- 2.2	1.6	0.5
	FLUORIDE	mg/l	.5	.7	.6	.5	.5	.5	.5	.6	.5	.7	.5	.5	.5- .7	0.6	0.1
	GROSS A	pCi/l	30	15	13	10	15	18	12	24	22	10	20	18	10- 30	16.	7.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0
	URANIUM	ug/l	48	10	34	22	41	34	29	32	27	25	11	30	10- 48	29.	10.
	RA-226	pCi/l		.84			.21			.43			.19		.19- .84	0.42	0.26
	DTW	ft.	16.3	14.4	16.5	16.8	17.0	17.0	17.3	17.1	16.4	16.3	16.4	15.8	14.4- 17.3	16.4	0.7
T-1	NO3(N)	mg/l	600.0	270.0	360.0	640.0	790.0	430.0	760.0	820.0	1440	1720	1360	660	270.0- 1720	820.8	434.3
	FLUORIDE	mg/l	.7	.7	.4	.5	1.2	1.2	1.3	.7	1.9	1.9	1.6	1.3	.4- 1.9	1.1	0.5
	GROSS A	pCi/l	10	10	10	10	11	10	10	11	10	12	11	10	10- 12	7.	3
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	9	7	14	14	19	8	15	10	9	9	12	13	7- 19	11.	4.
	RA-226	pCi/l		.32			.33			.21			.46		.21- .46	0.33	0.09
	DTW	ft.	15.2	13.3	13.2	14.7	14.4	12.2	14.8	15.7	15.8	16.6	17.1	16.8	12.2- 17.1	15.0	1.5
T-2	NO3(N)	mg/l	200.0	72.0	112.0	154.0	93.0	48.0	69.0	338.0	980.0	1320	1380	160	48.0- 1380	410.5	484.9
	FLUORIDE	mg/l	1.0	.8	.7	.1	.6	.5	.7	.3	1.7	2.1	1.7	1.0	.1- 2.1	0.9	0.6
	GROSS A	pCi/l	10	10	10	10	24	10	10	10	13	20	20	10	10- 24	10.	7.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	11	0	12	8	23	12	15	20	43	21	17	8	0- 43	16.	10.
	RA-226	pCi/l		.66			.16			.25			.74		.16- .74	0.45	0.29
	DTW	ft.	16.2	5.2	5.8	13.7	11.3	5.1	17.8	19.3	19.3	19.6	19.8	7.3	5.1- 19.8	13.4	5.9
T-4	NO3(N)	mg/l	1500	1350	1750	1100	1650	1500	1100	1050	950	1180	1250	1450	950- 1750	1319.2	242.8
	FLUORIDE	mg/l	3.3	.8	2.7	.2	.5	2.9	2.2	.5	2.0	.4	.4	2.8	.2- 3.3	1.6	1.1
	GROSS A	pCi/l	15	17	23	20	40	28	17	11	10	15	10	11	10- 40	17.	9.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	17	7	6	9	18	11	23	8	7	52	8	7	7- 52	13	13.
	RA-226	pCi/l		1.06			.48			.51			91		.48- 1.06	0.74	0.25
	DTW	ft.	9.8	9.8	9.8	9.8	9.3	9.2	9.1	9.1	9.1	9.1	9.5	12.3	9.1- 12.3	9.7	0.8
T-5	NO3(N)	mg/l	320.0	92.0	108.0	128.0	140.0	143.0	172.0	195.0	380.0	488.0	405.0	69.0	69.0-488.0	220.0	134.5
	FLUORIDE	mg/l	1.6	9	1.0	1.0	1.3	1.3	1.3	.6	1.4	.6	1.1	1.1	.6- 1.6	1.1	0.3
	GROSS A	pCi/l	49	26	23	14	10	10	14	11	32	30	44	15	10- 49	22.	14.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	68	15	20	19	17	12	22	16	24	40	50	13	12- 68	26.	17.
	RA-226	pCi/l		19			20			56			8.15		19- 8.15	2.27	3.40
	DTW	ft.	20.3	16.3	18.6	19.4	18.9	17.8	19.1	19.5	19.7	20.0	20.5	18.8	16.3- 20.5	19.1	1.1

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
F-1	NO3(N)	mg/l	14.4	38.5	37.0	40.5	35.0	11.5	17.0	12.0	16.0	22.0	12.0	12.0	11.5- 40.5	22.3	11.3
	FLUORIDE	mg/l	.7	.3	.4	.2	.3	.4	.4	.5	.4	.4	.6	.4	.2- .7	0.4	0.1
	GROSS A	pCi/l	10	10	10	12	10	10	10	10	10	10	12	10	10- 12	6.	3.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	3	7	11	7	15	8	9	8	11	13	7	8	3- 15	8.	4.
	RA-226	pCi/l		.30			.14			.59			.39		.14- .59	0.35	0.16
	DTW	ft.	10.6	3.7	6.6	9.4	10.5	7.3	9.8	10.7	11.6	12.8	13.6	2.7	2.7- 13.6	9.1	3.3
F-2	NO3(N)	mg/l	5.4	9.0	9.2	8.8	6.0	.6	.2	.4	.4	DRY	DRY	.7	.2- 9.2	4.1	3.8
	FLUORIDE	mg/l	1.3	.6	.7	.9	1.1	.7	.7	.8	1.4	DRY	DRY	.9	.6- 1.4	0.9	0.3
	GROSS A	pCi/l	10	10	10	10	10	10	10	10	21	DRY	DRY	10	10- 21	7.	5.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	DRY	DRY	20	20- 20	10.	0.
	URANIUM	ug/l	18	7	15	7	63	12	7	21	10	DRY	DRY	11	7- 63	16.	17.
	RA-226	pCi/l		.18			.48			.27		DRY	DRY		.18- .48	0.31	0.13
	DTW	ft.	10.6	5.3	8.1	10.5	10.8	4.9	8.8	9.7	11.2	DRY	DRY	5.1	4.9- 11.2	8.5	2.4
F-3	NO3(N)	mg/l	.5	.4	.6	.7	.1	.3	.3	.2	.2	.7	.3	.4	.1- .7	0.4	0.2
	FLUORIDE	mg/l	.4	.5	.5	.8	.7	.5	.6	.9	.7	.7	.6	.6	.4- .9	0.6	0.1
	GROSS A	pCi/l	23	32	53	37	14	28	13	19	24	17	20	15	13- 53	25.	11.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	23	15	72	42	32	28	25	24	25	18	21	25	15- 72	29.	14.
	RA-226	pCi/l		.41			.15			.18			.12		.12- .41	0.22	0.11
	DTW	ft.	16.8	16.8	16.7	16.4	16.4	16.2	16.3	16.6	16.3	6.1	16.6	16.6	6.1- 16.8	15.7	2.9
M-1	NO3(N)	mg/l		156.0	92.0	93.0	10.0	6.0	12.0	70.0	30.0	43.0	40.0	106.0	6.0-156.0	56.2	44.4
	URANIUM	ug/l		7	9	7	6	21	11	9	10	13	208	7	7- 208	27.	58.
	DTW	ft.		5.8	6.7	12.2	9.9	8.3	14.3	15.9	16.6	16.9	17.5	5.8	5.8- 17.5	11.8	4.5
M-2	NO3(N)	mg/l		30.0		63.0	DRY	36.0	54.0	36.0	61.0	62.0	64.0	61.0	30.0- 64.0	51.9	13.0
	URANIUM	ug/l		29		44	DRY	26	26	27	71	28	12	42	12- 71	34.	16.
	DTW	ft.		19.0		19.0	DRY	18.5	18.6	18.8	18.5	18.7	18.9	18.8	18.5- 19.0	18.8	0.2
M-3	NO3(N)	mg/l	14.0	19.0	17.0	20.0	14.0	10.0	15.0	13.0	16.0	23.0	31.0	17.0	10.0- 31.0	17.4	5.3
	FLUORIDE	mg/l	.7	.3	.8	.3	1.0	.2	.3	.2	.3	.3	.3	.2	.2- 1.0	0.4	0.3
	GROSS A	pCi/l	10	10	10	10	24	10	10	19	19	10	10	10	10- 24	8.	6.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	17	10	10	7	15	10	7	50	50	14	12	7	7- 50	17.	16.
	RA-226	pCi/l		.28			.04			.27			.24		.04- .28	0.21	0.10
	DTW	ft.	18.9	19.0	19.6	20.2	19.3	16.7	18.1	19.9	19.7	20.1	20.8	22.4	18.1- 22.4	19.7	1.1
M-4	NO3(N)	mg/l		87.0	73.0	92.0	37.0	20.0	27.0	37.0	30.0	33.0	29.0	90.0	20.0- 92.0	50.6	27.5
	URANIUM	ug/l		7	14	7	20	7	8	18	12	19	15	7	7- 20	11.	6.
	DTW	ft.		13.5	13.9	17.9	15.3	12.2	17.9	18.9	20.0	19.4	19.8	5.8	5.8- 20.0	15.9	4.1

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE: WELL WATER

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
M-5	NO3(N)	mg/l		4.2	3.8	3.8	3.8	6.0	1.0	4.2	3.6	3.6	4.2	105.0	1.0-105.0	13.0	29.1
	URANIUM	ug/l		7	3	7	29	56	9	6	11	12	9	15	7- 56	14.	15.
	DTW	ft.		14.5	14.3	14.3	14.2	13.3	14.8	14.3	.2	15.0	14.8	14.7	.2- 15.0	13.1	4.1
M-6	NO3(N)	mg/l		1.5	3.1	2.9	.1	.3	.2	.1	.1	.2	.5	1.1	.1- 3.1	0.9	1.1
	URANIUM	ug/l		7	8	7	8	11	7	4	18	13	12	9	7- 18	8.	5.
	DTW	ft.		16.7	15.4	18.4	19.8	16.7	20.3	20.3	18.9	19.3	19.2	19.0	15.4- 20.3	18.5	1.5
M-7	NO3(N)	mg/l		2.2	DRY	DRY	DRY	.1	DRY	DRY	DRY	DRY	DRY	DRY	.1- 2.2	1.1	1.1
	URANIUM	ug/l		7	DRY	DRY	DRY	7	DRY	DRY	DRY	DRY	DRY	DRY	7- 7	4.	0.
	DTW	ft.		12.1	DRY	DRY	DRY	8.4	DRY	DRY	DRY	DRY	DRY	DRY	8.4- 12.1	10.3	1.9
M-8	NO3(N)	mg/l		193.0	38.0	34.0	33.0	26.0	29.0	33.0	18.0	DRY	DRY	4.0	4.0-193.0	45.3	53.1
	URANIUM	ug/l		7	6	12	23	8	10	33	32	DRY	DRY	10	7- 33	15.	11.
	DTW	ft.		2.2	2.7	4.6	3.9	3.5	6.9	8.8	8	DRY	DRY	12.7	.8- 12.7	5.1	3.5
M-9	NO3(N)	mg/l		208.0	204.0	1.8	178.0	227.0	174.0	DRY	DRY	DRY	DRY	199.0	1.8-227.0	170.3	70.8
	FLUORIDE	mg/l			1.3	5	1.8	1.9	4.5	DRY	DRY	DRY	DRY	2.0	5- 4.5	2.0	1.2
	GROSS A	pCi/l	26	16	25	24	10	34	24	DRY	DRY	DRY	DRY		10- 34	22.	8.
	GROSS B	pCi/l	20	20	20	20	20	20	20	DRY	DRY	DRY	DRY		20- 20	10.	0.
	URANIUM	ug/l		18	14	19	23	8	7	DRY	DRY	DRY	DRY	7	7- 23	13.	7.
	RA-226	pCi/l		2.36			1.25			DRY	DPY	DRY	DRY		1.25- 2.36	1.80	0.55
	DTW	ft.		5	.4	2.9	2.4	2.0	10.8	DRY	DRY	DRY	DRY	1.1	.4- 10.8	2.9	3.4
M-10	NO3(N)	mg/l		31.0	24.0	28.5	18.5	20.5	20.0	40.5	DRY	DRY	DRY	43.0	18.5- 43.0	28.3	8.8
	URANIUM	ug/l		7	14	7	7	7	7	8	DRY	DRY	DRY	7	7- 14	5.	4.
	DTW	ft.		1.8	2.8	3.9	4.4	4.3	9.3	10.5	DRY	DRY	DRY	4.4	1.8- 10.5	5.2	2.9

TABLE 14-9

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

YEAR 1982

SAMPLE TYPE: SOIL SAMPLES

PAGE 1 OF 1

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2403	FLUORIDE	ug/g				150.0						150.0			150.0-150.0	150.0	0.0
	URANIUM	ug/g				5						10			5- 10	8.	3
2404	FLUORIDE	ug/g				190.0						190.0			190.0-190.0	190.0	0.0
	URANIUM	ug/g				270						2			2- 270	136.	134.
2405	FLUORIDE	ug/g				180.0						350.0			180.0-350.0	265.0	85.0
	URANIUM	ug/g				13						50			13- 50	32.	19.
2406	FLUORIDE	ug/g				130.0						150.0			130.0-150.0	140.0	10.0
	URANIUM	ug/g				8						10			8- 10	9.	1.
2407	FLUORIDE	ug/g				190.0									190.0-190.0	190.0	0.0
	URANIUM	ug/g				2									2- 2	2.	0.
2408	FLUORIDE	ug/g				140.0									140.0-140.0	140.0	0.0
	URANIUM	ug/g				3									3- 3	3.	0.
2409	FLUORIDE	ug/g				130.0						140.0			130.0-140.0	135.0	5.0
	URANIUM	ug/g				3						6			3- 6	5.	2.
2410	FLUORIDE	ug/g				94.0						120.0			94.0-120.0	107.0	13.0
	URANIUM	ug/g				1						5			1- 5	3.	2.

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

TABLE 14-9

YEAR 1982

SAMPLE TYPE VEGETATION SAMPLES

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2503	FLUORIDE	ug/g				300.0						54.0			54.0-300.0	177.0	123.0
	URANIUM	ug/g				2						3			2- 3	3.	1
2504	FLUORIDE	ug/g				170.0						170.0			170.0-170.0	170.0	0.0
	URANIUM	ug/g				6						10			6- 10	8.	2
2505	FLUORIDE	ug/g				66.0						53.0			58.0- 66.0	62.0	4.0
	URANIUM	ug/g				5						8			5- 8	7.	2.
2506	FLUORIDE	ug/g				91.0						37.0			37.0- 91.0	64.0	27.0
	URANIUM	ug/g				1						4			1- 4	3.	2.
2507	FLUORIDE	ug/g				32.0						15.0			15.0- 32.0	23.5	8.5
	URANIUM	ug/g				1						2			1- 2	2.	1
2508	FLUORIDE	ug/g				31.0						21.0			21.0- 31.0	26.0	5.0
	URANIUM	ug/g				0						1			0- 1	1.	0.
2509	FLUORIDE	ug/g				33.0						8.0			8.0- 33.0	20.5	12.5
	URANIUM	ug/g				1						1			1- 1	1.	0.
2510	FLUORIDE	ug/g				9.0						13.0			9.0- 13.0	11.0	2.0
	URANIUM	ug/g				1						2			1- 2	2.	1.

*ALL NUMBERS AT OR BELOW THE ANALYTICAL DETECTION LIMIT ARE COMPUTED AS 50% OF THE LLD IN THE MEAN AND STANDARD DEVIATION.

LLD AS FOLLOWS:

	GROSS ALPHA	- 10 pCi/l
	GROSS BETA	- 20 pCi/l
	Ra-226	- 01 pCi/l
	Th-230	- 001 pCi/l
	FLUORIDE	- 1 mg/l
	NITRATE	- 1 mg/l
	URANIUM	- 7 ug/l
SOIL	URANIUM	- 1 ug/g
SOIL	FLUORIDE	- 10 ug/g
VEG	URANIUM	- 03 ug/g
VEG	FLUORIDE	- 2 ug/g

TABLE 14-9

SEQUOYAH ENVIRONMENTAL SURVEILLANCE

YEAR 1982

SAMPLE TYPE: SURFACE WATER

PAGE 2 OF 2

LOCAT	ANALYSIS	UNITS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RANGE	MEAN*	STD DEV*
2208	NO3(N)	mg/l						.8					.1		.1- .8	0.4	0.4
	FLUORIDE	mg/l						.2							.2- .2	0.2	0.0
	GROSS A	pCi/l						10					10		10- 10	5.	0.
	GROSS B	pCi/l						20					20		20- 20	10.	0.
	URANIUM	ug/l						16					17		16- 17	17.	1.
	RA-226	pCi/l											.06		.06- .06	0.06	0.00
2209	NO3(N)	mg/l	1.7	6.5	1.0	3.5	1.5	9.0	.1	DRY	DRY	DRY	.1	2.7	.1- 9.0	3.1	3.2
	FLUORIDE	mg/l			.3	.2	.2	.3	.4	DRY	DRY	DRY	.2	.1	.1- .4	0.2	0.1
	GROSS A	pCi/l	10	10	10	10	10	10	10	DRY	DRY	DRY	10	10	10- 10	5.	0.
	GROSS B	pCi/l	20	20	20	20	20	20	20	DRY	DRY	DRY	20	20	20- 20	10.	0.
	URANIUM	ug/l	4	7	5	17	0	65	31	DRY	DRY	DRY		8	4- 65	17.	20.
	RA-226	pCi/l	.15	.11			.21	.23	.18	DRY	DRY	DRY	10.00		.11-10.00	1.81	3.66
2210	NO3(N)	mg/l	.2	.2	.3	.1	.1	.2	1.0	.1	.2		.2	.2	.1- 1.0	0.2	0.3
	FLUORIDE	mg/l	.3	.1	.2	.1	.2	.1	.2	.1	.2		.2	.2	.1- .3	0.2	0.1
	GROSS A	pCi/l	10	10	10	10	10	10	10	10	10	10	10	10	10- 10	5.	0.
	GROSS B	pCi/l	20	20	20	20	20	20	20	20	20	20	20	20	20- 20	10.	0.
	URANIUM	ug/l	2	7	7	7	10	11	6	4	8			17	2- 17	7.	4.
	RA-226	pCi/l		.30			.13			.48			15.00		.13-15.00	3.98	6.37

1983 SURFACE WATER

1983

2201

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
1/24	1/12*	14	.3	.2	<10	<20		28.	4.7	7.	90.
2/28	2/10*	7	.5	.1	<10	<20		28.	4.3	7.1	103.
3/31	3/16*	< 7	1	.1	11	<20	.004	26.	6.2	10.	81
4/28		< 7	.5	.1	<10	<20		30	4.1	7	94
5/26		< 7	.8	.1	<10	<20	6E-03	30	3.9	14	
6/17		< 7	.6	.3	<10	<20					
7/28		10	.8	.1	<10	<20		30	6.0	10.6	104
8/26		< 7	.5	.1	<10	<20	.03	33	5.8	9.7	99
9/30		< 7	.2	.2	<10	<20		37	7.3	12	113
10/27		< 7	.3	.1	<10	<20		35	10.6	20.2	119
11/17		< 7	.3	.1	11	<20	.04			19	111
12/21		8	.2	.08				32	7.1	13.0	89
01/06											
AVG	7.3	6.2	.8	.2	10.4	20	0	30.9	6	11.8	100.3
STD DEV	10.57	3.85	1	.33	.9	0	.03	3.38	2.02	4.54	11.99
MAXIMUM	23.08	14	4	1.3	13	20	.07	37	10.6	20.2	119
MINIMUM	1	1	.2	.08	10	20	4E-03	26	3.9	7	81

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

1983

2202

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
1/24	1/12*	15	.5	.2	170	46		28.	4.9	5.	92
2/?8	2/10*	48	.7	.1	35	<20		29.	4.9	7.1	90
3/31	3/10*	20	1	.1	20	<20	.05	24.	6.4	6	74
4/28		23	.6	.1	16	<20		30	4.4	7.7	99
5/26		9	.7	.1	<10	<20	.04	30	4.3	7.7	
6/17		8	.6	.3	<10	<20					
7/28		19	.8	.1	11	<20		30	8.9	14.5	107
8/26		< 7	.04	.3	<10	<20	.04	45	80	111	135
9/30		14	.2	.1	13	<20		37	11	17.8	113
10/27		7	.2	.1	28	<20		36	10.6	19.7	119
11/17		< 7	.3	.2	21	<20	.04			48	
12/21		26	.24	.13				33	9.0	15.4	87
01/06											
AVG	7.3	15.8	.8	.2	29.8	22.2	0	32.2	14.4	23.6	101.8
STD DEV	10.57	12.27	1.01	.33	44.87	7.51	.01	5.88	23.18	31.41	18.66
MAXIMUM	23.08	48	4	1.3	170	46	.07	45	80	111	135
MINIMUM	1	1	.04	.1	10	20	.04	24	4.3	5	74

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

2202

1983

2203

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
1/12			.2					39	23	34	117
2/10			.6					41.	34.	55.	112.
3/16			.4					49.	135.	219.	117.
3/31		< 7	1.	.3	<10	<20	.11				
4/28		< 7	.7					42	57	91	120
5/26		< 7	.6	.2	15	<20	.1	36	46	79	
6/17	6/22*	15	.6					51	118	88	131
7/28		11	.2					51	135	226	138
8/26		< 7	.04	.3	<10	<20	.04	45	88	118	123
9/30		< 7	.3					57	121	183	154
10/27			.2					58	140	221	178
11/17		15	.4	.3	11	<20	.06			135	148
12/21			.32					46	56	92	112
01/06											
AVG	6	7.4	.4	.3	11.5	20	.1	46.8	86.6	128.4	131.8
STD DEV	0	5.48	.26	.05	2.38	0	.03	7.12	44.7	67.78	20.9
MAXIMUM	6	15	1	.3	15	20	.11	58	140	226	178
MINIMUM	6	2	.04	.2	10	20	.04	36	23	34	112

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

2203

1983

2204

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
1/12			.3					34	13.7	21	103.
2/10			.4					36.	35.	53.	117.
3/16			.4					50.	141.	228.	117.
3/31		< 7	1.	.2	<10	<20	.04				
4/28		< 7	.8					40	57	95	112
5/26		< 7	.6	.2	<10	<20	.05	34	49	83	
6/17	6/22*	< 7	.68					50	117	90	133
7/28		9	.1					48	132	213	138
8/26		< 7	.1	.3	<10	<20	.03	44	74	108	120
9/30		9	.2					54	110	169	148
10/27			.3					58	141	219	137
11/17		< 7	.3	.3	<10	<20	.07			137	128
12/?1			.40					43	55	92	115
01/06											
AVG	6	4.3	.4	.3	10	20	0	44.6	84.1	125.7	124.4
STD DEV	0	3.41	.27	.06	0	0	.02	8.13	45.61	67.78	13.48
MAXIMUM	6	9	1	.3	10	20	.07	58	141	228	148
MINIMUM	6	1	.1	.2	10	20	.03	34	13.7	21	103

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

2204

1983

2205

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
3/31											
4/28											
5/26		< 7	.4	.2	<10	<20	1E-03	24	7.5	6.7	
6/17											
7/28		< 7	.2					25	14.614.610.6164		
8/26	DRY										
9/30	DRY										
10/27											
11/17	NS										
01/06											
AVG		3	.3	.2	10	20	0	24.5	11.1	85.4	
STD DEV	0	0	.14	0	0	0	0	.71	5.03	111.23	0
MAXIMUM	0	3	.4	.2	10	20	1E-03	25	14.614	164	0
MINIMUM	0	3	.2	.2	10	20	1E-03	24	7.5	6.7	0

2205

1983

2207

DATE	DEPTH TO H20 ft	U u6/l	NO3-N m6/l	F m6/l	ALPHA pCi/l	BETA pCi/l	Ra-226 pCi/l	Th-230 pCi/l
1/24		2670			1840	230		1.02
2/28		1770			1300	210		.207
3/31		1430			1090	410	.08	.228
4/28		920			730	120		.243
5/31		900			680	320	.09	.030
6/17		470			380	50		.051
7/29		890			583	99		.690
8/2		270			220	34	.14	.024
9/28		600			450	83		.03
10/[illegible]		690			590	120		.096
11/28		420			440	290	.09	.091
12/28		440			330	52		.030
AVG		1061			754.8	178.7	.1	.2
STD DEV	0	717.08	0	0	476.3	122.22	.03	.32
MAXIMUM	0	2670	0	0	1840	410	.14	1.02
MINIMUM	0	270	0	0	220	34	.08	.024

2207

1983

2208

DATE	DEPTH TO H20	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
	ft	uG/l	mG/l	mG/l	pCi/l	pCi/l	pCi/l	mG/l	mG/l	mG/l	mG/l
3/31											
4/28		< 7	.7					30	4.6	5.8	97
1/12			.3					28.	4.3	5.	90.
2/10			.3					24.	3.8	5.2	95.
3/16			.5					24.	4.5	5.	74.
5/26		< 7	.7	.1	<10	<20	.1	30	4.	6.7	
6/17	6/22*	< 7	.88					33	3.7	5.3	102
7/20		12	.2					26	10.5	8.2	131
8/26			.2					32	4.4	5.8	94
9/30		< 7	.2					36	4.2	5.8	116
10/27			.1					33	3.9	9.6	111
11/17	NS										
12/21			.28					30	4.0	7.7	87
01/06											
AVG	6	4.6	.4	.1	10	20	.1	29.6	4.7	6.4	99.7
STD DEV	0	4.34	.26	0	0	0	0	3.85	1.94	1.51	16.18
MAXIMUM	6	12	.88	.1	10	20	.1	36	10.5	9.6	131
MINIMUM	6	1	.1	.1	10	20	.1	24	3.7	5	74

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

2208

1983

2209

DATE	DEPTH TO H2O ft	U UG/l	NO3-N MG/l	F MG/l	Alpha PCi/l	Beta PCi/l	Ra PCi/l	Ca MG/l	Na MG/l	Cl MG/l	HCO3 MG/l
-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----	-----
1/6		< 7	5.3								
1/13	1/12*	8	11					21.	14.2	16.	38.
1/20		< 7	9.5								
1/24		< 7	7.8	.1	<10	<20					
2/4		< 7	4.4								
2/10		7	4.2					9.4	6.4	3.8	24.
2/18		< 7	3.1								
2/28		9	.1	.1	<10	<20					
3/3		< 7	2.6								
3/10		8	2.5								
3/17	3/16*	< 7	2					15.	19.	30.	32.
3/24		< 7	33								
3/31	TH .009	< 7	1	.1	<10	<20	.03				
4/7		< 7	1.1								
4/14		< 7	1.5								
4/21		< 7	1.4								
4/28		< 7	1.5	.1	<10	<20		13	17.2	22	44
5/5		< 7	2								
5/12		8	4.9								
5/19		< 7	1.4								
5/26	TH .053	< 7	1.3	.1	<10	<20	.02	17	14.3	18.3	
6/?		11	2.1								
6/2											
6/?		< 7	.2								
6/17		< 7	.1	.2	<10	<20					
6/23		< 7	.2								
6/30		< 7	.2								
7/7		< 7	.7								
7/14		< 7	.1								
7/21		< 7	.1								
7/28	DRY										
8/4	DRY										
8/11	DRY										
8/18	DRY										
8/26	DRY										
9/2	DRY										
9/8	DRY										
9/15	DRY										
9/22	DRY										
9/30	DRY										
10/6	DRY										
10/13	DRY										
10/20		< 7	.6								
10/27		< 7	.4	.2	<10	<20		10.8	22	28.3	26
11/3		7									
11/10	DRY	< 7									
11/17	TH .026	< 7		.2	10	<20	.03			152	

2209

12/8		< 7	.7								
12/15		< 7	1.7								
12/21			.84					12.9	9.2	8.2	32
01/06	FZ										
AVG	2	4.6	3.2	.1	10	20	0	14.2	14.6	34.8	32.7
STD DEV	1.41	2.46	5.9	.05	0	0	.01	3.93	5.44	48.19	7.45
MAXIMUM	3	11	33	.2	10	20	.03	21	22	152	44
MINIMUM	1	1	.1	.1	10	20	.02	9.4	6.4	3.8	24

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

1983

2210

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
1/24		11	.1	.1	<10	<20					
2/28		7	.1	.1	<10	<20					
3/31		< 7		.1	<10	<20	.07				
4/28		< 7	.1	.1	<10	<20					5/26
5/26				.1	.1	<10	<20	4E-03	7.4	7.1	
6/17		< 7	.2	.1	<10	<20					
7/28		7	.9		<10	<20		30	4.1	4.8	97
8/26		< 7	.2	.2	<10	<20	.08				
9/30	1	9	.1	.2	<10	<20					
10/27		< 7	.1	.5	<10	<20					
11/17		< 7	.1	.2	<10	<20	.03			5.8	64
12/21	NS										
01/06	FZ										
AVG	1	5.8	.2	.2	9.1	19.1	5	15	5.8	5.9	55.3
STD DEV	0	2.86	.26	.13	2.98	3.02	9.97	21.21	2.33	1.15	46.61
MAXIMUM	1	11	.9	.5	10	20	20	30	7.4	7.1	97
MINIMUM	1	2	.1	.1	.1	10	.03	4E-03	4.1	4.8	5

2210

1983

SP4SEF

DATE	DEPTH TO H2O ft	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
		ug/l	mg/l	mg/l	pCi/l	pCi/l	pCi/l	mg/l	mg/l	mg/l	mg/l
4/28		10	.5					31	12	8.7	131
1/12			8.					31.	12.4	10.	79.
2/10			12.					33.	13.	21.8	63.
3/16			.1					29.	15.	4.	34.
5/26		< 7	.4	.2							
6/17	6/22*	< 7	.36					31	10.6	9.6	151
7/28		< 7	.2					25	14.6	10.6	164
8/26		< 7	.3					26	20.2	19.3	140
9/30			.3					26	28	26	204
10/27			.4					30	17.1	17.8	93
11/17	NS										
12/21	FROZ										
AVG	6	5.2	2.3	.2				29.1	15.9	14.2	117.7
STD DEV	0	2.77	4.19	0	0	0	0	2.8	5.39	7.26	54.18
MAXIMUM	6	10	12	.2	0	0	0	33	28	26	204
MINIMUM	6	3	.1	.2	0	0	0	25	10.6	4	34

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

SP4SEF

1983

SP2EF

DATE	DEPTH TO H2O ft	U UG/l	NO3-N MG/l	F MG/l	Alpha PCi/l	Beta PCi/l	Ra PCi/l	Ca MG/l	Na MG/l	Cl MG/l	HCO3 MG/l
4/28		8	7.0					32	12	7.7	110
1/12			28.					41.	11.8	13.	35.
2/10			19.					33.	12.	142.	44.
3/1[illegible]			15.					25.	12.	13.	40.
5/26		< 7	1.2					21	6.9	5.7	
6/17	6/22*	< 7	.2					24	8.5	6.7	94
7/28		8	.2					26	10.5	8.2	131
8/[illegible]		7	.1					28	13.3	11.1	84
9/30		< 7	.2					34	15.6	12.5	169
10/27			.3					2.7	12.5	9.1	90
11/17	NS										
12/21	FZ										
AVG	6	5.3	7.1					26.7	11.5	22.9	88.6
STD DEV	0	3.08	10.08	0	0	0	0	10.25	2.43	41.93	44.72
MAXIMUM	6	8	28	0	0	0	0	41	15.6	142	169
MINIMUM	6	1	.1	0	0	0	0	2.7	6.9	5.7	35

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

SP2EF

1983

SP2SEF

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
4/28		< 7	.2					7.7	5.1	2.9	44
1/12			.2					5.2	4.5	5.	30.
2/10			.3					5.9	4.	4.2	33.
3/16			4.8					6.9	5.1	17.	87.
5/26		< 7	.1					5.5	3.6	5.7	
6/17	6/22*	< 7	.28					6.6	4.5	3.4	42
7/2?		< 7	.2					8.0	6.0	2.4	55
8/26		11	.1					8.9	8.2	4.3	52
9/30			.2					8.5	10	6.3	58
10/27			.2					6.8	8.5	4.8	52
11/17	NS										
12/21	FROZ										
AVE	6	4.8	.7					7	6	5.6	50.3
STD DEV	0	3.77	1.46	0	0	0	0	1.26	2.18	4.18	16.79
MAXIMUM	6	11	4.8	0	0	0	0	8.9	10	17	87
MINIMUM	6	1	.1	0	0	0	0	5.2	3.6	2.4	30

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

1983

DW#2PN

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
5/5		7	800				
5/12		< 7	880				
5/19		< 7	100				
5/26		<7	240				
6/2		20	260				
6/2							
6/9		< 7	620				
6/17							
6/23	DRY						
6/30	DRY						
7/7	DRY						
7/14	DRY						
7/21	DRY						
7/28	DRY						
8/4	DRY						
8/11	DRY						
8/18	DRY						
8/26	DRY						
9/1	DRY						
9/8	DRY						
9/15	DRY						
9/22	DRY						
9/30	DRY						
10/6	DRY						
10/13	DRY						
10/20		7	391				
10/27							
11/3		< 7	700				
11/10		< 7	660				
11/17		< 7	720				
12/8		< 7	280				
12/15		9	400				
12/21	DRY						
AVG		5.7	504.3				
STD DEV	0	6.01	255.5	0	0	0	0
MAXIMUM	0	20	880	0	0	0	0
MINIMUM	0	-7	100	0	0	0	0

DW#2PN

1983

PIEOZ

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
9/29			2600				
10/27							
10/28			2600				
11/17		< 7					
AVG		4	2600				
STD DEV	0	0	.06	0	0	0	0
MAXIMUM	0	4	2600	0	0	0	0
MINIMUM	0	4	2600	0	0	0	0

PIEOZ

1983

VICR

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
3/31											
4/28		< 7	<.1					29	2.5	2.4	97
1/12			.1					34.	4.1	6.	95.
2/10			<.1					21	2.8	6.6	73.
3/16			.1					25.	3.7	5.	81.
5/26		< 7	<.1					32	2.6	6.2	
6/17	6/22*	< 7	.08					41	4.6	3.4	133
7/28		8	<.1					36	5.4	6.8	138
8/26		< 7	.1					.43	6.2	7.7	133
9/30			<.1					53.	5.8	5.[illegible]	183
10/27			.2					12.1	6.5	5.8	41
11/17	NS										
12/21			.04					37	3.9	35	101
01/06											
AVG	6	3.8	0					29.1	4.4	8.2	107.5
STD DEV	0	2.59	.11	0	0	0	0	14.31	1.45	9	40.21
MAXIMUM	6	8	.2	0	0	0	0	53	6.5	35	183
MINIMUM	6	1	-.1	0	0	0	0	.43	2.5	2.4	41

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

VICR

1983

DRC

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l	Ca mG/l	Na mG/l	Cl mG/l	HCO3 mG/l
4/28		< 7	.2					14	17	16.4	44
1/12			.4					21.	21.8	26.	24.
2/10			.4					7.4	8.6	6.2	19.
3/16			.2					19.	19.	23.	30.
5/26		< 7	.3					20	15	26	
6/17	6/22*	< 7	.16					31	61	15.4	68
7/28		9	.2					58	206	404	84
8/26		10	.1					41	135	255	73
9/30			.1					51	159	356	105
10/27			.4					13.2	18.1	30.8	55
11/17	NS										
12/21			.44					13.8	20	5.3	37
AVG	6	5.8	.3					26.3	61.9	105.8	53.9
STD DEV	0	3.83	.13	0	0	0	0	16.76	70.51	153.36	28.18
MAXIMUM	6	10	.44	0	0	0	0	58	206	404	105
MINIMUM	6	1	.1	0	0	0	0	7.4	8.6	5.3	19

* ACTUAL SAMPLE DATE FOR Ca Na Cl HCO3

DRCR

1984 SURFACE WATER

1984

2201

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	:	5.6	.5	.1	10.2	20	.02	30.9	6	11.8	100.3
STD DEV	:	3.48	.25	.06	.4	1	.02	3.38	2.02	4.54	11.99

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16		< 7	.1	.1	<10	<20	.001	33	14	26	84
03/26		< 7	.2	.1	<10	<20		29	4.5	6.7	80
04/27		< 7	.4	.2	11	<20		32	5.1	10	96
05/23		10	.6	.2	12	<20	0.03	30	4.5	10	84
06/25		< 7	.6	0.2	014	0-20		30	4.7	8	98
07/16		< 7	.7	.1	<10	<20		26	6.	9.	101
08/31		< 7	.6	.1	<10	<20	.09	32	5.5	13.	109
09/21		< 7	.3	.1	<10	<20		30	4.1	9.6	107
10/22		< 7	.5	.4	<10	<20		36	8.7	15.9	101
10/22											
11/14		<.5	.4	.1	<10	<20	0.09	31	4.6	8.	81
12/20		<5	.6	.1	19	<20		37	5.1	6.0	99
AVG		2.9	.5	.2	11.5	20	.1	31.4	6.1	11.1	93.6
STD DEV	0	3.79	.19	.09	2.81	0	.04	3.2	2.91	5.68	10.49
MAXIMUM	0	10	.7	.4	19	20	.09	37	14	26	109
MINIMUM	10000	-5	.1	.1	10	20	1E-03	26	4.1	6	80

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2202

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	32.3	.5	.1	31.3	22.4	.04	32.2	14.4	23.6	101.8
STD DEV	1	61.7	.29	.08	46.7	7.8	.02	5.88	23.18	31.4	18.7

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DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16		31	.3	.2	<10	<20	.07	40	70	113	
03/26		16	.4	.1	18	<20			27	4.9	7.2
04/27		9	.5	.2	17	<20		31	5.2	10	93
05/23		21	.7	.1	20	<20	0.18	31	4.9	10	81
06/25		0 7	.6	0.1	0-10	0-20		31	6.1	11	98
07/16		8	.7	.1	12	<20		29	37	11	112
08/31		< 7	.2	.3	<10	<20	.07	47.	102.	170.	147.
09/21		< 7	.1	.2	<10	<20		43	85	158	138
10/22		14	.6	.2	19	<20		35	9.3	16.4	101
10/22											
11/14		< 7	.4	.1	<10	<20	0.09	31	5.2	10	86
12/20		31.	.9	.1	21	<20		37.	5.1	7.4	86.
AVG		13.4	.5	.2	14.7	20	.1	35.5	32.4	47.4	94.9
STD DEV	0	10.42	.24	.07	4.69	0	.05	6.1	36.44	65.41	37.94
MAXIMUM	0	31	.9	.3	21	20	.18	47	102	170	147
MINIMUM	10000	1	.1	.1	10	20	.07	29	4.9	4.9	7.2

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2202

1984

2203

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	7.4	.4	.3	11.5	20	.1	46.8	86.6	129.4	131.3
STD DEV	1	5.48	.26	.05	2.39	1	.03	7.12	44.7	67.8	20.9

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	92										
02/16			.1		47	<20	.05	48	167	285	61
03/26			.6					40	67	69	101
04/27	0.		.7					45	49	69	121
05/23		34*H	.7	.2	<10	<20	0.24	48	89	192	141
06/25			.5					42	58	94	135
07/16			.1					38	113	192	144
08/31		<.7	<.1	.3	11	<20	.12	49	116.	184.	156
09/21			<.1					48	115	192	153
10/22			.2					55	128	180	150
10/22											
11/14		<.5	.2	.2	<10	<20	0.09	40	20	34	107
12/20			.3					36.	16.	19.8	84.
AVG		18.5	.3	.2	19.5	20	.1	44.5	85.3	137.3	123
STD DEV	0	21.92	.29	.06	18.34	0	.08	5.73	47.51	83.95	31.2
MAXIMUM	0	34	.7	.3	47	20	.24	55	167	285	156
MINIMUM	10000	3	-.1	.2	10	20	.05	36	16	19.8	61

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2203

1984

2204

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	4.3	.4	.3	10	20	.04	44.6	84.1	125.7	124.4
STD DEV	1	3.41	.27	.06	1	1	.02	8.13000001	45.61	67.8	13.5

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			.1		32	<20	.06	47	171	289	68
03/26			.6					39	67	111	98
04/27			.3					42	48	86	110
05/23		25*H	.6	.2	11	<20	0.02	46	89	167	141
06/25			.4					42	58	96	135
07/16			.3					37	112	182	135
08/31		7	<.1	.2	10	<20	.09	48	98.	141.	141
09/21			<.1					44	102	171	150
10/22			.2					53	122	180	153
10/22											
11/14		<.5	4.0	.3	<10	<20	0.04	39	14	28	101
12/20			.3					34.	16.	21.8	89.
AVG		16	.6	.2	15.8	20	.1	42.8	81.5	133.9	120.1
STD DEV	0	12.73	1.15	.06	10.84	0	.03	5.49	46.97	76.85	28.16
MAXIMUM	0	25	4	.3	32	20	.09	53	171	289	153
MINIMUM	10000	7	-.1	.2	10	20	.02	34	14	21.8	68

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2204

1984

2205

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	3	.3	.2	10	20	1E-03	24.5	11.1	85.4	1
STD DEV	1	1	.1	1	1	1	1	.71	5.03	111.2	1

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
AVG											
STD DEV	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2207

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1983 DATA

	DEPTH	U	NO3-N	F	ALPHA	BETA	Ra-226	Th-230
DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	ALPHA pCi/l	BETA pCi/l	Ra-226 pCi/l	Th-230 pCi/l
-----	-----	-----	-----	-----	-----	-----	-----	-----
DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	ALPHA pCi/l	BETA pCi/l	Ra-226 pCi/l	Th-230 pCi/l
-----	-----	-----	-----	-----	-----	-----	-----	-----
01/29		750	1.7	.7	990	330		<0.033
02/28		290	.7	.2	251	39	.06	.060
03/29		560	1.3	.4	540	317		0.381
04/29		720	2.1	.9	650	87		0.324
05/28		370	1.7	.7	320	50	.11	.140
06/28		330	2.0	.8	354	95		.172
07/28		370	1.7	.4	253	27		.120
08/28		370	1.4	.4	377	74	.06	.085
09/28		520	1.2	.7	430	80		0.15
10/28		730	1.9	1.0	530	80	0.10	0.071
11/28		1310	1.7	1.1				
11/30			.9		820	198	0.09	0.823
12/28		1060	1.8	.7	910	184	0.21	1.45
AVG		615	1.5	.7	535.4	130.1	.1	.3
STD DEV	0	316.59	.42	.27	255.36	104.01	.06	.42
MAXIMUM	0	1310	2.1	1.1	990	330	.21	1.45
MINIMUM	10000	290	.7	.2	251	27	.06	-.033

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2207

1984

2208

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	4.6	.4	.1	10	20	.1	29.6	4.7	6.4	99.7
STD DEV	1	4.34	.26	.1	1	1	.1	3.85	1.94	1.51	16.2

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			.2					34	4.2	5.8	94
03/26			.3					28	4.2	6.7	80
04/27			.6					31	4.4	8	927
05/23		< 7	.8	.1	<10	<20	0.05	30	4	6	89
06/25			.1					31	4.	6.	95
07/16			.6					24	3.9	7.	107
08/31		11	.3	.1				34.	4.3	11.	112.
09/21			<.1					30.	3.6	10.5	118
10/22			<.1					35	4.1	8.9	112
10/22											
11/14		<5	.4	.2				31	4.2	8	86
12/20			.8					35.	4.3	6.0	84.
AVG		8	.4	.1	10	20	.1	31.2	4.1	7.6	173.1
STD DEV	0	4.24	.32	.06	0	0	0	3.31	.23	1.85	250.37
MAXIMUM	0	11	.8	.2	10	20	.05	35	4.4	11	927
MINIMUM	10000	5	-.1	.1	10	20	.05	24	3.6	5.8	80

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2208

1984

2209

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE :		4.6	3.2	.1	10	20	.02	14.2	14.6	34.8	32.7
STD DEV :		2.5	5.8	.05	1	1	.01	3.9	5.4	48.2	7.4

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/11		< 7	1								
01/19	FZ										
01/26	FZ										
02/02		7	0.7								
02/09		< 7	.6								
02/16		NR	1.2		<10	<20	.15	8.8	8.3	6.7	16
03/01		< 7	2								
03/08			7	2.2							
03/15		< 7	3.5								
03/22		< 7	5.7								
03/28		<7	2.7	.1	<10	<20		11.1	9.2	8.6	26
04/05		11*H	3.9								
04/12		< 7	3.4								
04/19		< 7	7.3								
04/27			2.2		<10	<20		16	22	29	48
05/03		10*H	1.3								
05/10		< 7	2.7								
05/17		< 7	2.2								
05/23			1	.1	<10	<20	0.05	24	21	33	29
05/31		< 7	1								
06/07		< 7	1								
06/14		7	.1								
06/22		8	.1								
06/28	DRY										
07/12	DRY										
07/16		< 7	.1	.2	11	<20		19	24	38	115
07/26	DRY										
08/02	DRY										
08/10		< 7	.6								
08/17	DRY										
08/23	DRY										
08/31	DRY										
09/06	DRY										
09/13	DRY										
09/20	DRY										
09/27	DRY										
10/05	DRY										
10/11		< 7	.6								
10/18		< 7	.8								
10/22		14	.6	.2	<10	<20		8.1	6.6	6.4	29
10/22											

2209

11/02		< 7	2.5								
11/08		< 7	2.6								
11/16											
11/14		<5	.5	.1	<10	<20	0.11	15	13	15	29
12/05			CL=5.2	CL=12							
12/13		< 7	1.2								
12/20		<.5	2.0	.1	<10	<20		15.	9.2	6.9	32
12/20											
AVG		3.6	2	.4	10.1	20	.1	14.6	14.2	18	40.5
STD DEV	0	4.12	1.88	.79	.35	0	.05	5.32	7.04	13.25	31.36
MAXIMUM	0	14	7.3	2.2	11	20	.15	24	24	38	115
MINIMUM	10000	-7	.1	.1	10	20	.05	8.1	6.6	6.4	16

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2210

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	6.3	.2	.2	9.1	19.1	5	15	5.8	5.9	55.3
STD DEV	1	4.33	.25	.12	2.98	3.01	9.97	21.2	2.3	1.16	46.6

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16		7	.2	0.2	30	<20	.06				
03/26		<7	.3	.1	<10	<20					
04/27			.1		11	<20		7.5	8.9	3	31
05/23		7	.1	.1	10	<20					
06/25		< 7	.9		0-10	0-20					
07/16		< 7	.1	.3	<10	<20		5.5	6.4	31	37
08/31		< 7	.1	.1	<10	<20	.03				
09/21		< 7	.6	.11	<10	<20		8.5	7.1	4.3	58
10/22		< 7	.1	.1	<10	<20					
10/22											
11/14		<5	1.2	.1	<10	<20		0.05	7.8	7.6	5.
12/20		<5	.2	.1	<10	<20		8.2	8.0	3.5	32
AVG		1.9	.4	.1	12.1	20	0	6	7.6	9.9	32.6
STD DEV	0	4.38	.38	.07	6.3	0	.02	3.5	.94	11.94	18.9
MAXIMUM	0	7	1.2	.3	30	20	.06	8.5	8.9	31	58
MINIMUM	10000	-7	.1	.1	10	20	.03	.05	6.4	3	5

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

SP2EF

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	:	5.3	7.1	1	1	1	1	26.7	11.5	22.9	88.6
STD DEV	:	3.08	10.08	1	1	1	1	10.25	2.43	41.9	44.7

DATE	DEPTH TO H20	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
	ft	ug/l	mg/l	mg/l	pci/l	pci/l	pci/l	mg/l	mg/l	mg/l	mg/l
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
01/26	FZ										
02/16			27					43	12.4	14.4	75
03/26			4					30	10	9.1	40
04/27			12					28	9.8	10	65
05/23		39*H	1.4	.3				20	6	3	81
06/25			.2					18	4.9	<2	89
07/16			.1					16	5.8	<2	109
08/31		13	.3	.4				25.	8.4	10.	124.
09/21			.1					20	7.4	12	115
10/22			.6					20	7.6	4.0	86
10/22											
11/14			.2					19	7.0	8	58
12/20			4.6					26.	9.8	6.4	58.
AVG		26	4.6	.4				24.1	8.1	6.6	81.8
STD DEV	0	18.38	8.25	.07	0	0	0	7.69	2.23	5.38	26.27
MAXIMUM	0	39	27	.4	0	0	0	43	12.4	14.4	124
MINIMUM	10000	13	.1	.3	10000	10000	10000	16	4.9	-2	40

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

SP2SEF

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	4.8	.7	1	1	1	1	7	6	5.6	50.3
STD DEV	1	3.77	1.46	1	1	1	1	1.26	2.18	4.19	16.8

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			.2					7.4	7.2	8.2	40
03/26			.3					6	4.1	2.4	28
04/27			.4					7	3.6	2	37
05/23		< 7	.4	.3				6.9	3.4	6	32
06/25			.4					5.5	3.7	<2	46
07/16			.6					5.7	5.3	<2	60
08/31		7	.1	.5				12.5	7.7	7.	86.
09/21			.1					10.9	6.8	7.2	78
10/22			.2					7.8	5.7	4.5	49
10/22											
11/14			3.8					7.0	3.4	5	35
12/20			.3					6.3	3.4	3.0	32.
AVG		6	.6	.4				7.5	4.9	3.8	47.5
STD DEV	0	1.41	1.07	.14	0	0	0	2.2	1.67	3.48	19.38
MAXIMUM	0	7	3.8	.5	0	0		12.5	7.7	8.2	86
MINIMUM	10000	5	.1	.3	10000	10000	10000	5.5	3.4	-2	28

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

SP4SEF

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	5.2	2.3	.2	1	1	1	229.1	15.9	14.2	117.7
STD DEV	1	2.77	4.19	.2	1	1	1	2.8	5.39	7.26	54.18

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			.5					36	15	19.2	77
03/26			4					33	12.1	9.1	61
04/27			.6					35	11.6	8	143
05/23		9	.4	.3	<10	<20	0.11	25	4.8	3	127
06/25			.1					17	3.9	<2	75
07/16			.1					18.7	4.8	<2	98
08/31		< 7	.1	.3				13.	7.7	4.0	78.
09/21			.1					16.4	11.1	2.9	95
10/22			.1					13.8	5.2	1.0	75
10/22											
11/14		<5	.3	.2	<10	<20	0.09	15.4	6.4	6.	72
12/20			2.7					36.	140	7.9	89.
AVG		7.5	.8	.3	10	20	.1	23.6	20.2	5.2	90
STD DEV	0	2.12	1.3	.06	0	0	.01	9.61	39.89	6	24.89
MAXIMUM	0	9	4	.3	10	20	.11	36	140	19.2	143
MINIMUM	10000	6	.1	.2	10	20	.09	13	3.9	-2	61

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

SP4SEF

1984

DW#2PN

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	DRY						
01/19	NS						
01/26	FZ						
02/02		17	0.6				
02/09							
02/16							
02/24	NS						
03/01	DRY						
03/08		8	100				
03/15		< 7	78				
03/22		< 7	79				
03/30	NS						
04/05		< 7	78				
04/12		< 7	86				
04/19	NS						
04/27	NS						
05/03		< 7	26				
05/10		11	155				
05/17		10	560				
05/24		< 7	638				
05/31	NS						
06/07	DRY						
06/14	DRY						
06/22	DRY						
06/29							
07/12	DRY						
07/19							
07/26	DRY						
08/02	DRY						
08/10	DRY						
08/17	DRY						
08/23	NS						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20		17.	59				
09/28		< 7	148				
10/05		< 7	760				
10/11		< 7	200				
10/18		< 7	164				
10/29		< 7	151				
11/02		< 7	190				
11/08		< 7	161				
11/16		8	345				
11/30							
12/05		< 7	380	CL=27			
12/13		< 7	25				
12/20		< 7	17				
12/29							

DW#2PN

AVG		4.8	200				
STD DEV	0	4.92	209.3	0	0	0	0
MAXIMUM	0	17	760	0	0	0	0
MINIMUM	10000	1	.6	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

PIEOZ

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/23	DRY						
02/24	NS						
03/30	NS						
04/27	NS						
05/24	DRY						
06/29			1500				
07/19							
08/31	DRY						
09/28	NS						
10/29							
AVG			1500				
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	1500	0	0	0	0
MINIMUM	10000	10000	1500	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

PIEOZ

1984

VICR

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	3.8	.1	1	1	1	1	29.1	4.4	8.2	107.5
STD DEV	1	2.59	.11	1	1	1	1	14.3	1.45	9	40.2

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			<.1					33	3.0	6.3	35
03/26			.1					18	2.7	1.9	56
04/27			<.1					32	2.6	5	96
05/23		19*H	<.1	.1				28	2.5	5	95
06/25			<.1					35	4.8	6	127
07/16			.6					32	6.8	12	138
08/31		< 7	<.1	.2				44.	6.4	17.	141.
09/21			.1					37	4.8	12.5	141
10/22			.2					33	3.7	5.0	98
10/22											
11/14			.1					41	4.3	6.	127
12/20			.2					29.	3.0	3.5	75.
AVG		12.5	.1	.2				32.9	4.1	7.3	102.6
STD DEV	0	9.19	.21	.07	0	0	0	6.88	1.51	4.55	36.08
MAXIMUM	0	19	.6	.2	0	0	0	44	6.8	17	141
MINIMUM	10000	6	-.1	.1	10000	10000	10000	18	2.5	1.9	35

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

DRCR

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra	Ca	Na	Cl	HCO3
AVERAGE	1	5.8	.3	1	1	1	1	26.3	61.9	105.8	53.9
STD DEV	1	3.8	.13	1	1	1	1	16.8	70.5	153.4	28.2

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l
01/26	FZ										
02/16			.1					37	111	244	47
03/26			.4					7.5	8.1	6.2	21
04/27			.2					21	19	25	39
05/23		9	.2	.1				27	22	27	37
06/25			.1					52	113	264	58
07/16			.1					81	290	287	104
08/31		11	.1	.3				35.	85.	105.	127.
09/21			<.1					52	180	377	112
10/22			.4					15	26	33.7	60
10/22											
11/14			<.1					17	20	40	37
12/20			.3					15.	9.2	9.9	32.
AVG		10	.2	.2				32.7	80.3	129	61.3
STD DEV	0	1.41	.15	.14	0	0	0	21.86	89.42	136.38	36.18
MAXIMUM	0	11	.4	.3	0	0	0	81	290	377	127
MINIMUM	10000	9	-.1	.1	10000	10000	10000	7.5	8.1	6.2	21

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

DRCR

1983 POND #2 MONITOR WELLS

1983

2305

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
1/6	12.5	18	3				
1/13	15	11	4				
1/20	16.33	17	4				
1/24	16.43	19	5	.5	<10	<20	
2/4	7.91	15	7.5				
2/10	6.91	12	6.5				
2/18	8.91	7	7.5				
2/28	4	12	11	.3	<10	<20	
3/3	9.66	10	7.5				
3/10	8	12	6.5				
3/17	11.25	9	6.5				
3/24	14.26	< 7	6.5				
3/31	12.25	12	6	.3	<10	<20	.11
4/7	9.75	16	7				
4/14	6.83	7	9				
4/21	8.5	9	9.5				
4/28	7.08	7	12	.3	15	<20	
5/5	12.5	9	11				
5/12	15.33	12	10				
5/19	5.00	< 7	9.5				
5/26	8.25	< 7	10	.4	<10	<20	.16
6/2	11.25	9	8.5				
6/2	11.25						
6/9	9.66	7	9.5				
6/17	16.83	9	9.5	.3	<10	<20	
6/23	18.66	< 7	12				
6/30	19.5	18	11				
7/7	20.41	10	13				
7/14	19.75	19	27				
7/21	20.50	17	33				
7/28	20.33	< 7	36	.4	14	<20	
8/4	21	9	22				
8/11	20.83	9	37				
8/18	20.75	< 7	48				
8/26	20.50	7	40	.4	<10	<20	.09
9/2	20.93	20	52				
9/8	20.50	9	51				
9/15	20.33	19	49				
9/22	19.75	15	50				
9/30	19.91	9	53	.4	<10	<20	
10/6	20.58	28	38				
10/13	11.16	11	54				
10/20	18.75	8	10				
10/27	18.91	18	33	.4	12	<20	
11/3	19.50	8	22				
11/10	19.50	< 7	34				
11/17	19.33	11	42	.4	<10	<20	.12

2305

12/8	15.00	< 7	11				
12/15	15.91	< 7	11				
12/21	16.83	19	11				
01/06	18.08	< 7	11	.4	12	<20	
AVG	14.7	14.1	20.1	.5	18.7	20	.1
STD DEV	5.45	23.92	16.42	.37	27.49	0	.03
MAXIMUM	21	177	54	1.7	110	20	.16
MINIMUM	2.25	1	3	.3	10	20	.09

1983

2310

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha Pci/l	Beta Pci/l	Ra Pci/l
3/31	DRY						
5/26	23.83	< 7	380	.4	34	<20	.3
8/26	NS						
11/17	DRY						
01/06	DRY						
AVG	23.8	3	380	.4	34	20	.3
STD DEV	0	0	0	0	0	0	0
MAXIMUM	23.83	3	380	.4	34	20	.3
MINIMUM	23.83	3	380	.4	34	20	.3

2310

1983

2311

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
3/31	DRY						
5/26	DRY						
8/26	DRY						
11/17	DRY						
01/06	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	0	0	0	0	0	0	0

2311

1983

2312

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	11.50	29	440				
1/13	11.67	18	470				
1/20	11.58	21	500				
1/24	11.7	12	530	.8	14	<20	
2/4	8.58	16	390				
2/10	8.17	13	500				
2/18	7.83	14	530				
2/28	3.92	21	530	.9	<10	<20	
3/3	5.25	< 7	530				
3/10	3.83	23	460				
3/17	5.25	7	460				
3/24	6.5	< 7	530				
3/31	7.17	< 7	320	.6	21	<20	.44
4/7	8.25	9	500				
4/14	8.5	13	550				
4/21	7.75	< 7	730				
4/28	4.00	< 7	300	.8	12	<20	
5/5	5.67	8	370				
5/12	6.67	9	310				
5/19	3.67	8	270				
5/26	4.08	< 7	330	.8	10	<20	.25
6/2	4.50	10	370				
6/[illegible]	4.50						
6/9	5.67	21	430				
6/17	6.58	11	430	.7	<10	<20	
6/23	8.08	< 7	540				
6/30	8.25	17	460				
7/7	8.87	17	460				
7/14	9.08	16	440				
7/21	9.75	11	540				
7/28	9.92	11	510	.6	22	<20	
8/4	10.58	13	500				
8/11	11.25	10	420				
8/18	11.17	< 7	480				
8/26	11.33	8	440	.6	13	<20	.42
9/2	11.67	10	430				
9/8	11.75	12	470				
9/15	11.92	7	500				
9/22	11.50	< 7	460				
9/30	12.17	< 7	490	.5	16	<20	
10/6	12.75	< 7	390				
10/13	12.85	9	530				
10/20	12.83	11	470				
10/27	12.75	< 7	360	.4	17	<20	
11/3	13.00	11	380				
11/10	13.00	8	460				
11/17	13.00	< 7	420	.4	18	<20	.46

1983

2313

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/24							
2/28							
3/31	4.83	17	5	.7	<10	<20	.06
5/26	5.08	< 7	5.5	.9	<10	<20	.14
8/26	10.33	9	.2	.8	<10	<20	.1
11/17	15.75	< 7	.4	.4	<10	<20	.11
01/06	10.50	< 7	3.9	.8			
AVG	9.3	8.2	3	.7	10	20	.1
STD DEV	4.52	5.26	2.53	.19	0	0	.03
MAXIMUM	15.75	17	5.5	.9	10	20	.14
MINIMUM	4.83	4	.2	.4	10	20	.06

2313

2312

12/8	12.83	< 7	450				
12/15	12.58	< 7	380				
12/21	12.50	19	430				
01/06	11.92	13	430	.5	25	<20	
AVG	9.2	10.7	452.4	.6	15.7	20	.4
STD DEV	3.12	6.02	79.66	.17	5.07	0	.1
MAXIMUM	13	29	730	.9	25	20	.46
MINIMUM	3.67	2	270	.4	10	20	.25

1983

2314

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	10.92	< 7	500				
1/13	11.84	14	520				
1/20	13.59	14	580				
1/24	13.07	20	675	2	<10	<20	
2/4	9.59	17	640				
2/10	9.25	22	880				
2/18	9.75	12	960				
2/28	NS	< 7	970	1.9	10	<20	
3/3	8.84	7	980				
3/10	8.75	10	980				
3/17	9	8	940				
3/24	10.25	< 7	1140				
3/31	CI						
4/7	9.25	14	940				
4/14	14.00	19	40				
4/21	15.5	7	400				
4/28	14.17	7	725	1.4	220	51	
5/5	14.84	10	360				
5/12	14.75	< 7	300				
5/19	14.59	< 7	320				
5/26	14.50	7	750	2.4	130	32	.27
6/2	14.25	< 7	320				
6/2	14.25						
6/9	14.42	24	320				
6/17	14.42	9	1025	2.2	82	<20	
6/23	14.59	< 7	360				
6/30	15.00	7	340				
7/7	14.5	9	420				
7/14	14.59	23	320				
7/21	14.84	25	420				
7/28	14.92	< 7	1375	2.1	73	<20	
8/4	15.00	7	480				
8/11	15.25	10	400				
8/18	14.84	< 7	380				
8/26	15.34	< 7	1075	2.7	33	32	.21
9/2	15.00	13	400				
9/8	14.75	20	540				
9/15	15.25	12	680				
9/22	15.34	15	740				
9/30	15.59	< 7	1000	2	49	<20	
10/6	15.92	10	980				
10/13	15.59	14	1260				
10/20	15.59	14	1460				
10/27	15.84	41	1690	1.9	39	<20	
11/3	15.92	13	1580				
11/10	15.59	9	1800				
11/17	15.67	8	2900	.1	37	<20	.95

2314

12/8	16.42	18	2080				
12/15	16.34	9	1820				
12/21	16.59	27	1920				
01/06	16.75	19	2475	.1	38	<20	
AVG	14	12.1	901.2	1.7	65.5	25	.5
STD DEV	2.32	7.63	616.64	.86	61.74	9.87	.41
MAXIMUM	16.75	41	2900	2.7	220	51	.95
MINIMUM	8.75	2	40	.1	10	20	.21

1983

2317

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	3.82	10	258	.7	<10	<20	
2/28	3	7	288	.6	<10	<20	
3/31	3.09	8	356	1.2	<10	<20	1.2
4/28	3.09	< 7	180	.9	<10	<20	
5/26	3.09	< 7	294	.9	19	<20	1.52
6/17	6.00	< 7	425	1.2	12	<20	
7/28	10.42	21	450	.8	20	<20	
8/26	14.67	< 7	400	.7	10	<20	.94
9/30	17.52	16	425	.7	<10	<20	
10/27	4.0	13	512	.5	13	<20	
11/17	8.84	15	275	.5	<10	<20	.5
01/06	3.09	7	300	1.1	16	<20	
AVG	7.2	9.6	321	.8	12.3	20	.9
STD DEV	5.11	6.13	131.39	.29	3.66	0	.57
MAXIMUM	17.52	21	512	1.2	20	20	1.52
MINIMUM	3	1	10	.2	10	20	.09

2317

1983

2318

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/6	4	36	10.5				
1/13	4.17	12	13.5				
1/20	5	18	13				
1/24	4.42	14	17	.6	<10	<20	
2/4	1.59	19	9.5				
2/10	1.5	10	11.5				
2/18	2.92	11	15.5				
2/28	1.5	7	14	.6	<10	<20	
3/3	3.17	8	16				
3/10	2.17	26	15				
3/17	3.67	29	16				
3/24	4	7	19.5				
3/31	3.25	16	13	.5	<10	<20	.17
4/7	2.75	15	18				
4/14	2.92	15	14				
4/21	3.67	7	16				
4/28	2.34	7	23	.5	<10	<20	
5/5	4.09	< 7	15				
5/12	5.25	10	14				
5/19	2.50	< 7	12				
5/26	3.09	8	11	.6	13	<20	.12
6/2	3.09	10	12				
6/2	3.09						
6/9	3.92	12	13				
6/17	4.67	10	12	.5	<10	<20	
6/23	7.67	< 7	14				
6/30	7.42	13	13				
7/7	8.92	16	13				
7/14	9.34	17	14				
7/21	10.34	12	17				
7/28	7.09	11	11	.2	<10	<20	
8/4	11.59	10	15				
8/11	12.25	9	13				
8/18	12.59	< 7	16				
8/26	13.42	< 7	11	.7	<10	<20	.11
9/2	13.84	12	13				
9/8	14.00	14	15				
9/15	14.17	8	12				
9/22	14.34	13	16				
9/30	14.67	16	14	.7	13	<20	
10/6	15.50	9	15				
10/13	15.34	16	16				
10/20	15.67	13	19				
10/27	16.00	19	13	.6	16	<20	
11/3	16.59	17	15				
11/10	16.67	13	19				
11/17	16.67	10	8	1.1	15	<20	.13

2318

12/8	5.50	7	24				
12/15	4.00	< 7	23				
12/21	4.42	16	22				
01/06	8.84	9	4	.7	<10	<20	
AVG	7.7	12.4	14.5	.6	11.3	20	.1
STD DEV	5.18	6.12	3.75	.23	2.18	0	.03
MAXIMUM	16.67	36	24	1.1	16	20	.17
MINIMUM	1.5	4	4	.2	10	20	.09

1983

2319

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	5.09	< 7	1800				
1/13	5.5	9	3500				
1/20	6.25	9	3600				
1/24	6.62	7	3900	.5	260	130	
2/4	4.34	< 7	1300				
2/10	4.42	16	2400				
2/18	5	< 7	3300				
2/28	4.34	17	2800	.9	170	86	
3/3	4.75	< 7	3200				
3/10	4.42	34	2800				
3/17	11.75	9	2700				
3/24	4.92	< 7	7800				
3/31	4.75	< 7	2400	1	107	58	11.3
4/7	4.92	12	1900				
4/14	4.34	10	2400				
4/21	10.09	< 7	2100				
4/28	4.75	< 7	2100	15.8	160	47	
5/5	4.92	10	2000				
5/12	5.34	8	1700				
5/19	4.34	16	1500				
5/26	4.59	7	1800	14.7	72	41	4.77
6/2	4.59	13	1700				
6/2	4.59						
6/9	5.00	< 7	1900				
6/17	12.67	< 7	1800	14.9	55	<20	
6/23	8.00	< 7	2400				
6/30	8.50	15	2100				
7/7	9.09	12	2300				
7/14	9.84	15	1400				
7/21	10.17	24	2700				
7/28	10.50	< 7	2400	.5	72	23	
8/4	11.42	7	2200				
8/11	16.09	< 7	2000				
8/18	11.75	< 7	2300				
8/26	12.75	< 7	2600	.2	64	38	4.28
9/2	13.34	24	2200				
9/8	13.50	15	2300				
9/15	13.59	< 7	3000				
9/22	13.75	< 7	2700				
9/30	13.75	20	4300	4	72	21	
10/6	14.17	9	2600				
10/13	14.75	< 7	3300				
10/20	14.34	7	3100				
10/27	14.25	< 7	3600	2.3	63	22	
11/3	14.09	9	2200				
11/10	13.84	< 7	2800				
11/17	13.42	30	2800	1	58	23	3.23

2319

12/8	7.34	8	2500				
12/15	5.75	18	2500				
12/21	7.00	18	2700				
01/06	7.92	12	2200	9.9	31	<20	
AVG	8.8	10.4	2541.4	5.1	91.8	42.2	4.7
STD DEV	3.97	7.09	1042.81	6.3	67.67	32.9	4.1
MAXIMUM	16.09	34	7800	15.8	260	130	11.3
MINIMUM	4.34	2	10	.2	10	20	.09

1983

2325

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Alpha PCi/l	Beta PCi/l	Ra PCi/l
1/24	15.83	16	2520	5.4	<10	<20	
2/28	14.91	27	1980	6	31	20	
3/31	14.5	< 7	2160	6.1	23	<20	.63
4/28	14.16	13	1670	3.5	14	<20	
5/26	14.91	20	1880	1.7	27	<20	.36
6/17	16.16	18	1560	.6	19	<20	
7/28	17.83	15	3190	.3	22	<20	
8/26	16.41	12	3820	.1	17	<20	.72
9/30	DRY	23	2990	.3	24	<20	
10/27	DRY						
11/17	16.58	44	1690	.1	20	<20	5E-03
01/06	16.00	18	2460	.2	27	<20	
AVG	16.5	19.1	2160.2	2.1	21.4	20	.4
STD DEV	2.8	10.05	968.31	2.45	5.87	0	.31
MAXIMUM	24.34	44	3820	6.1	31	20	.72
MINIMUM	14.16	2	2	.1	10	20	5E-03

2325

1983

2326

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	5.43	< 7	323	3.4	<10	<20	
2/28	3.58	18	620	5.4	12	<20	
3/31	4.00	< 7	690	5.3	30	<20	5E-03
4/28	3.75	< 7	181	3.5	32	<20	
5/26	4.08	< 7	197	2.9	21	<20	2.12
6/17	9.08	9	160	3.2	14	<20	
7/28	15.25	27	726	2.3	30	<20	
8/26	DRY						
9/30	DRY						
10/27	DRY						
11/17	DRY						
01/06	DRY						
AVG	8.7	10.9	362.4	3.4	21.5	20	.7
STD DEV	7.49	9.79	277.37	1.48	8.75	0	1.19
MAXIMUM	24.34	27	726	5.4	32	20	2.12
MINIMUM	3.58	2	2	.9	10	20	5E-03

2326

1983

2327

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
1/24	19.45	16	2670	.6	12	<20	
2/28	19.42	11	2640	.3	24	<20	
3/31	18.50	12	2300	.3	<10	<20	.65
4/28	19.08	9	1770	.3	13	<20	
5/26	19.58	13	1940	.2	17	<20	.42
6/17	18.33	14	1580	.2	<10	<20	
7/28	21.42	14	3480	.2	20	<20	
8/26	19.50	11	3900	.2	16	<20	.69
9/30	19.58	19	3580	.2	14	<20	
10/27	13.00	18	1950	.1	<10	<20	
11/17	19.08	16	3400	.1	<10	<20	.34
01/06	19.08	10	2900	.2	19	<20	
AVG	19.3	14.2	2470.2	.3	15.2	20	.4
STD DEV	2.44	3.67	1055.51	.22	5.04	0	.24
MAXIMUM	24.24	21	3900	.9	24	20	.69
MINIMUM	13	9	2	.1	10	20	.1

2327

1983

2328

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	18.58	12	120	3.1	<10	<20	
2/28	5.25	22	87	.7	<10	<20	
3/31	12.66	18	85	.8	<10	<20	.12
4/28	5.83	10	130	1.2	<10	<20	
5/26	7.16	7	100	1	<10	<20	.2
6/17	15.33	10	100	.8	<10	<20	
7/28	20.17	8	160	1	<10	<20	
8/26	19.08	13	92	.4	<10	<20	.3
9/30	19.75	18	440	.8	11	<20	
10/27	19.83	14	510	2.1	26	<20	
11/17	DRY						
01/06	19.25	13	720	1.8	24	<20	
AVG	15.6	13.8	212.2	1.2	13.7	20	.2
STD DEV	6.36	4.93	219.94	.76	6.47	0	.09
MAXIMUM	24.34	22	720	3.1	26	20	.3
MINIMUM	5.25	7	2	.4	10	20	.1

2328

1983

2329

DATE	DEPTH TO H20 ft	U u6/l	NO3-N m6/l	F m6/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24							
2/28							
3/31	DRY						
4/28	DRY						
5/26	DRY						
6/17	DRY						
7/28	DRY						
8/26	DRY						
9/30	DRY						
10/27	DRY						
11/17	DRY						
01/06	DRY						
AVG	24.3	21	2	.9	23	20	.1
STD DEV	0	0	0	0	0	0	0
MAXIMUM	24.34	21	2	.9	23	20	.1
MINIMUM	24.34	21	2	.9	23	20	.1

2329

1983

2330

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	23.07	15	15	.9	13	<20	
2/28	22.34	18	10	.7	<10	<20	
3/31	22.17	17	13	.6	19	<20	.07
4/28	20.92	20	13.4	.8	10	<20	
5/26	21.09	15	9.5	.9	<10	<20	.15
6/17	21.42	28	8	.6	15	<20	
7/28	24.17	20	14	.7	<10	<20	
8/26	22.75	14	7	.5	<10	<20	.11
9/30	23.0	17	17	1.4	19	<20	
10/27	23.00	14	7.5	.5	15	<20	
11/17	23.25	27	7.8	.4	<10	<20	.07
01/06	23.17	12	8.7	.7	13	<20	
AVG	22.7	18.3	10.2	.7	13.6	20	.1
STD DEV	1.06	4.87	4.08	.26	4.37	0	.03
MAXIMUM	24.34	28	17	1.4	23	20	.15
MINIMUM	20.92	12	2	.4	10	20	.07

2330

1983

T-1

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	14.91	16	450				
1/13	13.75	16	440				
1/20	14.91	41	540				
1/24	14.73	20	620	1.3	<10	<20	
2/4	14	18	370				
2/10	13.41	17	440				
2/18	13.16	15	590				
2/28	11.16	10	580	1.2	12	<20	
3/3	11	< 7	560				
3/10	11.41	16	670				
3/17	11.5	21	510				
3/24	11.75	< 7	620				
3/31	11.50	10	548	1.1	11	<20	.26
4/7	11.00	12	530				
4/14	11.33	11	650				
4/21	10.66	12	580				
4/28	10.16	13	660	.9	<10	<20	
5/5	10.91	14	620				
5/12	12.33	< 7	550				
5/19	15.50	9	560				
5/26	12.33	< 7	600	1	<10	<20	.24
6/2	12.91	14	530				
6/2	12.91						
6/9	13.08	13	530				
6/17	13.50	< 7	740	1	<10	<20	
6/23	14.16	< 7	880				
6/30	14.33	13	840				
7/7	14.66	14	310				
7/14	14.75	17	1050				
7/21	14.91	25	1170				
7/28	10.08	< 7	1260	1.5	<10	<20	
8/4	15.33	13	1300				
8/11	15.50	10	900				
8/18	15.41	9	1220				
8/26	12.75	< 7	1450	2	11	<20	.33
9/2	15.66	20	1290				
9/8	15.93	21	1460				
9/15	15.91	16	710				
9/22	15.66	10	1620				
9/30	16.0	11	1880	2.2	11	<20	
10/6	16.00	21	1340				
10/13	15.75	8	1910				
10/20	16.50	12	1660				
10/27	16.50	9	820	1.7	<10	<20	
11/3	16.75	11	1210				
11/10	16.91	8	1500				
11/17	16.91	12	1590	1.9	12	<20	.91

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12/8	15.00	18	810				
12/15	14.33	7	720				
12/21	14.16	15	750				
01/06	14.41	35	780	1.2	16	<20	
AVG	14.1	13.6	861.2	1.4	12	20	.4
STD DEV	2.43	7.19	437.28	.44	3.7	0	.31
MAXIMUM	24.34	41	1910	2.2	23	20	.91
MINIMUM	10.08	2	2	.9	10	20	.1

1983

Γ-2

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha Pci/l	Beta Pci/l	Ra Pci/l
1/6	5.08	7	57				
1/13	6.5	12	133				
1/20	8.5	39	140				
1/24	7.86	17	290	1.1	<10	<20	
2/4	3.08	21	175				
2/10	2.42	20	209				
2/18	2.5	8	192				
2/28	1.92	11	250	.9	<10	<20	
3/3	2.42	7	250				
3/10	2	27	212				
3/17	2.33	14	230				
3/24	2.42	9	232				
3/31	2.17	11	260	.8	<10	<20	.16
4/7	2.17	73	236				
4/14	2.75	13	276				
4/21	1.92	8	181				
4/28	1.67	9	260	.7	<10	<20	
5/5	2.42	18	187				
5/12	4.50	15	220				
5/19	1.58	14	100				
5/26	2.17	< 7	110	.8	<10	<20	.12
6/2	2.75	10	36				
6/?	2.75						
6/9	4.58	13	180				
6/17	8.00	9	180	.8	<10	<20	
6/23	9.75	< 7	240				
6/30	12.92	22	210				
7/7	14.82	13	1250				
7/14	16.50	17	171				
7/21	17.67	20	195				
7/28	18.42	< 7	230	.8	13	<20	
8/4	18.83	19	289				
8/11	19.00	15	112				
8/18	19.00	13	192				
8/26	18.92	8	183	1.2	14	<20	.18
9/2	14.42	25	560				
9/8	19.17	15	755				
9/15	19.33	8	510				
9/22	19.25	12	680				
9/30	19.25	18	950	1.7	13	<20	
10/6	19.50	18	670				
10/13	19.75	13	1390				
10/20	19.42	17	1040				
10/27	19.33	< 7	1110	1.8	<10	<20	
11/3	19.75	24	870				
11/10	19.58	14	1180				
11/17	19.58	14	174	2.1	25	<20	.72

12/8	12.75	16	220				
12/15	10.33	10	180				
12/21	11.42	45	190				
01/06	15.17	39	200	1.2	<10	<20	
AVG	10.7	15.5	359.8	1.1	12.9	20	.3
STD DEV	7.57	8.53	342.72	.45	5.14	0	.26
MAXIMUM	24.34	45	1390	2.1	25	20	.72
MINIMUM	1.58	3	2	.7	10	20	.1

1983

T-4

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	9.41	22	750				
1/13	9.41	< 7	1600				
1/20	9.5	8	1550				
1/24	9.53	15	1800	3.6	14	<20	
2/4	9.5	13	1700				
2/10	9.41	13	1850				
2/18	9.33	12	1900				
2/28	9.33	< 7	2240	3.3	25	<20	
3/3	8.16	< 7	2000				
3/10	9.25	17	2150				
3/17	9	9	1750				
3/24	9.33	7	2000				
3/31	9.25	< 7	1900	3.5	27	<20	1.35
4/7	9.08	9	1800				
4/14	9.33	9	1900				
4/21	9.00	< 7	1600				
4/28	8.91	10	1050	2.5	24	<20	
5/5	9.08	< 7	1450				
5/12	9.33	14	1350				
5/19	9.08	10	1400				
5/26	9.00	< 7	1380	2.8	12	30	1.09
6/2	8.91	8	1200				
6/2	8.91						
6/9	9.00	< 7	1250				
6/17	9.08	7	1080	2.3	23	<20	
6/23	9.16	< 7	1450				
6/30	9.16	8	1250				
7/7	9.33	12	525				
7/14	9.33	27	1200				
7/21	9.08	24	1600				
7/28	CI						
8/4	9.16	< 7	1100				
8/11	9.00	< 7	1000				
8/18	9.00	< 7	800				
8/26	DRY						
9/2	DRY						
9/8	DRY						
9/15	CI						
9/22	DRY						
9/30	DRY						
10/6	9.50	37	3700				
10/13	9.75	8	4400				
10/20	9.41	14	1900				
10/27	9.75	16	4600	2.5	400	74	
11/3	9.75	< 7	700				
11/10	9.75	< 7	900				
11/17	9.75	20	1750	2.8	282	96	1.16

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12/8	9.75	< 7	800				
12/15	9.66	< 7	700				
12/21	9.83	7	700				
01/06	10.16	16	700	3.1	274	56	
AVG	9.6	10.6	1555.2	2.7	110.4	37.6	.9
STD DEV	2.27	7.37	891.03	.78	147.59	27.87	.56
MAXIMUM	24.34	37	4600	3.6	400	96	1.35
MINIMUM	8.16	1	2	.9	12	20	.1

1983

T-5

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	19.17	14	88				
1/13	19.5	24	104				
1/20	19.75	15	96				
1/24	19.28	34	117	1.2	20	<20	
2/4	18.17	26	28				
2/10	18	16	60				
2/18	16.92	20	72				
2/28	14.25	13	50	1	<10	<20	
3/3	15.09	10	51				
3/10	13.5	26	44				
3/17	15.09	11	41				
3/24	16.75	< 7	72				
3/31	16.84	18	63	1.2	<10	<20	.08
4/7	16.92	20	52				
4/14	16.67	20	52				
4/21	14.59	11	48				
4/28	12.59	8	34	.9	12	<20	
5/5	14.84	17	36				
5/12	16.59	14	26				
5/19	14.15	29	32				
5/26	13.34	< 7	60	1	15	<20	.08
6/2	13.92	16	48				
6/2	13.92						
6/9	14.84	7	36				
6/17	16.42	7	32	1	<10	<20	
6/23	18.00	11	40				
6/30	18.27	16	40				
7/7	18.67	18	9.6				
7/14	18.84	60	60				
7/21	19	31	39				
7/28	19.09	9	41	1.1	13	<20	
8/4	15.59	20	42				
8/11	19.75	16	37				
8/18	19.57	14	45				
8/26	19.75	8	77	1.1	<10	<20	.13
9/2	20.59	30	80				
9/8	20.00	19	96				
9/15	20.00	22	107				
9/22	20.00	19	143				
9/30	20.17	24	150	1.1	15	<20	
10/6	20.34	25	118				
10/13	20.59	19	163				
10/20	19.75	27	215				
10/27	19.59	7	171	1	<10	<20	
11/3	20.34	30	149				
11/10	20.34	33	151				
11/17	20.34	< 7	163	1	30	<20	.22

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12/8	19.17	18	88				
12/15	19.42	29	80				
12/21	19.67	7	163				
01/06	20.00	12	137	1.2	19	<20	
AVG	17.9	18.3	77.4	1.1	15.2	20	.1
STD DEV	2.53	9.98	49.29	.11	6.24	0	.06
MAXIMUM	24.34	60	215	1.2	30	20	.22
MINIMUM	12.59	4	2	.9	10	20	.08

1984 POND #2 MONITOR WELLS

1984

2305

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	15	11.4	19.8	.4	11	20	.1
STD DEV	5.2	5.9	16.6	.07	1.8	0	.03

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	18.33	13	12				
01/19	19.16	10	12				
01/26	19.25	< 7	13	.3	<10	<20	
02/02	19.66	< 7	16				
02/09	20.16	< 7	19				
02/16	18.91	7	22				
02/24	19.83	< 7	20	.3	<10	<20	.08
03/01	13.50	8	20				
03/08	13.25	< 7	19				
03/15	12.91	< 7	24				
03/22	8.50	< 7	24				
03/30	7.00	< 7	23	.3	<10	<20	
04/05	9.08	10	12				
04/12	8.00	< 7	21				
04/19	11.16	14	28				
04/27	13.41	< 7	18	.3	<10	<20	
05/03	15.33	< 7	28				
05/10	13.91	8	27				
05/17	15.41	< 7	27				
05/24	16.75	< 7	26	.3	14	<20	0.06
05/31	17.75	< 7	.1				
06/07	18.00	< 7	28				
06/14	18.16	36*H	30				
06/22	18.58	7	29				
06/29	19.41	15	30	.4	<10	<20	
07/12	19.83	< 7	40				
07/19	19.91	< 7	40	.3	<10	<20	
07/26	20.16	10	42				
08/02	20.16	< 7	42				
08/10	19.58	7	38				
08/17	20.00	< 7	39				
08/23	20.25	< 7	41				
08/31	19.91	7	43	.3	<10	<20	.08
09/06	21.00	< 7	43				
09/13	20.75	22	44				
09/20	20.33	< 7	44				
09/28	20.00	< 7	43	.3	<10	<20	
10/05	20.00	< 7	47				
10/11	20.00	< 7	52				
10/18	17.41	< 7	3.5				
10/29	6.83	7	2.5	.3	<10	<20	

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11/02	6.91	< 7	3				
11/08	9.16	< 7	2.5				
11/16	9.75	< 7	2.5				
11/30	7.25	< 7	4.5	.3	<10	<20	0.03
12/05	11.33	< 7	.4	CL=11			
12/13	10.75	14	3				
12/20	.66	< 7	3				
12/29	7.75	< 7	2.5	.2	<10	<20	
AVG	15.4	6.4	23.5	.3	10.3	20	.1
STD DEV	5.26	5.98	15.19	.04	1.15	0	.02
MAXIMUM	21	36	52	.4	14	20	.08
MINIMUM	.66	1	.1	.2	10	20	.03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2310

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	23.8	3	380	.4	34	20	.3
STD DEV	1	1	1	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	23.17	27	350	.1	23	<20	.3
05/24	23.50	7	340	.6	33	<20	0.35
08/31	DRY						
11/30	DRY	< 7	450*H	.6	22	<20	0.59
12/05	24.33		600*H	CL=57			
AVG	23.7	11.7	435	.4	26	20	.4
STD DEV	.6	13.61	120.69	.29	6.08	0	.16
MAXIMUM	24.33	27	600	.6	33	20	.59
MINIMUM	23.17	1	340	.1	22	20	.3

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2310

1984

2311

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	1	1	1	1	1	1	1
STD DEV	1	1	1	1	1	1	1

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DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	DRY						
05/24	DRY						
08/31	DRY						
11/30	DRY			.1			
AVG				.1			
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	.1	0	0	0
MINIMUM	10000	10000	10000	.1	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2311

1984

2312

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9.3	10.5	444	.6	14.8	20	.4
STD DEV	3.2	6	101	.16	5.3	1	.1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	11.92	8	450				
01/19	11.83	< 7	470				
01/26	23.12	< 7	490	.4	18	<20	
02/02	11.58	7	460				
02/09	11.42	< 7	510				
02/16	11.17	< 7	630				
02/24	11.00	< 7	440	.4	<10	<20	.33
03/01	4.00	10	500				
03/08	4.25	< 7	410				
03/15	4.67	7	320				
03/22	4.00	8	190				
03/30	3.92	< 7	300	.1	<10	<20	
04/05	4.42	15	280				
04/12	4.08	< 7	150				
04/19	5.25	15	250				
04/27	5.75	< 7	390	.6	14	<20	
05/03	12.00	< 7	190				
05/10	5.25	7	360				
05/17	6.41	< 7	440				
05/24	7.00	7	450	.7	19	<20	0.36
05/31	8.08	9	340				
06/07	8.00	< 7	560				
06/14	8.59	111*H	560				
06/22	8.92	9	580				
06/29	9.08	< 7	610	.7	14	<20	
07/12	9.91	< 7	500				
07/19	9.91	< 7	1230*H	.6	17	<20	
07/26	11.00	< 7	600				
08/02	10.92	< 7	590				
08/10	11.25	< 7	540				
08/17	11.25	< 7	450				
08/23	20.41	< 7	520				
08/31	11.41	< 7	560	.7	14	<20	.36
09/06	23.12	8	530				
09/13	12.83	10	540				
09/20	12.75	16	510				
09/28	12.33	< 7	540	.4	13	<20	
10/05	12.66	< 7	520				
10/11	12.75	8	280				
10/18	12.66	< 7	530				
10/29	3.66	< 7	660*H	2	25	<20	

2312

11/02	3.83	< 7	420				
11/08	4.66	< 7	560				
11/16	5.92	< 7	690*H				
11/30	3.91	< 7	360	.3	11	<20	0.55
12/05	6.23	< 7	500	CL=51			
12/13	8.16	9	720*H				
12/20	3.33	< 7	500				
12/29	4.41	< 7	530	1	11	<20	
AVG	9.1	7.7	483.9	.7	14.7	20	.4
STD DEV	4.7	15.48	168.43	.47	4.44	0	.1
MAXIMUM	23.12	111	1230	2	25	20	.55
MINIMUM	3.66	1	150	.1	10	20	.33

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2313

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9	9.3	2.8	.7	10	20	.1
STD DEV	5.2	5.4	2.8	.2	1	1	.03

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	12.33	32*H	3.8	.7	<10	<20	.51
05/24	4.42	< 7	8.3	.6	<10	<20	0.18
08/31	10.25	54*H	2.5	.4	<10	<20	.13
09/07	NR	< 7					
11/30	3.0	< 7	3.4	.7	<10	<20	0.21
12/05	3.34		4.4	CL=13			
AVG	6.7	20.2	4.5	.6	10	20	.3
STD DEV	4.31	22.23	2.24	.14	0	0	.17
MAXIMUM	12.33	54	8.3	.7	10	20	.51
MINIMUM	3	4	2.5	.4	10	20	.13

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2313

1984

2314

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	13.9	11.9	861.4	1.8	68.3	25.5	.5
STD DEV	2.29	7.6	574.4	.69	64.4	10.3	.41

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DATE	DEPTH TO H20 ft	U ug/1	NO3-N mg/1	F mg/1	Alpha pci/1	Beta pci/1	Ra pci/1
-----	-----	-----	-----	-----	-----	-----	-----
01/11	16.67	19	1220				
01/19	16.92	12	1080				
01/26	16.92	< 7	2400*H	.1	27	<20	
02/02	16.67	14	960				
02/09	17.00	14	970				
02/16	16.59	18	1100				
02/24	16.58	< 7	2175*H	2.7	30	<20	.41
03/01	16.67	14	1080				
03/08	16.25	< 7	640				
03/15	15.75	12	520				
03/22	15.34	8	180				
03/30	14.75	< 7	310	2.4	34	<20	
04/05	14.75	19	240				
04/12	14.16	< 7	240				
04/19	14.50	15	280				
04/27	14.16	< 7	300	1.9	33	<20	
05/03	14.42	14	280				
05/10	14.41	12	260				
05/17	14.50	< 7	260				
05/24	14.58	13	825	1.9	39	<20	0.30
05/31	16.00	< 7	100				
06/07	15.17	< 7	340				
06/14	15.17	39*H	390				
06/22	15.34	< 7	480				
06/29	15.33	12	1125	2.6	25	<20	
07/12	14.83	< 7	300				
07/19	15.08	7	750	2.1	37	<20	
07/26	15.50	7	500				
08/02	15.75	9	940				
08/10	16.00	11	960				
08/17	15.00	8	1040				
08/23	14.41	< 7	1180				
08/31	15.83	11	1400	2.9	47	<20	.46
09/06	9.25	16	1380				
09/13	15.00	12	1610				
09/20	16.16	21	1460				
09/28	16.08	< 7	2825*H	.1	34	<20	
10/05	16.33	8	1510				
10/11	16.16	8	1830				
10/18	16.16	8	1580				
10/29	16.33	< 7	2600*H	.6	37	<20	

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11/02	16.25	8	1770				
11/08	16.08	< 7	1690				
11/16	16.33	< 7	3150*H				
11/30	16.50	14	4350*H	.1	54	<20	0.88
12/05	16.58	7	4700*H	CL=298			
12/13	16.25	9	4825*H				
12/20	16.58	15	2600*H				
12/29	16.25	< 7	2175*H	2.3	31	31	
AVG	15.6	10	1324.1	1.6	35.7	20.9	.5
STD DEV	1.25	6.43	1150.81	1.09	8.17	3.18	.25
MAXIMUM	17	39	4825	2.9	54	31	.88
MINIMUM	9.25	2	100	.1	25	20	.3

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2317

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	3	9	322.8	.8	12.2	20	1
STD DEV	5.9	6.1	137.1	.25	3.8	1	.43

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	3.34	< 7	325	.8	<10	<20	
02/24	4.42	< 7	300	.2	<10	<20	0.51
03/30	3.30	< 7	350	.6	<10	<20	
04/27	4.41	< 7	300	.3	<10	<20	
05/24	6.83	7	300	.6	15	<20	0.86
06/29	9.16	7	200		<10	<20	
07/19	13.25	< 7	200	.8	<10	<20	
08/31	16.59	7	225	.7	<10	<20	.28
09/29	3.75	< 7	200	.6	<10	<20	
10/29	2.83	< 7	175	.7	<10	<20	
11/30	2.33	12	220	.7	<10	<20	0.61
12/05	3.59		260	CL=34			
12/29	3.33	8	200	.5	<10	<20	
AVG	5.9	5.7	250.4	.6	10.4	20	.6
STD DEV	4.42	2.96	58	.19	1.44	0	.24
MAXIMUM	16.59	12	350	.8	15	20	.86
MINIMUM	2.33	1	175	.2	10	20	.28

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2317

1984

2318

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	7.5	12.3	14.8	.6	11.5	20	.1
STD DEV	5.3	6.2	3.4	.2	2.3	1	.03

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	9.25	9	22				
01/19	9.59	8	21				
01/26	9.92	< 7	20	.7	11	<20	
02/02	9.84	< 7	22*H				
02/09	10.17	10	21				
02/16	5.67	< 7	25*H				
02/24	6.75	8	17	.7	<10	<20	.29
03/01	1.42	< 7	15				
03/08	2.25	16	17				
03/15	1.50	7	16				
03/22	1.67	< 7	15				
03/30	1.17	9	15	.4	<10	<20	
04/05	1.75	9	13				
04/12	1.42	< 7	14				
04/19	2.67	18	19				
04/27	3.50	< 7	24*H	.5	15	<20	
05/03	4.09	< 7	17				
05/10	2.17	< 7	12				
05/17	3.84	< 7	13				
05/24	5.25	13	12	.6	11	<20	0.11
05/31	1.67	19	7				
06/07	4.42	< 7	5.5				
06/14	5.75	13	9.6				
06/22	8.59	7	13				
06/29	8.75	13	8		10	<20	
07/12	10.09	< 7	13				
07/19	10.67	< 7	12	.5	15	<20	
07/26	11.92	7	13				
08/02	12.09	7	12				
08/10	12.75	12	11				
08/17	13.84	< 7	12				
08/23	13.34	< 7	12				
08/31	13.50	23	10	.7	<10	<20	.10
09/06	14.34	21	13				
09/13	14.00	10	12				
09/20	15.09	9	12				
09/28	15.00	7	13	.9	<10	<20	
10/05	15.34	8	12				
10/11	15.92	13	20				
10/18	3.92	< 7	2.2				
10/29	1.09	< 7	24*H	.6	<10	<20	

2318

11/02	2318	< 7	24*-				
11/08	3.25	8	32*H				
11/16	2.33	< 7	27*H				
11/30	1.25	< 7	22*H	.9	<10	<20	0.13
12/05	3.09	< 7	25*H	CL=7			
12/13	.50	13	22*H				
12/20	.75	< 7	18				
12/29	2.67	< 7	19	.5	<10	<20	
AVG	54.1	7.8	16	.6	11	20	.2
STD DEV	330.2	5.2	6.05	.16	1.91	0	.09
MAXIMUM	2318	23	32	.9	15	20	.29
MINIMUM	.5	1	2.2	.4	10	20	.1

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2319

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9.6	10.2	2634	4.7	104.8	46.3	5.9
STD DEV	4.1	7.12	1015	6.4	65.3	34.4	3.7

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DATE	DEPTH TO H2O	U	NO3-N	F	Alpha	Beta	Ra
	ft	ug/l	mg/l	mg/l	pci/l	pci/l	pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/11	7.50	7	2500				
01/19	8.92	12	2500				
01/26	7.92	< 7	2400	1.3	50	32	
02/02	7.84	15	2800				
02/09	9.34	30*H	2200				
02/16	7.34	10	2900				
02/24	7.17	11	2300	16.7	61	28	1.59
03/01	5.02	13	2200				
03/08	6.00	7	2900				
03/15	4.67	< 7	2500				
03/22	4.50	< 7	1300				
03/30	4.34	10	2600	2.2	77	41	
04/05	4.34	12	3200				
04/12	4.83	< 7	1800				
04/19	5.33	47*H	3500				
04/27	5.33	< 7	3500	.8	110	34	
05/03	5.92	< 7	3100				
05/10	5.25	7	2200				
05/17	6.42	< 7	2300				
05/24	7.50	33*H	3100		71	41	1.95
05/31	6.25	13	500				
06/07	6.75	< 7	2400				
06/14	7.25	61*H	2900				
06/22	9.59	< 7	1850				
06/29	9.42	< 7	2400	10.7	45	<20	
07/12	10.33	< 7	2200				
07/19	11.00	50*H	2600	2.9	60	31	
07/26	11.42	< 7	2900				
08/02	12.17	9	3100				
08/10	12.59	11	2650				
08/17	13.42	< 7	2750				
08/23	13.83	22	3050				
08/31	13.83	20	2700	1.1	59	25	3.69
09/06	14.67	8	3000				
09/13	14.42	7	2300				
09/20	15.00	< 7	2700				
09/28	14.83	< 7	3300	3.9	68	32	
10/05	15.42	< 7	3300				
10/11	15.42	< 7	3750				
10/18	15.33	7	1100				
10/29	12.75	< 7	1600	1.3	72	30	

2319

11/02	9.83	15	3200				
11/08	9.08	< 7	3550				
11/16	9.58	< 7	3400				
11/30	5.08	< 7	3500	.6			
12/05	6.08	< 7	3450	CL=368			
12/13	7.33	8	3750				
12/20	4.50	< 7	1050				
12/29	5.08	< 7	2700	.7	95	40	
AVG	8.9	10.7	2641.8	3.8	69.8	32.2	2.4
STD DEV	3.65	12.92	714.97	5.16	19	6.66	1.12
MAXIMUM	15.42	61	3750	16.7	110	41	3.69
MINIMUM	4.34	1	500	.6	45	20	1.59

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2325

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	16	19.4	2308	2.4	20.7	20	.4
STD DEV	1.4	10.6	733.4	2.5	6.15	1	.32

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	15.66	9	1360	.2	14	<20	
02/24	14.28	18	940	1.3	28	<20	1.16
03/30	13.50	19	960	.3	<10	<20	
04/27	14.00	15	3520	.2	25	<20	
05/24	14.83	19	3530	.1	16	<20	0.65
06/29	26.00	11	2130	.1	17	<20	
07/19	15.91	23	2980	.1	29	<20	
08/31	16.41	10	1570	.1	<10	<20	1.07
09/28	16.75	11	1590	.1	10	<20	
10/29	17.16	8	1810	.1	14	<20	
11/30	16.08	8	4600*H	.1	26	<20	0.98
12/05	16.66		4550*H	CL=184			
12/29	15.75	7	3950*H	.1	<10	<20	
AVG	16.4	13.2	2576.2	.2	17.4	20	1
STD DEV	3.1	5.39	1334.86	.34	7.53	0	.22
MAXIMUM	26	23	4600	1.3	29	20	1.16
MINIMUM	13.5	7	940	.1	10	20	.65

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2325

1984

2326

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	6.3	9.4	387.6	3.6	21.3	20	1.1
STD DEV	4.22	8.9	247.5	1.2	9.43	1	1.5

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	12.08	< 7	139	3	<10	<20	
02/24	7.00	< 7	96	3.5	<10	<20	.5
03/30	2.91	9	700	8.8	38	<20	
04/27	4.42	< 7	651	3.9	40	<20	
05/24	8.42	19	501	4.5	20	<20	1.45
06/29	12.34	< 7	266	3.5	<10	<20	
07/19	DRY						
08/31	DRY						
09/28	DRY						
10/29	10.59	< 7	185	5.9	26	<20	
11/30	3.42	< 7	350	2.8	11	<20	1.38
12/05	4.09		450	CL=203			
12/29	3.25	12	830	7.8	16	<20	
AVG	6.9	6.3	416.8	4.9	20.1	20	1.1
STD DEV	3.77	6	252.76	2.17	12.03	0	.53
MAXIMUM	12.34	19	830	8.8	40	20	1.45
MINIMUM	2.91	1	96	2.8	10	20	.5

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1984

2327

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	19.1	15.4	2595	.4	14.2	20	.5
STD DEV	2.16	6	809	.38	4.67	1	.17

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	19.33	< 7	1330	.1	<10	<20	
02/24	18.92	7	940	.2	<10	<20	.77
03/30	18.75	13	950	.4	12	<20	
04/27	18.42	9	3380	2	23	20	
05/24	18.84	8	3210	.1	19	23	0.49
06/29	19.50	7	1530	.1	10	<20	
07/19	19.50	10	2780	.1	11	<20	
08/31	19.25	7	1600	.1	10	<20	.73
09/28	19.42	8	1570	.1	<10	<20	
10/29	19.34	< 7	1130	.1	15	<20	
11/30	16.34	< 7	6000*H	.1	<10	<20	0.82
12/05	20.92		3650	CL=24			
12/29	22.50	< 7	2950	.1	<10	<20	
AVG	19.3	6.7	2386.2	.3	12.5	20.3	.7
STD DEV	1.39	3.39	1462.34	.55	4.32	.87	.15
MAXIMUM	22.5	13	6000	2	23	23	.82
MINIMUM	16.34	1	940	.1	10	20	.49

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2327

1984

2328

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	15	13.8	216.7	1.2	11.7	20	.2
STD DEV	6.2	5.04	187.3	.77	5.03	1	.09

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	18.83	< 7	1160*H	3.8	<10	<20	
02/23	NR	18	1275*H				
02/24	18.38	19	940*H	.2	13	<20	.66
03/30	4.33	9	60	1.5	17	<20	
04/27	8.41	< 7	70	1.5	17	<20	
05/24	12.00	10	90	.6	10	<20	0.10
06/29	15.91	< 7	110	1.2	<10	<20	
07/19	18.00	< 7	110	.4	<10	<20	
08/31	DRY						
09/28	19.08	< 7	170	.7	<10	<20	
10/29	8.66	< 7	70	1	<10	<20	
11/30	5.58.	< 7	100	.3	<10	<20	0.21
12/05	21.16		95	CL=68			
12/29	5.25	< 7	110	1.8	<10	<20	
AVG	12.9	7.3	335.4	1.2	11.5	20	.3
STD DEV	6.24	5.86	456.28	1.02	2.84	0	.3
MAXIMUM	21.16	19	1275	3.8	17	20	.66
MINIMUM	4.33	1	60	.2	10	20	.1

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2328

1984

2329

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	20.5	10	9.7	.8	1	1	1
STD DEV	1	1	1	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	DRY						
02/24	DRY						
03/30	DRY						
04/27	DRY						
05/24	DRY						
06/29	DRY						
07/19	DRY						
08/31	DRY						
09/28	DRY						
10/29	DRY						
11/30	DRY						
12/29	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2329

1984

2330

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	21	18.7	11	.9	12.8	20	.1
STD DEV	5.3	4.6	3.34	.63	3.66	1	.04

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DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	23.59	13	12	.7	<10	<20	
02/24	DRY						
03/30	22.25	13	7.2	.8	<10	<20	
04/27	19.50	7	4.8	.7	20	<20	
05/24	19.25	7	2.9	.3	24	<20	0.16
06/29	19.41	13	1.4	.4	<10	<20	
07/19	20.66	11	1.7	1.2	10	<20	
08/31	22.25	7	4.9	2.4	<10	<20	.15
09/28	22.83	13	5.2	.6	<10	<20	
10/29	22.83	7*L	4.9	.8	15	<20	
11/30	22.66	< 7	3.7	.9	26	<20	0.07
12/05	23.58		4.2	CL=332			
12/29	22.91	< 7	13	.8	<10	<20	
AVG	21.8	8.6	5.5	.9	14.1	20	.1
STD DEV	1.64	4.25	3.64	.56	6.27	0	.05
MAXIMUM	23.59	13	13	2.4	26	20	.16
MINIMUM	19.25	2	1.4	.3	10	20	.07

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2330

1984

2338

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	22.25	14	37	.7	16	<20	.72
03/01	23.00	24	75				
03/08	22.67	29	78				
03/15	21.00	30	68				
03/22	20.50	15	75				
03/30	21.00	< 7	81	.8	<17	<20	
04/05	21.42	22	67				
04/12	21.17	93	72				
04/19	21.09	20	133				
04/27	21.12	15	152	.4	12	<20	
05/03	21.34	17	137				
05/10	21.25	9	174				
05/17	21.25	15	188				
05/24	22.25	11	233	.5	15	<20	0.18
05/31	22.50	28	164				
06/07	21.67	9	216				
06/14	21.67	61	212				
06/22	21.42	23	260				
06/29	21.67	12	.1	2.5	13	<20	
07/12	21.42	25	656				
07/19	21.50	18	162	2.3	11	<20	
07/26	22.17	22	196				
08/02	21.84	29	320				
08/10	21.67	23	228				
08/17	21.42	17	188				
08/23	21.25	23	208				
08/31	21.34	24	260	.4	14	<20	.20
09/06	22.25	22	244				
09/13	21.67	27	260				
09/20	21.34	42.	620				
09/28	21.25	8	1.3	.3	17	<20	
10/05	21.50	15	288				
10/11	21.25	29	276				
10/18	21.09	18	116				
10/29	20.50	< 7		.5	<10	<20	
11/02	20.59	18	284				
11/08	20.92	17	312				
11/16	21.00	13	284				
11/30	20.25	11	250	.1	<10	<20	0.20
12/05	22.75	12	204	CL=60			
12/13	22.50	< 7	220				
12/20	21.42	11	200				
12/29	21.00	18	300	.7	<10	<20	
AVG	21.5	21	202.4	.8	10.1	20	.3
STD DEV	.62	15.22	131.22	.8	9.32	0	.26
MAXIMUM	23	93	656	2.5	17	20	.72

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MINIMUM	20.25	4	.1	.1	-17	20	.18

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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2339

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	8.67	< 7	2100	.2	26	<20	.36
03/01	7.83	13	2750				
03/08	8.75	16	2900				
03/15	6.00	20	2550				
03/22	6.17	14	3450				
03/30	5.67	11	2750	.2	19	<20	
04/05	5.75	29	2550				
04/12	5.75	21	2600				
04/19	6.94	24	1925				
04/27	7.00	20	3250	.2	39	24	
05/03	7.09	20	4175				
05/10	7.25	< 7	3450				
05/17	8.00	11	3950				
05/24	8.42	14	4725	.18	40	<20	1.40
05/31	8.17	13	3800				
06/07	8.42	13	4800				
06/14	8.75	28	4900				
06/22	8.50	30	5200				
06/29	9.67	19	7100	.1	38	25	
07/12	11.17	14	5900				
07/19	12.17	7	6700	.2	75	22	
07/26	DRY						
08/02	DRY						
08/10	DRY						
08/17	DRY						
08/23	DRY						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20	DRY						
09/28	DRY						
10/05	DRY						
10/11	DRY						
10/18	DRY						
10/29	DRY						
11/02	11.25	14	6800				
11/08	12.00	8	5300				
11/16	10.58	7	7200				
11/30	10.84	< 7	7200	.6			
12/05	10.75	8	6000	CL=208			
12/13	9.42	7	7400				
12/20	8.42	< 7	5100				
12/29	8.09	22	4300	.1	<10	<20	
AVG	8.5	14.5	4511.2	.2	35.3	21.6	.9
STD DEV	1.91	7.63	1720.39	.16	20.86	2.15	.74
MAXIMUM	12.17	30	7400	.6	75	25	1.4

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MINIMUM	5.67	2	1925	.1	10	20	.36

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

T-1

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	13.9	13	876	1.4	10.6	20	.4
STD DEV	2.01	6.48	424.9	.43	.81	1	.32

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	14.91	26	740				
01/19	14.58	10	740				
01/26	14.66	< 7	860	1.3	<10	<20	
02/02	14.75	< 7	790				
02/09	15.00	11	850				
02/16	14.58	16	950				
02/24	14.58	< 7	720	1.2	<10	<20	.37
03/01	14.91	11	660				
03/08	13.75	17	490				
03/15	13.00	7	630				
03/22	11.58	< 7	640				
03/30	10.58	27*H	700	1.1	<10	<20	
04/05	9.91	22	550				
04/12	9.58	9	580				
04/19	10.83	15	700				
04/27	11.58	< 7	720	1.6	<10	<20	
05/03	12.33	< 7	640				
05/10	7.33	11	730				
05/17	13.00	< 7	760				
05/24	13.25	12	940	1	<10	<20	0.36
05/31	14.25	10	260				
06/07	14.33	7	810				
06/14	14.25	10	940				
06/22	14.41	8	1010				
06/29	14.33	< 7	1400	1	<10	<20	
07/12	14.41	18	1070				
07/19	14.58	< 7	1400	1.6	11	<20	
07/26	14.83	10	1080				
08/02	15.08	7	1360				
08/10	15.00	12	1270				
08/17	15.16	9	1460				
08/23	15.16	12	1400				
08/31	15.25	10	1580	2.4	<10	<20	.44
09/06	15.66	18	1380				
09/13	15.75	15	1300				
09/20	15.58	11	1240				
09/28	15.75	8	1660	1.9	<10	<20	
10/05	15.91	24	1400				
10/11	15.66	< 7	960				
10/18	14.50	< 7	130				
10/29	8.25	< 7	220	1	<10	<20	

11/02	8.16	15	510				
11/08	9.16	< 7	540				
11/16	9.50	< 7	570				
11/30	8.75	< 7	910	.7	<10	<20	0.44
12/05	9.41	< 7	890	CL=233			
12/13	9.50	12	1010				
12/20	8.41	7	930				
12/29	8.41	< 7	1000	1.1	<10	<20	
AVG	12.9	9.7	899.6	1.3	10.1	20	.4
STD DEV	2.65	6.45	356.4	.47	.29	0	.04
MAXIMUM	15.91	27	1660	2.4	11	20	.44
MINIMUM	7.33	1	130	.7	10	20	.36

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	10.2	14.8	366.1	1.1	12.3	20	.3
STD DEV	7.37	7.93	342.8	.47	4.5	1	.28

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	16.25	14	190				
01/19	17.50	48	220				
01/26	18.00	< 7	220	1.3	<10	<20	
02/02	18.50	13	240				
02/09	18.75	10	220				
02/16	18.33	7	260				
02/24	18.67	7	220	1.5	<10	<20	.18
03/01	10.75	16	220				
03/08	8.83	16	190				
03/15	7.92	9	250				
03/22	4.08	< 7	200				
03/30	2.75	< 7	180	.9	14	<20	
04/05	2.42	14	170				
04/12	1.92	7	230				
04/19	4.08	9	250				
04/27	6.17	< 7	240	.9	<10	<20	
05/03	8.75	< 7	210				
05/10	9.00	7	280				
05/17	11.50	7	260				
05/24	13.75	8	260	.9	<10	<20	2.40
05/31	13.67	9	80				
06/07	16.25	< 7	250				
06/14	16.83	< 7	250				
06/22	18.17	14	290				
06/29	19.17	< 7	300	1.2	<10	<20	
07/12	19.00	27	350				
07/19	19.08	< 7	520	1.1	<10	<20	
07/26	19.75	< 7	760				
08/02	19.92	15	860				
08/10	19.50	21	830				
08/17	19.67	13	920				
08/23	19.50	8	970				
08/31	19.50	12	1050	2.1	12	<20	1.45
09/06	20.17	22	1170*H				
09/13	19.58	35*H	1270*H				
09/20	19.50	16	1160*H				
09/28	19.50	9	1190*H	2	17	<20	
10/05	19.00	< 7	1290*H				
10/11	18.75	12	1740*H				
10/18	18.92	23	1000				
10/29	14.42	< 7	70	.9	<10	<20	

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11/02	11.00	< 7	110				
11/08	11.25	7	130				
11/16	14.08	< 7	130				
11/30	5.92	< 7	150	.9	<10	<20	0.16
12/05	7.50	< 7	190	CL=84			
12/13	8.08	11	270				
12/20	1.25	8	310				
12/29	2.17	< 7	290	.9	<10	<20	
AVG	13.7	10.7	457.3	1.2	11.1	20	1
STD DEV	6.24	8.75	412.73	.44	2.23	0	1.08
MAXIMUM	20.17	48	1740	2.1	17	20	2.4
MINIMUM	1.25	1	70	.9	10	20	.16

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9.4	10.1	1608.7	2.9	100.9	37.5	1.2
STD DEV	.56	7.25	857.5	.46	151.62	30.1	.13

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	10.25	< 7	500				
01/19	10.75	< 7	700				
01/26	10.75	9	700	3.1	252	59	
02/02	10.58	< 7	500				
02/09	10.58	< 7	500				
02/16	10.50	< 7	600				
02/24	10.42		700	2.7	153	46	.34
03/01	10.50	12	400				
03/08	10.66	8	500				
03/15	10.00	< 7	370				
03/22	9.58	< 7	400				
03/30	9.58	< 7	420	2	170	39	
04/05	9.83	9	500				
04/12	9.66	< 7	375				
04/19	10.08	< 7	500				
04/27	9.83	< 7	500	1.9	160	30	
05/03	9.91	< 7	410				
05/10	9.66	< 7	410				
05/17	10.16	< 7	390				
05/24	10.16	9	500	2.1	147	41	0.43
05/31	9.50	10	240				
06/07	10.33	8	420				
06/14	10.50	< 7	490				
06/22	10.25	< 7	380				
06/29	10.50	< 7	700	2.2	135	45	
07/12	9.75	< 7	340				
07/19	9.66	< 7	420	2	138	30	
07/26	9.83	< 7	400				
08/02	9.66	< 7	370				
08/10	10.00	< 7	320				
08/17	9.83	< 7	400				
08/23	8.83	< 7	350				
08/31	9.75	146	400	2.3	127	28	.80
09/06	16.08	< 7	350				
09/13	10.16	< 7	410				
09/20	9.83	< 7	370				
09/28	9.83	< 7	500	1.9	118	29	
10/05	9.75	11	380				
10/11	9.91	< 7	410				
10/18	9.66	< 7	170				
10/29	9.66	< 7	2200	2.3	142	45	

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11/02	9.75	< 7	380				
11/08	9.59	< 7	400				
11/16	10.17	< 7	380				
11/30	9.58	< 7	570	1.3	125	<20	0.39
12/05	5.75	< 7	1150	CL=392			
12/13	9.41	11	1650				
12/20	9.50	< 7	900				
12/29	9.66	< 7	660	2	119	<20	
AVG	10	7.5	530.3	2.1	148.8	36	.5
STD DEV	1.15	20.62	337.82	.44	36.28	11.76	.21
MAXIMUM	16.08	146	2200	3.1	252	59	.8
MINIMUM	5.75	1	170	1.3	118	20	.34

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	17.8	18.3	77.6	1.1	14.1	20	.1
STD DEV	2.37	10.07	47.88	.09	6.16	1	.07

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	20.92	25	111				
01/19	19.92	22	119				
01/26	21.34	18	123	2.8	22	<20	
02/02	21.67	34	119				
02/09	21.34	24	132				
02/16	21.75	32	130				
02/24	DRY						
03/01	5.42	14	32				
03/08	5.50	25	21				
03/15	4.00	12	32				
03/22	4.09	25	33				
03/30	3.34	7	46	.7	14	<20	
04/05	3.75	10	28				
04/12	4.17	< 7	27				
04/19	8.50	12	37				
04/27	10.92	< 7	34	.8	<10	<20	
05/03	13.75	< 7	36				
05/10	7.75	7	31				
05/17	10.67	< 7	30				
05/24	12.92	< 7	31	.8	14	<20	0.07
05/31	11.60	< 7	29				
06/07	13.92	< 7	39				
06/14	15.00	16	29				
06/22	16.17	11	27				
06/29	16.59	7	30	.7	<10	<20	
07/12	18.09	8	30				
07/19	18.34	10	31	.8	13	<20	
07/26	19.17	12	38				
08/02	19.17	13	34				
08/10	19.25	14	25				
08/17	19.42	7	42				
08/23	19.42	10	38				
08/31	19.59	12	33	.9	11	<20	.11
09/06	20.42	9	37				
09/13	19.75	18	45				
09/20	20.34	13	53				
09/28	20.34	7	40	1.1	<10	<20	
10/05	20.84	< 7	74				
10/11	21.16	14	43				
10/18	20.75	14	73				
10/29	15.42	< 7	27	1	16	<20	

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11/02	15.50	< 7	27				
11/08	15.84	10	39				
11/16	17.33	< 7	33				
11/30	9.09	< 7	21	.6	<10	<20	0.10
12/05	12.42	< 7	25	CL=20			
12/13	12.25	12	38				
12/20	6.75	< 7	27				
12/29	7.34	< 7	24	.6	11	<20	
AVG	14.6	11.4	45.9	1	12.8	20	.1
STD DEV	6.03	7.78	31.08	.62	3.68	0	.02
MAXIMUM	21.75	34	132	2.8	22	20	.11
MINIMUM	3.34	2	21	.6	10	20	.07

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1983 INJECTION WELL MONITORING

1983

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DATE	DEPTH TO H2O ft	COND uMHO	NO3-N mg/l	pH	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l	T.D.S. mg/l	NH3-N mg/l
1/5			.2	7.7	.9	79.	228.	78.	870.	1013.	
1/12			.1			91.	250.	80.	849.		
2/2			16.1	7.7	8.1	96.	230.	85.7	797.	1093	
2/10			.1			88.	229.	86.6	772.		
3/16			.2			50.	137.	98.	706.		
3/22			.17	7.9	1.1	79.	260.	81.1	840.	1013.	
4/28		1115	.5	7.7	1.15	72	230.	121.	746.	1046	0.5
5/26	U 19	1605	.18	F .6	.07	64	200	128	874		.4
6/22		1680	.17	7.6		63	210	169	770		.5
7/25		1710	.35			50	210	168	786		2.5
8/26	7.25		<.1	A <10	3.13	53	540	724	736	B <20	
8/31		8150	.20			53	1780	2580	666		1.7
9/8	7.25	9100	.32	7.9	1.29	61	2010	2950	616	Ra1.53T	2.2
9/9	7.58	10000	.22			64	2020	3270	608		2.3
9/10	7.58	10550	.14			69	2600	3487	611		2.8
9/11	7.42	12200	.15			85	2700	4419	583		3.9
9/12	7.67	17000	.19	7.6		118	3200	5480	515		3.2
9/13	7.75	18200	.19	7.4		123	3400	5820	500		4.2
9/14		18600	.23			128	3600	5910	498		4.1
9/15	7.83	18600	.20	7.5		126	3500	5950	495		4.0
9/16	7.67	18400	.31			135	3500	5920	498		4
9/19	8.08	18900	.1	7.6		121	3800	6340	495		3.9
9/20	8.08	18900	.20			123	3600	6240	493		3.8
9/21	8.08	19100	.20	7.5		120	3600	6290	495		3.7
9/22	8.08	19200	.20			120	3300	6140	492		4.8
9/23	NS	19800	.30	7.8		139	3800	6301	486	10940	
9/26	9.17	19100	.10			132	3600	6290	492		4.6
9/27	8.92	19100	.37			121	3700	6240	474		3.9
9/28	8.67	19000	.22			124	3600	6220	498		3.9
9/29	8.58	18900	2.53			129	3500	6350	471		4.3
9/30	8.50	18800	.4			125	3600	6205	469		3.8
10/3	8.50	18700	.30			134	3400	6230	483		3.9
10/4	8.42	18600	.40	7.6		140	3600	6060	473		3.7
10/5	8.50	18700	.30	7.4		112	3100	5960	482		3.8
10/6	8.58	18600	.10			118	3100	6250	473		4.3
10/7	8.50	18600	<.1			118	3300	6250	477		3.6
10/10	8.50	18700	<.1			116	3300	6010	469		3.7
10/11	8.33	18700	.1			117	3400	6060	483		3.3
10/13	NS	18700	.1	7.5		117	3300	6110	480		3.8
10/20	8.33	18400	.3			118	3300	6110	499		3.7
10/28	8.50	18800	.1			113	3200	6080	480		4.5
11/17	8.42	18300	<.1	A 24	2.75	103	3300	6060	495	B <20	3.7
12/8	8.33	18300	.1			134	3100	5820	590		2.7
12/12	8.33	4550	25			54	860	798	1240		.2
12/14	8.17	2780	27			29	640	366	908		
12/16	8.42	1740	16			24	460	242	736		<.2
12/19	9.67	1680	31			29	430	296	698		.2
12/21	8.17	1700	28			31	370	294	570		.2

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12/23	8.25	1720	31			33	360	308	550		.2
12/26	8.08	1730	18.2			39	370	322	579		<.2
12/28	8.00	1750	20.6			41	400	325	556		<.2
12/30	8.25	1730	18.8			42	390	334	576		<.2
AVG	8.2	12894.9	4.7	7.6	2.3	91.6	2134.9	3586.7	605.7	3021	2.7
STD DEV	.5	7579.23	9.46	.16	2.54	36.65	1482.89	2788.37	161.35	4426.98	1.67
MAXIMUM	9.67	19800	31	7.9	8.1	140	3800	6350	1240	10940	4.8
MINIMUM	7.25	1115	-.1	7.4	.07	24	137	78	469	1013	-.2

1983

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DATE	DEPTH TO H2O ft	COND uMHO	NO3-N mg/l	pH	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l	T.D.S. mg/l	NH3-N mg/l
1/5			.4	7.2	137.	205.	5900.	10567.	413.	18400	
2/2			.64	7.2	152.	196	5500.	10472	462.	17540	
3/22			.56	7.1	286	196	6000	10385	441.	17640	
4/28		27500	1.0	7.2	115	193.	5200.	10430.	412.	18510.	6.7
5/26	U -7	30000	.23			200	6100	10239	472		3.4
6/22		29600	.47	7.3		190	5100	10287	350		5.2
7/25		29800	.41			203	5300	10700	428		5.6
8/26	NS										
8/31		29920	.14			200	6100	10700	480		4.5
9/29	63.00	29700	.42			204	5900	10535	375		4.9
10/13	NS	30300	.4	7.4		195	5500	10700	387		5.0
10/28	63.0	31000	.5			196	5500	10500	384		5.8
11/17	62.83	30300	1.4	A 140	67	175	5900	10700	375	B 62	4.6
12/12	XX	30800	.35			186	5300	10900	413		4.4
AVG	62.9	29892	.5	7.2	151.4	195.3	5638.5	10547.3	414.8	18022.5	5
STD DEV	.1	957.41	.33	.1	81.81	8.2	357.16	189.08	40.53	503.08	.9
MAXIMUM	63	31000	1.4	7.4	286	205	6100	10900	480	18510	6.7
MINIMUM	62.83	0	.14	7.1	67	175	5100	0	350	0	3.4

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1984 INJECTION WELL MONITORING

1984

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COND	NO3-N	pH	Ra	Ca	Na	Cl	HCO3	T.D.S.	NH3-N
uMHO	mg/l		pci/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1770	18			44	440	344	580		<.2
1790	21.6			45	500	350	590		0.2
1900	16.8			46	480	390	600		<.2
1970	13.6			52	600	420	620		<.2
2060	12.6			56	520	460	630		0.4
2020	14.4			61	420	360	613		0.5
1950	15.0			67	430	418	613		0.8
1900	16.0			71	430	409	599		0.7
	0.21			3.1	340	178	650		
3120	.1	135 A	.36	4.5	350	304	646	40 B	1.7
2560	.2			2.5	310	207	536		1.9
2330	.1	11.8		2.4	360	371	508		4.0
2500	.1			4.4	340	289	466		4.5
2330	.2			3.3	320	314	428		6.0
1956	.5			3.3	300	316	370		<.2
1900	<.1			2.9	300	326	211		9
1613	<.1			2	280	316	419		6
1626	.1			1.6	270	295	239		4.5
1455	.5			1.4	260	305	264		5.5
1094	.1	11.0		1.3	270	303	230		4.3
1440	.1			1.5	270	301	204		.8
1230	.1			1.9	200	297	222		3.3
1300	3.4	34 ALP	0.05	4.8	260	300	219	<20 BETA.9	
1490	2			5.9	250	268	207		3.3
1250	.8			3.4	250	280	193		3.0
1230	.2			8.3	230	266	129		3.4
1350	.2			10.0	230	232	138		1.9
1060	.2			12.2	190	245.	144.		1.2
1313	.4		16 A	16	200	226	140	<20 B	.8
1325	1.7		0.12	23	240	105	331	U=8	
797	1.6			39	230	208	230		<.2
1721	4.5	48	4.1	19.4	324.8	303.3	386.1	26.7	2.3
516.51	7.05	59	7.91	23.33	105.04	76.15	191.02	11.55	2.38
5 3120	21.6	135	16	71	600	460	650	40	9
797	-.1	11	.05	1.3	190	105	129	20	-.2

D WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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2331

DATE	DEPTH TO H20 ft	COND uMHO	NO3-N mg/l	pH	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l	T.D.S. mg/l	NH3-N mg/l
02/24	NR	24300	.9	138 A	44.3	220	4800	10630	335	61 B	4.0
03/30	NR	24400	.3			200	5200	10442	398		
04/27	NR	24500	<.1	170 AL	51	200	5300	10059	436	72 B	6.0
05/25	NR	24600	.5	U=5	51	200	5000	9580	441	72 B	5
06/08	65.17										
06/29	66.11	25200	.1			200	4800	10490	435		4.9
07/20	67.00	31300	.5			190	5300	10251	475		5.0
07/20	67.00										
07/27	66.75	27900	.4			180	5200	10394	403		8.0
08/31	65.75	31000	.3			210	5200	10538	475		5.9
09/28	68.00	25600	.8			170	4900	10394	495.		6.7
10/29	63.50	29900	.4		128 A	220	6800	11000	489	69 B	7.4
11/30	64.66	30600	.9		44	260	6500	9920	452	U=7	
12/05	59.41		.2					11500			
12/29	67.0	14600	.7			270	6800	11000	461		4.4
AVG	65.5	26158.3	.5	154	63.7	210	5483.3	10476.8	441.3	68.5	5.7
STD DEV	2.39	4604.24	.31	22.63	36.13	29.54	757.79	498.04	45.37	5.2	1.31
MAXIMUM	68	31300	.9	170	128	270	6800	11500	495	72	8
MINIMUM	59.41	10000	-.1	138	44	170	4800	9580	335	61	4

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1984

2332

DATE	DEPTH TO H20 ft	COND uMHO	NO3-N mg/l	pH	Ra pci/l	Ca mg/l	Na mg/l	Cl mg/l	HCO3 mg/l	T.D.S. mg/l	NH3-N mg/l
02/24	7.33	13680	<.1	63 A	0 4.04	24	3100	6320	309	<20 B	3.5
03/01	6.92	13700	.08			50	3100	5870	328		4.1
03/08	NR	13760	<.1	8.4		40	3600	6514	316		5.4
03/15	5.67	13620	<.1			45	3400	5892	321		5.2
03/22	5.08	15000	.1			43	3200	5892	317		7.0
03/30	4.83	13770				39	3200	6514	328		4.2
04/05	4.33	13620	<0.1			44	3300	5844	374		3.8
04/12	3.67	13450	<.1			53	3000	5844	332		6.5
04/19	3.83	13790	<.1	43 A	3.9	71	3100	6083	370	<20 B	4.8
04/27	3.67	13660	.3			67	3000	6179	433		5.5
05/03	3.33	13300	<.1	7.7		87	3100	6227	483		4.2
05/10	3.08	13750	.1			87	3000	6131	461		.8
05/17	3.50	13420	.1			80	2400	6370	449		3.5
05/24	3.33			U=7	3.9	43 ALP	<20 BETA		F .04		05/31
05/31	2.58	18400	<.1			79	3200	6035	475		3.4
06/29	4.25	13380	.3			78	2900	6227	498		4.1
07/20	5.67	16970	<.1			81	3100	6035	504		4.0
07/20	5.67										
08/31	7.33	19600	<.1			80	3500	5940	507		4.6
09/28	7.58	13400	<.1			84	2900	5652	518		4.7
10/23	7.42	16300	.1	8.2		88	3600	5844	539		4.4
10/29					59 A					<20 B	
11/30	5.17	14440	.9		4.5	85	3800	6299	510	U=15	
12/29	4.08	9080	.1			96	3800	6350	518		2.9
AVG	4.9	14290	.1	26.1	15.1	66.5	3060	6098.2	423.3	20	4.4
STD DEV	1.58	2134.85	.25	25.59	24.56	21.73	751.23	242.56	84.99	0	1.29
MAXIMUM	7.58	19600	.9	63	59	96	3800	6514	539	20	7
MINIMUM	2.58	9080	-.1	7.7	3.9	24	20	5652	309	20	.8

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2332

1984

2333

DATE	DEPTH TO H20 ft	COND uMHO	NO3-N mg/1	pH	Ra pci/1	Ca mg/1	Na mg/1	Cl mg/1	HCO3 mg/1	T.D.S. mg/1	NH3-N mg/1
02/24	13.33	725	.3	<10 A	0.18	26	140	46	358	<20 B	<.2
03/01	12.33	730	.2			24	150	42	358		<.2
03/08	NR	7610**	0.3	8.1		SL	SL	45	351		<.2
03/15	10.91	708	.4			27	150	29	367		<.2
03/22	10.16	720	.3			23	140	24	367		.7
03/30	10.25	764	.4			24	154	42	370		4.5
04/05	10.16	743	.2			22	152	32	479		<0.2
04/12	9.67	794	.3			24	130	23	374		<.2
04/19	10.41	707	<.1			20	146	28	374		<.2
04/27	11.08	933	.1			23	146	27	447		.3
05/03	11.00	806	.3	6.8		24	152	33.1	467		.3
05/10	10.30	710	.4			26	120	28	452		.2
05/17	11.08	700	.4			24	143	30	449		<.2
05/24	11.50		.6		0.05	<10 ALP	<20 BETA		F .7		05/31
05/31	9.50	852	.3			27	160	24.4	464		<.2
06/29	12.00	840	2.6			25	150	22.5	464		<.2
07/20	12.33	2120	.6			25	140	22	472		<.2
07/20	12.33										
08/31	15.16	1790	.2			25	123	15.8	466		.5
09/28	16.75	650	.2			23	139	13.4	478.		.2
10/23	14.91	892	.2	8.4		28	1980	18.7	484		<.2
10/29					12 A					<20	
11/30	10.25	800	.8		0.09	31	156	14.4	475	U=5	
12/29	9.66	533	5.1			36	146	9.4	484		<.2
AVG	11.6	875.9	.6	8.3	3.1	24.6	225.6	27.1	428.6	20	.5
STD DEV	1.95	383.09	1.12	1.31	5.95	4.74	403.02	10.34	52.35	0	1.49
MAXIMUM	16.75	2120	5.1	10	12	36	1980	46	484	20	5
MINIMUM	9.5	533	-.1	6.8	.05	10	20	9.4	351	20	-.2

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

** NOT USED IN CALCULATION OF AVG. OR STD DEV POSSIBLE BAD SAMPLE

2333

1983 FERTILIZED ACREAGE MONITORING

1983

FTP-1A

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Mo UG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/24	8.75	18	.6			1		.07
2/28	5	17	.5			1		.18
3/31	7.00	20	1		< 4	<10	<20	.15
4/28	6.58	38	.6		3.5			.21
5/26	5.08	10	1		7.1	13	<20	.29
6/17	6.50	17	.8		4.1			.21
7/28	9.42	15	.9		10			.27
8/26	11.92	< 7	1.5		6	14	<20	.23
9/30	13.58	9	.9		7			.07
10/27	14.00	10	1.4		8	19	<20	.07
11/17	14.58	46	1.1		5	15	<20	.08
01/06	15.42	29	.7		2			.10
AVG	10.8	18.8	1.2	1.3	6.6	11.6	16.7	.2
STD DEV	5.23	12.08	.91	0	3.25	7.29	8.14	.08
MAXIMUM	23.08	46	4	1.3	13	20	20	.29
MINIMUM	5	4	.5	1.3	2	1	.07	.07

FTP-1A

1983

FTP-2A

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Mo uG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	13.67	482	8.5					
1/13	13.42	619	13.5					
1/20	12.17	472	15					
1/24	11.82	601	16.5					.08
2/4	12.17	446	12					
2/10	11.17	589	18					
2/18	10.84	573	18					
2/28	10.75	665	18					.43
3/3	10.09	581	21					
3/10	11.84	609	22					
3/17	11.00	668	20					
3/24	9.75	608	21.5					
3/31	9.59	687	19		< 4	420	59	.07
4/7	9.59	561	24					
4/14	11.00	501	25					
4/21	9.09	334	22					
4/28	9.00	311	25		3.5			.19
5/5	9.25	287	34					
5/12	8.34	388	32					
5/19	8.92	437	32					
5/26	8.92	377	32		4.6	353	58	.21
6/2	8.59	461	30					
6/2	8.59							
6/9	8.75	413	31					
6/17	8.75	459	30		4.2			.20
6/23	8.75	275	22					
6/30	8.84	422	22					
7/7	10.00	411	28					
7/14	8.66	431	30					
7/21	9.17	353	32					
7/28	8.75	397	31		5			.81
8/4	8.92	431	33					
8/11	9.00	360	27					
8/18	14.67	369	33					
8/26	9.00	282	36		2	300	91	.14
9/2	16.58	373	31					
9/8	9.00	444	36					
9/15	8.17	314	32					
9/22	9.25	364	35					
9/30	9.25	370	31		2			.19
10/6	9.42	442	36					
10/13	9.59	382	48					
10/20	9.5	479	37					
10/27	9.59	362	44		2	282	26	.15
11/3	10.42	441	40					
11/10	10.00	374	43					
11/17	10.50	260	42		2	255	98	.2

FTP-2A

12/8	9.34	375	34					
12/15	10.25	291	30					
12/21	12.00	305	47					
01/06	12.17	425	34		1			.16
AVG	10.4	428.9	28.2	1.3	3.9	271.7	55.3	.2
STD DEV	2.48	126	9.62	0	3.46	136.49	37.49	.2
MAXIMUM	23.08	687	48	1.3	13	420	98	.81
MINIMUM	8.17	12	4	1.3	1	20	.07	.07

1983

FTP-3A

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Mo uG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	11.61	17	24			1		.04
2/28	11.33	31	23					.27
3/31	11.50	10	18		< 4	11	<20	.02
4/28	10.92	< 7	18		2.1			.21
5/26	11.00	< 7	20		3.7	18	<20	.21
6/17	11.08	7	15		2.9			.06
7/28	11.75	< 7	16		2			.17
8/26	12.25	< 7	15		1	<10	<20	.19
9/30	DRY							
10/27	13.00	< 7	23		<1	14	<20	.07
11/17	13.25	10	28		<.1	23	<20	.12
01/06	13.17	9	27		<1			.09
AVG	12.8	9.3	19.3	1.3	2.5	13.9	16.7	.1
STD DEV	3.34	8.34	6.54	0	4.27	7.38	8.14	.08
MAXIMUM	23.08	31	28	1.3	13	23	20	.27
MINIMUM	10.92	1	4	1.3	-1	1	.07	.02

1983

FTP-4A

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	12.37	13	.3			1		.05
2/28	14.84	15	.5					.68
3/31	9.59	16			< 4	<10	<20	.07
4/28	9.34	< 7	.2		3.0			.09
5/26	8.25		.2		3.5	<10	<20	.08
6/17	10.42	20	.2		5.7			.16
7/28	13.09	16	1.1		11			.08
8/26	14.17	< 7	1.2		7	10	<20	.12
9/30	15.00	< 7	.7		6			.08
10/27	14.75	9	.8		7	20	<20	.02
11/17	14.84	11	.8		<.1	14	<20	.05
01/06	13.75	16	1.1		13			.08
AVG	13.3	11.9	.9	1.3	6.9	12.1	16.7	.1
STD DEV	3.77	5.05	1.04	0	4.34	6.64	8.14	.18
MAXIMUM	23.08	20	4	1.3	13	20	20	.68
MINIMUM	8.25	4	.2	1.3	-.1	1	.07	.02

FTP-4A

1983

FTP-5

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	18.5	< 7	1			1		.03
2/28	16.25	7	26					.32
3/31	16.25	7	30		< 4	<10	<20	.14
4/28	16.08	< 7	18		3.0			.24
5/26	16.83	7	22		3.3	<10	<20	.27
6/17	17.67	12	7.6		.3			.17
7/28	17.92	7	9.4		3			.15
8/26	18.42	< 7	16		<1	<10	<20	.10
9/30	18.67	12	8.2		1			.14
10/27	18.75	<5	13		<1	<10	<20	.1
11/17	18.83	7	13		9	<10	<20	.08
01/06	18.83	8	11		<1			.13
AVG	18.2	6.4	13.8	1.3	3	10.1	16.7	.2
STD DEV	1.82	4.7	8.46	0	4.66	5.49	8.14	.08
MAXIMUM	23.08	12	30	1.3	13	20	20	.32
MINIMUM	16.08	-5	1	1.3	-1	1	.07	.03

FTP-5

1983

FTP-6

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Mo uG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	8.26	10	.6			1		.17
2/28	11.91	19	1.1					.39
3/31	7.66	12	1		< 4	<10	<20	.26
4/28	7.16	9	1		2.5			.26
5/26	7.00	7	1.4		3.5	<10	<20	.23
6/17	7.91	13	1.2		4.4			.25
7/28	8.25	14	.8		3			.48
8/26	8.66	< 7	.9		<1	<10	<20	.02
9/30	8.66	9	.3		1			.25
10/27	8.5	12	.6		<1	13	<20	.19
11/17	8.41	< 7	.5		2	<10	<20	.35
01/06	7.91	16	.8		<1			.30
AVG	9.5	11	1.1	1.3	2.6	10.6	16.7	.3
STD DEV	4.25	4.12	.92	0	4.14	5.59	8.14	.12
MAXIMUM	23.08	19	4	1.3	13	20	20	.48
MINIMUM	7	4	.3	1.3	-1	1	.87	.02

FTP-6

1983

FTP-7

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/24	31.73	13	.1			1		.05
2/28	34.33	28	1					.21
3/31	31.91	19			< 4	<10	<20	.32
4/28	34.17	19	.2		2.7			.15
5/26	34.00	15	.2		3.2	11	<20	.24
6/17	31.25	24	.2		3.6			.19
7/28	31.09	21	.2		4			.23
8/26	31.17	7	.2		1	12	<20	.10
9/30	31.17	16			2			.09
10/27	31.25	13	.2		<1	<10	<20	.12
11/17	31.59	9	.1		1	11	<20	.07
01/06	31.50	19	.1		<1			.10
AVG	31.4	16.5	.6	1.3	2.9	10.7	16.7	.2
STD DEV	2.78	5.92	1.16	0	3.98	5.53	8.14	.08
MAXIMUM	34.33	28	4	1.3	13	20	20	.32
MINIMUM	23.08	7	.1	1.3	-1	1	.07	.05

FTP-7

1983

270-1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	15.82	18	22			1		.03
2/28	1111	18	30.5					2.46
3/31	17.75	19	25		< 4	21	<20	.14
4/28	19.92	13	22		8.3			.16
5/26	20.33	8	17		13.4	13	<20	.15
6/17	20.58	14	12		16.3			.08
7/28	20.25	25	5.4		11			.05
8/24	29.75	22	7.2		12	<10	<20	.12
9/30	17.17	8	4		10			.15
10/27	15.58	18	6.2		10	13	<20	.06
11/17	15.33	13	6		9	12	<20	.11
01/06	14.75	19	7.2		7			.05
AVG	103.2	15.9	13	1.3	11	12.9	16.7	.3
STD DEV	302.84	5.11	9.18	0	2.75	6.67	8.14	.68
MAXIMUM	1111	25	30.5	1.3	16.3	21	20	2.46
MINIMUM	14.75	8	4	1.3	7	1	.07	.03

270-1

1983

270-2

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	15.45	18	9			1		.06
2/28	11.0?	19	10					.54
3/31	10.16	17	10		< 4	16	<20	.07
4/28	13.83	10	12		5.2			.14
5/26	12.50	8	12		3.9	13	<20	.16
6/17	12.33	12	9.5		6.6			.10
7/28	12.17	21	6		8			.22
8/26	11.67	13	7.8		3	16	<20	.13
9/30	9.25	16	5.5		4			.09
10/27	9.17	13	6		3	17	<20	.09
11/17	9.17	8	6.2		4	18	<20	.1
01/06	9.92	15	4		2			.08
AVG	12.3	14	7.8	1.3	5.3	14.4	16.7	.1
STD DEV	3.76	4.1	2.78	0	3.25	6.29	8.14	.13
MAXIMUM	23.08	21	12	1.3	13	20	20	.54
MINIMUM	9.17	8	4	1.3	2	1	.07	.06

270-2

1983

270-3

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Mo uG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	1.77	9	2			1		.08
2/28	1111	18	1.9					.42
3/31	1.09	13	1		< 4	<10	<20	3E-03
4/28	2.33	7	.4		2.7			.13
5/26	2.08	< 7	.3		5.6	13	<20	.14
6/17	2.58	21	.1		5.1			.09
7/28	4.00	22	.4		4			.25
8/26	4.75	20	.2		1	15	<20	.20
9/30	4.00	10	.3		2			
10/27	4.50	13	.7		1	16	<20	.12
11/17	4.91	10	1		2	15	<20	.09
01/06	3.75	17			<1			.43
AVG	90	13.6	1	1.3	3.5	12.9	16.7	.2
STD DEV	306.93	5.52	1.13	0	3.88	6.04	8.14	.14
MAXIMUM	1111	22	4	1.3	13	20	20	.43
MINIMUM	1.09	5	.1	1.3	-1	1	.07	3E-03

270-3

1984 FERTILIZED ACREAGE MONITORING

1984

FTP-1A

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	9.3	17.8	.9	1	6.3	10.4	20	.2
STD DEV	3.47	12.31	.31	1	2.14	6.97	1	.08

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	16.00	40	.7		2			.13
02/16	16.25	9	.6		3	11	<20	.06
03/26	NS							
04/17	5.00	11	<.1		<0.018	<10		
04/27	NS							
06/25	8.17	0 15	.5					
08/31	11.83	< 7	1.1		<0.018	10		
10/29	12.33	< 7	.8		<0.018	24		0.30
11/30	5.67		.4					
AVG	10.8	13	.6		1.2	13.8	20	.2
STD DEV	4.6	14.29	.37	0	1.51	6.85	0	.12
MAXIMUM	16.25	40	1.1	0	3	24	20	.3
MINIMUM	5	.018	-.1	10000	-.018	10	20	.06

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

FTP-1A

1984

FTP-2A

****

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	10.2	435.1	28.2	1	3.2	322	66.4	.2
STD DEV	1.8	129.8	9.4	1	1.31	65.46	28.99	.21

****

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----	-----
01/11	12.42	250	38					
01/19	13.00	287	33					
01/26	12.42	284	38		1			.21
02/02	12.75	419	39					
02/09	12.92	314	40					
02/16	12.84	282	38		2.	274	30	.09
03/01	13.00	344	43					
03/08	13.17	334	26					
03/15	12.84	284	33					
03/22	12.34	210	28					
03/26	NS							
04/05	11.25	283	23					
04/12	NS							
04/17	10.67	286	42		<0.018	218		0.66
04/19	NS							
04/27	NS							
05/03	NS							
05/10	NS							
05/17	NS							
05/31	NS							
06/07	11.17	283	38					
06/25	9.75	0 272	44					
07/26	9.50	198	32					
08/10	8.84	295	35					
08/31	9.25	299	41		<0.018	224		.66
10/29	10.59	< 7	41		<0.018	157		0.18
11/30	10.09		3.7					
12/05	10.92		40	CL=28				
AVG	11.5	273.6	34.8		.6	218.3	30	.4
STD DEV	1.45	83.44	9.28	0	.9	47.93	0	.28
MAXIMUM	13.17	419	44	0	2	274	30	.66
MINIMUM	8.84	.18	3.7	10000	-.018	157	30	.09

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

FTP-3A

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	12	9.8	20.3	1	1.5	12.8	20	.1
STD DEV	1.06	9.11	4.24	1	1.66	7.52	1	.09

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	13.17	13	31*H		<1			.15
02/16	13.25	7	27		1	19	<20	.11
03/26	NS							
04/17	12.00	< 7	17		<0.018	<10		0.39
04/27	NS							
06/25	12.25	< 7	16					
08/31	13.00	< 7	21		<0.018	<10		.39
10/29	13.25	< 7	26		<0.018	17	0.10	
11/30	12.58		18					
AVG	12.8	4.8	22.3		.2	14	10.1	.3
STD DEV	.51	4.71	5.77	0	.51	4.69	14.07	.15
MAXIMUM	13.25	13	31	0	1	19	20	.39
MINIMUM	12	1E-03	16	10000	-.018	10	.1	.11

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

FTP-3A

1984

FTP-4A

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	12.6	12.5	.6	1	5.4	10.8	20	.1
STD DEV	2.5	6.02	.36	1	3.31	6.21	1	.18

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	14.25	25*H	.4		13			.08
02/16	13.84	7	.3		2	<10	<20	.07
03/26	NS							
04/17	10.84	8	.1		<0.018	13		0.13
04/27	NS							
06/25	12.00	< 7	.2					
08/31	13.67	7	.9		<0.018	26		
10/29	13.75	< 7	.7		<0.018	39		0.03
11/30	12.00		.6					
AVG	12.9	8.8	.5		3	22	20	.1
STD DEV	1.28	8.42	.29	0	5.66	13.29	0	.04
MAXIMUM	14.25	25	.9	0	13	39	20	.13
MINIMUM	10.84	.022	.1	10000	-.018	10	20	.03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

FTP-5

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	17.7	5.9	13.7	1	2.2	8.5	20	.2
STD DEV	1.07	4.58	9.22	1	3.26	3.67	1	.09

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	18.92	< 7	9.2		<1			.08
02/16	18.92	< 7	6.2		<1	<10	<20	.07
03/26	NS							
04/17	17.58	< 7	4.4		<0.018	<10		
04/27	NS							
06/25	18.17	< 7	.8					
08/31	18.10	< 7	1.0		<0.018	<10		
10/29	18.83	< 7	3.6		<0.018	22		0.07
11/30	16.83		.4					
AVG	18.2	3.7	3.7		-.3	13	20	.1
STD DEV	.79	2.5	3.26	0	.49	6	0	.01
MAXIMUM	18.92	6	9.2	0	0	22	20	.08
MINIMUM	16.83	.016	.4	10000	-1	10	20	.07

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

FTP-6

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	8.6	10.9	.8	1	1.8	9	20	.3
STD DEV	1.36	4.29	.34	1	2	4.1	1	.12

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	8.08	9	1		<1			.21
02/16	8.00	9	1.3		1	<10	<20	.24
03/26	NS							
04/17	6.91	9	2.0		<0.018	<10		
04/27	NS							
06/25	7.91	0 7	1.6*H					
08/31	8.58	7	1.3		<0.018	<10		
10/29	7.50		.4		<0.018	<10		
11/30	6.91		2.5*H					
AVG	7.7	8.2	1.4		.2	10	20	.2
STD DEV	.62	1.1	.68	0	.51	0	0	.02
MAXIMUM	8.58	9	2.5	0	1	10	20	.24
MINIMUM	6.91	7	.4	10000	-.018	10	20	.21

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

FTP-7

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	32.3	17.3	.3	1	2.1	9.2	20	.2
STD DEV	1.37	6.25	.27	1	1.67	4.07	1	.08

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	32.00	20	.2		<1			.11
02/16	32.09	12	.3		1	11	<20	.10
03/26	NS							
04/17	31.59	11	<.1		<0.018	<10		
04/27	NS							
06/25	32.17	0 14	.2					
08/31	32.17	14	.2		<0.018	<10		
10/29	32.25	< 7			<0.018	20		0.12
11/30	32.42		.4					
AVG	32.1	11.8	.2		.2	12.8	20	.1
STD DEV	.26	6.58	.17	0	.51	4.86	0	.01
MAXIMUM	32.42	20	.4	0	1	20	20	.12
MINIMUM	31.59	.017	-.1	10000	-.018	10	20	.1

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

FTP-7

1984

270-1

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	17	15.8	14.7	1	11.3	11.7	20	.3
STD DEV	6	5.19	9.03	1	2.61	6.44	1	.71

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	15.67	19	8.8		7			.12
02/16	16.75	13	9		9	<10	<20	.09
03/26	NS							
04/17	19.00	< 7	3.0		<0.018	<10		
04/27	NS							
06/25	20.42	< 7	7.8					
08/31	18.93	16	6.2		<0.018	10		
10/29	15.67	< 7	5.6		<0.018	16		0.39
11/30	14.67		9.8					
12/05	15.00		12	CL=13				
AVG	17	9.7	7.8		3.2	11.5	20	.2
STD DEV	2.14	7.42	2.79	0	4.45	3	0	.17
MAXIMUM	20.42	19	12	0	9	16	20	.39
MINIMUM	14.67	8E-03	3	10000	-.018	10	20	.09

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

270-1

1984

270-2

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	9							
STD DEV	11.5							

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	11.25	20	4		2			.15
02/16	12.09	8	4.4		3	16	<20	.05
03/26	NS							
04/17	10.34	< 7	4.0		<0.018	<10		
04/27	NS							
06/25	10.25	0 11	3					
08/31	8.92	13	5.5		<0.018	13		
10/29	8.34	< 7	2		<0.018	34		0.04
11/30	8.34		6.6					
12/05	8.50		6	CL=10				
AVG	9.8	9.2	4.4		1	18.3	20	.1
STD DEV	1.44	7.19	1.54	0	1.42	10.78	0	.06
MAXIMUM	12.09	20	6.6	0	3	34	20	.15
MINIMUM	8.34	.011	2	10000	-.018	10	20	.04

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

270-2

1984

270-3

1983 DATA

	DEPTH	U	NO3-N	F	Mo	Alpha	Beta	Ra
AVERAGE	9							
STD DEV	3							

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Mo ug/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	3.50	9	.2		<1			.21
02/16	3.08	< 7	4.2*H		1	<10	<20	.17
03/26	NS							
04/17	1.33	< 7	16.9		<0.018	<10		0.29
04/27	NS							
06/25	2.67	< 7	8.2*H					
08/31	3.75	< 7	.4		<0.018	<10		.29
10/29	3.25	< 7			<0.018	20		0.47
11/30	2.58		.1					
AVG	2.9	5.3	5		.2	12.5	20	.3
STD DEV	.8	2.94	6.64	0	.51	5	0	.12
MAXIMUM	3.75	9	16.9	0	1	20	20	.47
MINIMUM	1.33	.013	.1	10000	-.018	10	20	.17

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1979-1984 VEGETATION MONITORING

TABLE 13

SEQUOYAH VEGETATION
ug/g

Sample Location	Element	1979 April	1979 October	1980 April	1980 October	1981 April	1981 October	1982 April	1982 October	1983 April	1983 October	1984 April	1984 October
2503	F	23	30	44	31	86	47	300	54	6.5	56	14	6
	U	5	45	2	3	12	10	2	3	2.8	5.3	8.7	1.4
2504	F	14	18	10	122	23	5	170	170	9.8	180	23	7
	U	6	17	4	15	2	3	6	10	7.7	60	3.7	2.2
2505	F	39	27	9	34	26	14	66	58	5.1	39	21	9
	U	14	8	9	4	2	4	5	8	4.4	4.1	1.4	1.6
2506	F	6	8	29	48	93	7	91	37	8.5	36	29	13
	U	1	3	5	7	7	16	1	4	2.9	1.4	2.0	0.4
2507	F	6	9	17	29	3	13	32	15	2.0	27	30	11
	U	2	2	3	3	8	7	1	2	0.7	0.9	0.7	0.3
2508	F	7	10	7	26	6	5	31	21	2.1	77	31	6
	U	1	4	3	3	1	5	0	1	1.0	1.0	0.0	0.2
2509	F	10	3	10	28	22	5	33	8	5.7	24	7	12
	U	2	1	2	4	1	1	1	1	1.1	1.0	0.1	0.5
2510	F	11	8	12	33	3	10	9	13	2.9	24	6	9
	U	1	1	2	13	4	5	1	2	0.8	0.8	0.3	0.4

NOTE: Results are reported on an "as dried" basis.

1979-1984 SOIL MONITORING

SEQUOYAH SOIL
ug/g

Sample Location	Element	1979 April	1979 October	1980 April	1980 October	1981 April	1981 October	1982 April	1982 October	1983 April	1983 October	1984 April	1984 October
2403	F	140	160	284	130	170	140	150	150	170	120	230	110
	U	9	4	3	2	18	13	5	10	5.2	5.7	6.6	9.2
2404	F	360	135	110	170	200	97	190	190	100	290	150	84
	U	1	8	5	15	6	4	270	2	18	58	20.2	22
2405	F	130	89	213	85	110	160	180	350	200	210	290	110
	U	15	2	6	3	2	6	13	50	6.2	6.6	9.2	12
2406	F	110	125	156	140	130	120	130	150	150	130	180	110
	U	2	2	2	4	1	3	8	10	3.8	5.7	1.3	6.8
2407	F	200	140	111	180	160	210	190	NS	180	130	330	130
	U	1	2	2	2	2	1	2	NS	1.5	2.2	4.8	1.5
2408	F	150	140	280	150	220	120	140	NS	130	110	130	130
	U	2	2	1	1	2	1	3	NS	2.1	2.7	2.3	110
2409	F	80	170	207	410	400	110	130	140	100	100	420	10
	U	2	2	2	2	2	1	3	6	2.1	1.8	1.7	2.3
2410	F	100	120	249	120	200	100	94	120	160	140	230	91
	U	1	4	1	2	1	1	1	5	1.5	1.7	1.0	1.6

1978-1984 STREAM SEDIMENT MONITORING

TABLE 12
STREAM SEDIMENT SAMPLE DATA
SEQUOYAH FUELS CORPORATION
SEQUOYAH FACILITY

Date	UPSTREAM ILLINOIS RIVER			EFFLUENT STREAM[1]			DOWNSTREAM ILLINOIS RIVER			PORT ROAD BRIDGE		
	Uranium (ug/g)	Ra-226 (pCi/g)	Th-230 (pCi/g)	Uranium (ug/g)	Ra-226 (pCi/g)	Th-230 (pCi/g)	Uranium (ug/g)	Ra-226 (pCi/g)	Th-230 (pCi/g)	Uranium (ug/g)	Ra-226 (pCi/g)	Th-230 (pCi/g)
10/14/78	1.1	0.48	0.347	77	0.42	1.19	4.6	0.42	0.48	*	*	*
12/10/78	37	*	*	504	*	*	22.5	*	*	*	*	*
12/29/78	8.9	0.98	0.69	218	0.61	2.12	5.0	0.80	0.43	*	*	*
05/29/79	38.39	0.35	0.66	90	0.47	1.27	14.3	0.38	0.59	*	*	*
12/02/79	3.28	0.51	*	64	0.45	*	7.9	0.56	*	*	*	*
12/02/80	*	*	*	640	71.6	10.3	*	*	*	*	*	*
04/28/81	*	*	*	250	0.18	1.63	*	*	*	*	*	*
02/08/83	*	*	*	*	2.79[2]	4.4[2]	*	*	*	*	*	*
06/18/83	3.0	1.08	0.685	99.0[2] 92.0[3]	0.81[2] 0.99[3]	3.53[2] 2.35[3]	6.0	1.86	0.745	49	0.81	3.53
12/12/83	<2.0	0.824	0.833	87.5[3]	1.15[3]	2.38[3]	<2.0	0.564	0.438	160	1.05	1.87
06/26/84	1.2	1.04	22.0	90.0[3]	0.92[3]	3.90[3]	3.0	0.520	0.311	130	0.66	3.62
12/11/84	2.0	0.104	1.97	52.0[3]	0.88[3]	0.424[3]	2.0	0.045	13.0	236	0.072	0.54

NOTES:

1. Values are averages of concentrations obtained along the effluent stream and confluence with the Illinois River, unless otherwise noted.
2. Sample collected along effluent stream.
3. Sample collected at confluence with Illinois River.

* Parameter not analyzed.

0144E

Table 9A

1983 FACILITY OPERATIONS MONITORING

1983

2301

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
3/31	2.25	177	27	1.7	110	<20	.13
5/26	2.25	< 7	23	1.5	107	<20	.1
8/26	2.16	59	12	1.6	51	<20	.01
11/17	1.58	70	15	1.8	58	<20	.07
01/06	1.50	117	8	1.9			
AVG	1.9	85.4	17	1.7	81.5	20	.1
STD DEV	.38	65.09	7.84	.16	31.33	0	.05
MAXIMUM	2.25	177	27	1.9	110	20	.13
MINIMUM	1.5	4	8	1.5	51	20	.01

2301

1983

2302

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
-----	-----	-----	-----	-----	-----	-----	-----
1/24	1.4	19	54	.8	14	15	
2/28		56	55	.6	16	<20	
3/31	.17	20	45	.6	17	<20	.05
4/28	.08	17	54	.5	<10	<20	
5/26	.08	15	55	.5	13	<20	.18
6/17	1.17	23	46	.5	<10	<20	
7/28	1.83	24	47	.5	13	<20	
8/26	2.17	19	38	.5	<10	<20	.3
9/30	2.08	10	55	.5	22	<20	
10/27	1.67	26	58	.5	14	<20	
11/17	2.00	25	51	.5	19	<20	.28
01/06	NR	21	45	.6	30	<20	
AVG	1.4	34.8	48.5	.6	22.9	19.6	.2
STD DEV	.86	44.09	8.61	.33	26.75	1.39	.1
MAXIMUM	2.25	177	58	1.7	110	20	.3
MINIMUM	.08	10	27	.5	10	15	.05

2302

1983

2303

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
-----	-----	-----	-----	-----	----	----	----
1/24	5.75	19	116	.6	<10	<20	
2/28	4.92	14	130	.6	10	<20	
3/31	5.08	20	101	.5	<10	<20	.13
4/28	4.83	8	125	.5	10	<20	
5/26	4.92	10	134		12	<20	.12
6/17	6.67	16	122	.5	12	<20	
7/28	7.5	16	123	.5	11	<20	
8/26							
9/30	8.33	16	122	.6	12	<20	
10/27	8.17	40	87	.7	25	<20	
11/17	8.58	13	120	.8	27	<20	.15
01/06	2.92	20	93	.8	32	<20	
AVG	5.8	30.8	108.3	.7	23.4	20	.1
STD DEV	2.07	46.75	29.46	.35	28.37	0	.01
MAXIMUM	8.58	177	134	1.7	110	20	.15
MINIMUM	2.[illegible]	8	27	.5	10	20	.12

2303

1983

2306

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	4.7	12	11.6	.2	<10	<20	
2/28	4	< 7	11	.2	<10	<20	
3/31	4.08	10	9	.2	<10	<20	.2
4/28	4.00	< 7	7.5	.2	<10	<20	
5/26	4.25	9	6.4	.2	<10	<20	.12
6/17	4.58	9	6.1	.2	<10	<20	
7/28	11.08	< 7	4.5	.3	<10	<20	
8/26	14.08	< 7	2.9	.2	<10	<20	.05
9/30	13.5	< 7	2.5	.2	<10	<20	
10/27	13.88	24	4.5	.3	<10	<20	
11/17	13.58	< 7	3.4	.2	<10	<20	.07
01/06	4.58	< 7	12	.3	<10	<20	
AVG	7.6	20.1	8.3	.3	17.7	20	.1
STD DEV	4.72	47.56	6.5	.41	27.74	0	.06
MAXIMUM	14.08	177	27	1.7	110	20	.2
MINIMUM	2.25	1	2.5	.2	10	20	.05

2306

1983

2315

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	3.5	15	19	.3			
2/28	3.42	14	17	.3	<10	<20	
3/31	3.42	14	11	.3	<10	<20	.07
4/28	3.33	10	14	.2	<10	<20	
5/26	3.17	44	11	.3	<10	<20	.04
6/17	4.00	9	13	.3	<10	<20	
7/28	11.58	10	8	.3	<10	<20	
8/26	3.67	< 7	3	.3	<10	<20	.07
9/30	3.42	19	3	.3	<10	<20	
10/17	3.58	10	4	.3	<10	<20	
11/17	3.58	15	2	.2	<10	<20	.04
01/06	3.67	23	2	.3	<10	<20	
AVG	4.2	15.7	8.9	.3	10	20	.1
STD DEV	2.33	10.13	6.1	.04	0	0	.02
MAXIMUM	11.58	44	19	.3	10	20	.07
MINIMUM	3.17	5	2	.2	10	20	.04

2315

1983

2316

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
3/31	12.67	16	10	.2	<10	<20	.09
5/26	12.83	< 7	13	.4	<10	<20	.15
8/26	11.50	7	12	.3	<10	<20	.14
11/17	9.83	16	15	.3	<10	<20	.09
01/06	10.33	< 7	3	.3			
AVG	11.4	9	10.6	.3	10	20	.1
STD DEV	1.35	6.75	4.62	.07	0	0	.03
MAXIMUM	12.83	16	15	.4	10	20	.15
MINIMUM	9.83	1	3	.2	10	20	.09

2316

1983

2321

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
3/31	8.75	10	21	.6	15	<20	.14
5/26	10.00	21	23	.6	10	<20	.06
8/26	11.00	14	28	.7	10	<20	.07
11/17	12.33	10	32	.9	<10	<20	.08
01/06	12.75	27	23	.7			
AVG	11	16.4	25.4	.7	11.3	20	.1
STD DEV	1.65	7.44	4.51	.12	2.5	0	.04
MAXIMUM	12.75	27	32	.9	15	20	.14
MINIMUM	8.75	10	21	.6	10	20	.06

2321

1983

2322

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
3/31	DRY						
5/26	DRY						
8/26	DRY						
11/17	DRY						
01/06	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	0	0	0	0	0	0	0

2322

1983

2323

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
3/31	DRY						
5/26	DRY						
[illegible]	DRY						
11/17	DRY						
01/06	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	0	0	0	0	0	0	0

2323

1983

2324

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
3/31	24.34	21	2	.9	23	<20	.1
5/26	27.25	21	1.1	1.3	21	<20	.17
8/26	24.58	23	5.4	1.7	<10	<20	.04
11/17	23.33	14	1.1	.8	17	<20	.17
01/06	23.33	15	2.2	.8			
AVG	24.6	18.8	2.4	1.1	17.8	20	.1
STD DEV	1.61	4.02	1.77	.39	5.74	0	.06
MAXIMUM	27.25	23	5.4	1.7	23	20	.17
MINIMUM	23.33	14	1.1	.8	10	20	.04

2324

1983

F-1

DATE	DEPTH TO H2O ft	U UG/l	NO3-N MG/l	F MG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/24	4.77	9	8	.5	14	<20	
2/28	1.67	9	14	.5	14	<20	
3/31	4.17	< 7	12	.6	<10	<20	.15
4/28	6.42	< 7	14	.5	<10	<20	
5/26	7.75	< 7	19	.6	<10	<20	.08
6/17	9.17	9	30	.6	<10	<20	
7/28	10.59	< 7	23	.5	<10	<20	
8/26	11.59	< 7	15	.6	<10	<20	.16
9/30	12.25	< 7	17	.7	<10	<20	
10/27	12.75	16	4	.6	<10	<20	
11/17	DRY						
12/06	13.34	< 7	.8	1.2	<10	<20	
AVG	9.9	7	13.2	.7	11.8	20	.1
STD DEV	5.89	6.21	8.65	.21	3.86	0	.04
MAXIMUM	24.34	21	30	1.2	23	20	.16
MINIMUM	1.67	1	.8	.5	10	20	.08

F-1

1983

F-2

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
----	-----	-----	----	-----	-----	-----	-----
1/24	6.87	16	.8	1.2	<10	<20	
2/28	3.5	15	1.5	.9	<10	<20	
3/31	5.34	< 7	1	.9	<10	<20	.1
4/28	4.50	< 7	.5	.7	10	<20	
5/24	4.50	< 7	.9	.9	11	<20	.03
6/17	8.34	< 7	.7	.7	<10	<20	
7/28	DRY						
8/26	DRY						
9/30	DRY						
10/27	DRY						
11/17	DRY						
01/06	DRY						
AVG	8.2	9.7	1.1	.9	12	20	.1
STD DEV	7.3	7.52	.52	.17	4.86	0	.04
MAXIMUM	24.34	21	2	1.2	23	20	.1
MINIMUM	3.5	1	.5	.7	10	20	.03

1983

F-3

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	15.88	27	5.7	.9	13	<20	
2/28	16.08	32	1.6	1	18	<20	
3/31	DRY						
4/28	15.91	19	.5	.8	21	<20	
5/26	15.58	12	.4	.9	19	<20	.08
6/27	DRY						
7/28	15.25	21	.2	.7	<10	<20	
8/26	15.25	9	.2	.9	13	<20	.05
9/30	DRY	10					
10/27	15.33	< 7	.2	1.1	<10	<20	
11/17	DRY						
01/06	DRY						
AVG	16.7	17.1	1.3	.9	15.9	20	.1
STD DEV	3.1	9.32	1.89	.12	5.03	0	.03
MAXIMUM	24.34	32	5.7	1.1	23	20	.1
MINIMUM	15.25	3	.2	.7	10	20	.05

1983

ED-1

DATE	DEPTH TO H20 ft	U U6/l	NO3-N M6/l	F M6/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	25.75	20	650				
1/13	24.92	30	620				
1/20	24.59	31	600				
1/24	23.77	34	550	1.3	16	<20	
2/4	23.75	48	490				
2/10	23.92	38	650				
2/18	23.25	30	750				
2/28	23.59	37	770	1.5	43	<20	
3/3	23.92	35	770				
3/10	21.34	57	740				
3/17	23.59	64	670				
3/24	24.00	31	830				
3/31	24.00	33	810	1.6	54	<20	1.6
4/7	25.42	44	780				
4/14	25.17	41	830				
4/21	25.67	38	650				
4/28	25.67	25	700	1.2	48	<20	
5/5	25.75	31	810				
5/12	25.75	46	590				
5/19	25.75	43	800				
5/26	25.75	26	780	1.3	41	<20	1.45
6/2	26.00	32	170				
6/[illegible]	26.00						
6/9	26.42	26	790				
6/17	26.59	26	710	1.4	41	<20	
6/23	27.34	17	840				
6/30	28.00	38	860				
7/7	27.17	27	445				
7/14	26.92	37	720				
7/21	27.09	34	810				
7/28	26.84	22	640	1.2	32	<20	
8/4	28.00	35	830				
8/11	28.34	29	650				
8/18	28.00	25	810				
8/26	27.92	15	810	1.4	38	<20	1.33
9/2	28.59	22	800				
9/[illegible]	28.59	34	810				
9/15	28.50	30	790				
9/22	28.25	25	810				
9/30	28.34	8	950	1.5	45	<20	
10/6	28.42	30	657				
10/13	28.34	32	780				
10/20	28.92	34	760				
10/27	28.34	23	890	1.1	23	<20	
11/3	28.84	42	169				
11/10	28.75	22	159				
11/17	28.67	10	750	1.2	30	<20	1.98

1983

ED-5

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/24	1.7	17	3.2	.5	<10	<20	
2/28	.58	25	4	.3	<10	<20	
3/30	.92	11	1	.4	13	<20	2E-03
4/28	1.00	< 7	.1	.2	<10	<20	
5/26	1.92	< 7	3	.1	<10	<20	.12
6/17	5.17	8	1.6	.2	<10	<20	
7/28	14.5	9	.2	.3	<10	<20	
8/26	17.17	8	.2	.4	12	<20	.09
9/30	19.08	9	1.4	.5	12	<20	
10/27	19.17	21	8.3	.5	15	<20	
11/17	19.83	< 7	2.5	.4	<10	<20	.93
01/06	2.00		13	.3	<10	<20	
AVG	9.8	11.5	3.1	.4	11.9	20	.2
STD DEV	9.19	7.68	3.68	.2	3.68	0	.38
MAXIMUM	24.34	25	13	.9	23	20	.93
MINIMUM	.58	2	.1	.1	10	20	2E-03

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12/8	28.34	42	410				
12/15	28.42	30	450				
12/21	28.59	7	134				
01/06	28.34	117	590	1.1	36	<20	
AVG	26.5	32.8	663.5	1.3	36.2	20	1.3
STD DEV	1.94	16.24	213.79	.2	10.96	0	.71
MAXIMUM	28.92	117	950	1.6	54	20	1.98
MINIMUM	21.34	7	2	.9	16	20	.1

1983

ED-6

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
3/31	DRY						
5/26	DRY						
8/26	DRY						
11/17	DRY						
01/06	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	0	0	0	0	0	0	0

ED-6

1983

ED-8

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
3/31	23.08	12	4	1.3	13	<20	.07
5/26	23.91	11	2.2	1.3	14	<20	.14
8/26	DRY						
11/17	23.41	14	6.8	1.3	50	<20	.23
01/06	23.25	37	4.4	1.4			
AVG	23.4	18.5	4.4	1.3	25.7	20	.1
STD DEV	.36	12.4	1.89	.05	21.08	0	.08
MAXIMUM	23.91	37	6.8	1.4	50	20	.23
MIN SUM	23.08	11	2.2	1.3	13	20	.07

ED-8

1983

ED-10

DATE	DEPTH TO H20 ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	21.8	28	2.2	1.6	27	<20	
2/28	21.92	28	3	1.7	26	<20	
3/31	22.42	22	3	1.7	28	<20	.1
4/28	22.50	16	2.7	1.4	27	<20	
5/26	22.58	16	2.7	1.5	28	<20	.08
6/17	22.92	24	2.3	1.3	24	<20	
7/28	22.92	18	2.9	1.1	19	<20	
8/26	DRY						
9/30	23.08	19	1.7	1.7	22	<20	
10/27	22.75	< 7	2.6	1.5	23	<20	
11/17	22.58	30	1.7	1.4	21	<20	.05
01/06	22.42	15	28	1.2	27	<20	
AVG	22.6	19.4	4.7	1.5	23.8	20	.1
STD DEV	.41	7.35	7.35	.2	4.49	0	.02
MAXIMUM	23.08	30	28	1.7	28	20	.1
MINIMUM	21.8	5	1.7	1.1	13	20	.05

ED-10

1983

ED-11

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/24	15.97	35	.5	.6	16	<20	
2/28	15.75	28	.6	.6			
3/31	16.00	19	3	.6	15	<20	.16
4/28	16.67	13	.7	.5	16	<20	
5/26	16.57	16	1.1	.7	18	<20	.19
6/17	16.59	18	1.1	.6	14	<20	
7/28	16.75	20	1.2	.5	16	<20	
8/26	16.67	11	1.4	.5	13	<20	.48
9/30	16.34	42	1.4	.7	13	<20	
10/27	15.84	< 7	2	.5	13	<20	
11/17	15.67	10	1.1	.5	14	<20	.18
01/06	15.59	7	1.5	.4	11	<20	
AVG	16.7	18.2	1.5	.6	14.3	20	.2
STD DEV	1.95	10.85	.99	.22	1.92	0	.16
MAXIMUM	23.08	42	4	1.3	18	20	.48
MINIMUM	15.59	6	.5	.4	11	20	.07

1983

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DATE	DEPTH TO H2O ft	U UG/l	NO3-N MG/l	F MG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l

31

DATE	DEPTH TO H2O ft	U UG/l	NO3-N MG/l	F MG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/6	7.33	10	48				
1/13	8.75	12	104				
1/20	10.58	17	111				
1/24	8.7	< 7	103				
2/4	3.75	8	92				
2/10	2.42	7	82				
2/18	4.67	< 7	83				
2/28	3.83	22	74				
3/3	4.08	7	72				
3/10	3.75	10	81				
3/17	6	8	64				
3/24	7.25	< 7	73				
3/31	3.75	< 7	63				
4/7	3.75	8	65				
4/14	3.5	14	12				
4/21	4.33	< 7	54				
4/28	4.83	< 7	54				
5/5	7.92	7	55				
5/12	9.33	16	50				
5/19	3.50	10	13				
5/26	5.08	< 7	13				
6/2	4.08	26	82				
6/2	4.08						
6/9	8.08	< 7	14				
6/17	9.83	12	13				
6/23	10.92	< 7	23				
6/30	11.92	12	18				
7/7	12.50	15	19				
7/14	13	47	91				
7/21	13.42	22	21				
7/28	13.58	10					
8/4	13.93	14	19				
8/11	14.33	15	17				
8/18	14.67	7	20				
8/26	9.92	11	32				
9/2	16.58	24	43				
9/8	15.58	< 7	49				
9/15	15.92	8	46				
9/22	15.83	17	53				
9/30	16.25	16	50				
10/6	16.42	11	54				
10/13	16.50	12	51				
10/20	16.92	< 7	52				
10/27	16.92	14	56				
11/3	17.08	16	52				
11/10	17.25	< 7	54				
11/17	17.33	11	56				

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12/8	15.75	17	79				
12/15	13.00	50	104				
12/21	13.08	32	115				
01/06	13.67	< 7	127				
AVE	10.3	12.6	55.5				
STD DEV	5.05	9.69	31.27	0	0	0	0
MAXIMUM	17.33	50	127	0	0	0	0
MINIMUM	2.42	2	.5	0	0	0	0

1983

M-2

31

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/6	19.16	8	29				
1/13	19.16	41	59				
1/20	19.08	41	66				
1/24	19.08	29	68				
2/4	19	49	67				
2/10	19.08	44	66				
2/18	19	36	75				
2/28	19	< 7	69				
3/3	18.91	30	70				
3/10	19	50	63				
3/17	18.83	26	62				
3/24	18.91	31	75				
3/31	18.17	42	59				
4/7	18.83	40	76				
4/14	19.16	39	75				
4/21	18.75	28	75				
4/28	18.75	32	66				
5/5	18.75	21	79				
5/12	18.75	30	65				
5/19	18.75	29	79				
5/26	18.75	22	67				
6/2	18.66	13	13				
6/2	18.66						
6/9	18.66	29	85				
6/17	18.58	25	80				
6/23	18.66	22	91				
6/30	18.58	19	91				
7/7	18.58	39	92				
7/14	18.66	7	72				
7/21	19.66	80	97				
7/28	18.66	35					
8/4	18.72	33	96				
8/11	18.83	32	72				
8/18	18.75	30	92				
8/26	18.75	14	93				
9/2	18.75	21	91				
9/8	18.75	42	97				
9/15	18.66	30	87				
9/22	18.83	32	88				
9/30	18.75	40	98				
10/6	18.75	40	99				
10/13	18.75	39	94				
10/20	18.75	51	100				
10/27	18.75	50	118				
11/3	18.75	49	88				
11/10	18.75	29	89				
11/17	18.83	< 7	93				

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12/8	18.75	52	97				
12/15	19.00	45	75				
12/21	19.00	11	98				
01/06	19.16	53	82				
AVG	18.8	32.3	76.6				
STD DEV	.22	14.81	22.52	0	0	0	0
MAXIMUM	19.66	80	118	0	0	0	0
MINIMUM	18.17	3	.5	0	0	0	0

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M-3

31

DATE	DEPTH TO H20 ft	U UG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	19	14	7				
1/13	18.58	8	15				
1/20	20	10	18				
1/24	19.98	14	16	.3			
2/4	11.08	8	18				
2/10	1.08	11	15				
2/18	17.91	< 7	18				
2/28	16.75	7	17	.2			
3/3	18.41	11	66				
3/10	15.41	15	12				
3/17	18.66	< 7	13				
3/24	19.5	< 7	13				
3/31	16.66	9	13	.3	<10	<20	.1
4/7	16.16	8	12				
4/14	2.58	11	11				
4/21	18.41	< 7	12				
4/28	17.16	15	10	.1	<10	<20	
5/5	19.08	< 7	10				
5/12	19.41	8	13				
5/19	11.58	7	7				
5/26	HS	7	7	.1	<10	<20	.16
6/2	12.33	10	6				
6/2	12.33						
6/9	18.66	10	9				
6/17	19.25	< 7	7	.2	<10	<20	
6/23	19.41	10	9				
6/30	19.83	11	9				
7/7	20.08	20	12				
7/14	19.74	17	12				
7/21	19.91	11	13				
7/28	19.91	7		.2	<10	<20	
8/4	20.16	16	12				
8/11	19.83	10	10				
8/18	19.91	< 7	11				
8/26	19.91	38	11		<10	<20	.13
9/2	20.25	12	16				
9/8	20.00	9	19				
9/15	20.00	36	15				
9/22	19.83	12	16				
9/30	20.00	11	7	.3	<10	<20	
10/6	20.25	13	19				
10/13	19.75	12	20				
10/20	19.16	20	21				
10/27	20.16	< 7	29	.4	<10	<20	
11/3	20.41	12	28				
11/10	20.25	< 7	23				
11/17	20.16	33	31	.3	<10	<20	.11

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12/8	18.83	7	18				
12/15	17.83	< 7	17				
12/21	19.00	59	17				
01/06	19.75	< 7	20	.47	<10	<20	
AVG	17.9	12.2	15.2	.3	10	20	.1
STD DEV	4.04	9.95	9.44	.11	0	0	.03
MAXIMUM	20.41	59	66	.47	10	20	.16
MINIMUM	1.08	1	.5	.1	10	20	.1

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31

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	13.08	16	32				
1/13	15.33	7	85				
1/20	16.91	13	89				
1/24	16.68	< 7	86				
2/4	6.16	9	83				
2/10	3.41	7	75				
2/18	12.5	< 7	78				
2/28	9.08	31	72				
3/3	11.51	12	17				
3/10	8.41	22	68				
3/17	13.75	< 7	58				
3/24	16.5	< 7	45				
3/31	15.08	< 7	58				
4/7	13.91	< 7	74				
4/14	11.58	< 7	77				
4/21	13.83	< 7	73				
4/28	10.00	< 7	61				
5/5	15.5	< 7	57				
5/12	17.25	12	54				
5/19	12.92	10	66				
5/26	13.91	< 7	71				
6/2	13.91	14	19				
6/[illegible]	13.91						
6/[illegible]	16.41	< 7	89				
6/17	17.16	9	82				
6/23	18.33	< 7	96				
6/30	19.00	9	96				
7/7	19.08	9	93				
7/14	19.24	< 7	94				
7/21	19.25	15	94				
7/28	19.50	9					
8/4	19.66	10	88				
8/11	19.66	15	66				
8/18	19.75	< 7	85				
8/26	19.66	7	85				
9/2	19.25	< 7	83				
9/8	19.66	7	80				
9/15	19.83	13	73				
9/22	19.83	< 7	70				
9/30	19.83	< 7	77				
10/6	19.91	8	83				
10/13	19.41	< 7	69				
10/20	19.66	11	66				
10/27	19.75	7	73				
11/3	19.91	8	71				
11/10	19.75	< 7	63				
11/17	19.91	8	71				

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12/8	15.32	< 7	116				
12/15	15.91	< 7	87				
12/21	16.91	11	119				
01/06	18.66	< 7	99				
AVG	16.2	8.1	73.7				
STD DEV	3.96	5.4	21.93	0	0	0	0
MAXIMUM	19.91	31	119	0	0	0	0
MINIMUM	3.41	1	.5	0	0	0	0

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DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	14.74	15	4.6				
1/13	14.67	9	4				
1/20	14.84	9	4				
1/24	14.67	11	5				
2/4	14.75	11	4				
2/10	14.59	10	3.2				
2/18	14.25	< 7	4				
2/28	14.92	< 7	6				
3/3	13.84	< 7	3.8				
3/10	13.67	15.	4.2				
3/17	13.42	15	3.4				
3/24	12.84	< 7	4				
3/31	13.17	< 7	4				
4/7	13.09	12	4				
4/14	12.67	32	4				
4/21	12.67	7	3.6				
4/28	12.42	8	5				
5/5	12.42	< 7	4				
5/12	12.5	11	3.2				
5/19	12.42	< 7	3.8				
5/26	12.00	< 7	3.2				
6/2	12.17	14	3.6				
6/2	12.17						
6/9	11.92	< 7	4.2				
6/17	12.42	< 7	3.6				
6/23	12.42	< 7	6				
6/30	12.67	14	4.6				
7/7	13.34	10	4.8				
7/14	13.25	< 7	4.2				
7/21	13.25	11	4.2				
7/28	13.50	7					
8/4	13.67	12	4.2				
8/11	13.92	< 7	3.6				
8/18	14.00	< 7	4.6				
8/26	14.42	8	5.2				
9/2	14.50	10	4.4				
9/8	14.84	< 7	4				
9/15	14.84	12	3.8				
9/22	15.09	< 7	4				
9/30	15.09	27	4.1				
10/6	15.09	16	5.2				
10/13	14.92	< 7	4.2				
10/20	15.09	17	4.4				
10/27	15.25	< 7	1.2				
11/3	15.25	< 7	4.2				
11/10	15.25	< 7	8				
11/17	15.25	< 7	4.6				

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12/8	15.25	12	6.4				
12/15	15.25	< 7	4.6				
12/21	15.25	10	5.2				
01/06	15.34	< 7	3.6				
AVG	13.9	8.9	4.2				
STD DEV	1.13	5.9	1.11	0	0	0	0
MAXIMUM	15.34	32	8	0	0	0	0
MINIMUM	11.92	2	.5	0	0	0	0

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DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
----	-----	-----	-----	-----	-----	-----	-----
							31
1/6	18.92	9	1.8				
1/13	18.83	25	2				
1/20	17.92	9	2.1				
1/24	18.8	14	.9				
2/4	17.58	16	1.4				
2/10	16.83	10	1				
2/18	15	< 7	.7				
2/28	13.58	8	.3				
3/3	13.67	< 7	.3				
3/10	13.25	10	.2				
3/17	13.08	< 7	.2				
3/24	12.08	< 7	.24				
3/31	11.50	10					
4/7	10.58	< 7	.4				
4/14	10.25	12	.8				
4/21	8.50	7	1.1				
4/28	7.17	< 7	1.4				
5/5	10.0	12	1.4				
5/12	13.58	13	1.3				
5/19	10.25	9	1				
5/26	11.67	< 7	.7				
6/2	12.08	10	.3				
6/2	12.08						
6/9	12.83	< 7	.4				
6/17	14.75	< 7	.5				
6/23	15.25	11	.6				
6/30	16.08	16	.7				
7/7	16.58	14	.5				
7/14	16.5	9	.5				
7/21	16.42	10	.5				
7/28	17.75	8					
8/4	16.92	17	.4				
8/11	17.33	< 7	.4				
8/18	17.42	< 7	.5				
8/26	17.58	10	.5				
9/2	17.83	12	.5				
9/8	17.92	7	.4				
9/15	18.08	16	.9				
9/22	18.08	8	.9				
9/30	18.33	17	.8				
10/6	17.00	< 7	1				
10/13	18.50	12	.8				
10/20	17.5	< 7	.6				
10/27	18.67	13	1.2				
11/3	18.33	10	.5				
11/10	18.33	< 7	.7				
11/17	18.17	< 7	.6				

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12/8	17.92	< 7	.2				
12/15	18.08	8	.4				
12/21	18.08	9	.5				
01/06	18.00	9	1				
AVG	15.5	9	.7				
STD DEV	3.15	4.78	.45	0	0	0	0
MAXIMUM	18.92	25	2.1	0	0	0	0
MINIMUM	7.17	1	.2	0	0	0	0

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DATE	DEPTH TO H20 ft	U UG/l	NO3-N MG/l	F MG/l	Alpha PCi/l	Beta PCi/l	Ra PCi/l
1/6							
1/13							
1/20							
1/24							
2/4	4.5	10	.2				
2/10	7.92	< 7	.3				
2/18	10.5	< 7	.7				
2/28	9.33	7	.4				
3/3	10.92	59	.9				
3/10	8.83	9	.9				
3/17	12.25	8	.7				
3/24							
3/31	DRY						
4/7	DRY						
4/14	13.08	8	.6				
4/21	12.08	< 7	.6				
4/28	6.42	< 7	2				
5/5	DRY						
5/12	DRY						
5/19	4.83	11	3.4				
5/26	9.08	< 7	.4				
6/2	12.00	< 7	1.9				
6/2	12.00						
6/9	2.67	< 7	1.2				
6/17	DRY						
6/23	DRY	10					
6/30	DRY						
7/7	DRY						
7/14	DRY						
7/21	DRY						
7/28	DRY						
8/4	DRY						
8/11	DRY						
8/18	DRY						
8/26	DRY						
9/2	DRY						
9/8	DRY						
9/15	DRY						
9/22	DRY						
9/30	DRY						
10/6	DRY						
10/13	DRY						
10/20	DRY						
10/27	DRY						
11/3	DRY						
11/10	DRY						
11/17	DRY						

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12/8	DRY						
12/15	DRY						
12/21	DRY						
01/06	DRY						
AVG	9.1	9.6	1				
STD DEV	3.23	13.08	.85	0	0	0	0
MAXIMUM	13.08	59	3.4	0	0	0	0
MINIMUM	2.67	1	.2	0	0	0	0

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31

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/6	12.92	13	3				
1/13	12.92	17	3				
1/20							
1/24							
2/4	2.92	12	46				
2/10	1.42	< 7	43				
2/18	2.25	< 7	47				
2/28	1.83	7	40				
3/3	1.92	9	43				
3/10	1.67	.9	40				
3/17	2.08	< 7	36				
3/24	2.25	< 7	37				
3/31	1.42	< 7	27				
4/7	1.5	7	32				
4/14	2.25	8	31				
4/21	1.33	< 7	30				
4/28	1.75	7	27				
5/5	2.83	< 7	27				
5/12	3.83	12	26				
5/19	1.58	< 7	5				
5/26	3.00	< 7	20				
6/2	3.08	8	19				
6/2	3.08						
6/9	4.06	< 7	22				
6/17	4.75		20				
6/23	5.92	< 7	27				
6/30	5.50	8	23				
7/7	7.00	16	30				
7/14	7.5	8	27				
7/21	8.17	20	26				
7/28	8.75	< 7					
8/4	9.75	8	21				
8/11	11.00	< 7	18				
8/18	12.33	< 7	19				
8/26	DRY						
9/2	DRY						
9/8	DRY						
9/15	DRY						
9/22	DRY						
9/30	DRY						
10/6	DRY						
10/13	DRY						
10/20	DRY						
10/27	DRY						
11/3	DRY						
11/10	DRY						
11/17	DRY						

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12/8	DRY						
12/15	DRY						
12/21	DRY						
01/06	DRY						
AVG	4.8	7.4	26.3				
STD DEV	3.72	4.71	12.33	0	0	0	0
MAXIMUM	12.92	20	47	0	0	0	0
MINIMUM	1.33	1	.5	0	0	0	0

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31

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pCi/l	Beta pCi/l	Ra pCi/l
1/6	1.16	< 7	292				
1/13	1.16	< 7	356				
1/20	1.92	8	300				
1/24	1.85	< 7	276	3			
2/4	1.75	9	300				
2/10	1.58	10	308				
2/18	1.67	< 7	312				
2/28	1.75	< 7	300	.7			
3/3	1.75	< 7	296				
3/10	2.17	16	280				
3/17	1.75	7	240				
3/24	1.83	< 7	280				
3/31	1.75	8	15	.7	28	<20	2.88
4/7	1.58	13	380				
4/14	1.92	17	376				
4/21	1.58	< 7	376				
4/28	1.67	12	324	2.4	32	<20	
5/5	1.92	< 7	336				
5/12	3.67	13	320				
5/19	1.75	11	292				
5/26	2.00	< 7	264	2	20	<20	2.05
6/2	1.75	12	120				
6/2	1.75						
6/9	2.42	< 7	280				
6/17	4.58	< 7	268	1.9	35	<20	
6/23	8.83	< 7	364				
6/30	8.17	10	332				
7/7	11.25	9	2600				
7/14	DRY						
7/21	DRY						
7/28	DRY						
8/4	DRY						
8/11	DRY						
8/18	DRY						
8/26	DRY						
9/2	DRY						
9/8	DRY						
9/15	DRY						
9/22	DRY						
9/30	DRY						
10/6	DRY						
10/13	DRY						
10/20	DRY						
10/27	DRY						
11/3	DRY						
11/10	DRY						
11/17	DRY						

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12/8	4.33	< 7	592				
12/15	3.00	< 7	552				
12/21	3.93	23	580				
01/06	3.83	< 7	532	3.17	45	<20	
AVG	2.9	7.6	388.9	2	32	20	2.5
STD DEV	2.35	5.23	423.43	.99	9.19	0	.59
MAXIMUM	11.25	23	2600	3.17	45	20	2.88
MINIMUM	1.16	1	.5	.7	20	20	2.05

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31

DATE	DEPTH TO H2O ft	U uG/l	NO3-N mG/l	F mG/l	Alpha pci/l	Beta pci/l	Ra pci/l
1/6	4.34	< 7	40				
1/13	4.59	7	44				
1/20	2.83	< 7	43				
1/24	2.65	< 7	40	.8			
2/4	1.25	8	30.5				
2/10	.92	11	26.5				
2/18	1.42	< 7	29				
2/28	1.5	12	27	.7			
3/3	1.67	< 7	28				
3/10	1.5	7	26				
3/17	2	11	23.5				
3/24	2.17	< 7	25.5				
3/31	1.67	< 7	17	.8			
4/7	2.00	8	23				
4/14	1.25	10	24				
4/21	1.67	< 7	23				
4/28	1.92	< 7	23	.5			
5/5	2.58	< 7	23				
5/12	3.50	< 7	23				
5/19	1.42	< 7	15				
5/26	2.17		15	.2			
6/[illegible]	2.08	10	3				
6/2	2.08						
6/9	2.92	< 7	16				
6/17	4.42	<1	15	.3			
6/23	6.08	< 7	17				
6/30	6.75	7	19				
7/7	7.25	7	16				
7/14	7.75	< 7	16				
7/21	7.92	13	17				
7/28	8.50	< 7		.3			
8/[illegible]	9.25	12	16				
8/11	9.67	< 7	13				
8/18	DRY						
8/26	D						
9/2	DRY						
9/8	DRY						
9/15	DRY						
9/22	DRY						
9/30	DRY						
10/6	DRY						
10/13	DRY						
10/20	DRY						
10/27	DRY						
11/3	DRY						
11/10	DRY						
11/17	DRY						

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12/8	DRY						
12/15	DRY						
12/21	DRY						
01/06	DRY						
AVG	3.6	6.1	22.4	.5			
STD DEV	2.67	3.66	9.98	.25	0	0	0
MAXIMUM	9.67	13	44	.8	0	0	0
MINIMUM	.92	-1	.5	.2	0	0	0

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DATE	DEPTH TO H2O	PH	COND	NO3-N	NH3-N	F
-----	-----	-----	-----	-----	-----	-----
3/25/82	129.83	10.6	715	2.7	2.1	.5
6/2/82	129.33	10.3	750	3.1	<.2	.4
8/11/82	128.17	10.5	1250	4.5	<.2	.3
11/4/82	130.58	9.9	949	11.7	<.2	.4
3/17/83	127.67	9.8	100	10.1	<.2	.3
3/17/83	127.67	9.8	100	10.1	<.2	.3
4/15/83	NS	11.8	2500	.4	6.3	NR
8/26	NS					
AVG	128.9	10.4	909.1	6.1	1.3	.4
STD DEV	1.22	.71	818.64	4.45	2.63	.08
MAXIMUM	130.58	11.8	2500	11.7	6.3	.5
MINIMUM	127.67	9.8	100	.4	-.2	.3

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DATE	DEPTH TO H20	Ph	COND	NO3-N	NH3-N	F
-- --	-----	-----	----	-----	-----	-----
3/25/82	127.17	7.4	1754	78	<.2	.7
6/2/82	125.42	7.3	2320	78	<.2	.6
8/11/82	123.58	7.5	3700	62	<.2	.6
11/4/82	122	7.4	3300	77	<.2	.8
3/17/83	117.08	7.6	2780	36	<.2	.8
3/17/83	117.08	7.6	2780	36	<.2	.8
4/15/83	NS	8.3	4540	97	1.1	NR
8/26	NS					
AVG	122.1	7.6	3024.9	66.3	0	.7
STD DEV	4.23	.33	918.24	23.04	.53	.1
MAXIMUM	127.17	8.3	4540	97	1.1	.8
MINIMUM	117.08	7.3	1754	36	-.2	.6

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S-3

DATE	DEPTH TO H20	Ph	COND	NO3-N	NH3-N	F
3/25/82	16.17	6.6	315	.2	<.2	.5
6/2/82	22.58	6.8	300	.1	<.2	.2
8/11/82	31	7.0	600	.2	<.2	.3
11/4/82	33.75	7.1	690	.2	<.2	.4
3/17/83	14.92	6.4	340	.4	<.2	.1
3/17/83	14.92	6.4	340	.4	<.2	.1
4/15/83	NS	6.9	373	.1	.8	NR
8/26	NS					
AVG	22.2	6.7	422.6	.2	0	.3
STD DEV	8.41	.28	155.82	.13	.41	.16
MAXIMUM	33.75	7.1	690	.4	.8	.5
MINIMUM	14.92	6.4	300	.1	-.2	.1

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S-4

DATE	DEPTH TO H2O	Ph	COND	NO3-N	NH3-N	F
-----	-----	-----	-----	-----	-----	-----
3/25/82	56.08	8.7	418	.5	.2	.7
6/2/82	55.42	8.6	410	.6	.2	.7
8/11/82	55.42	8.6	657	.3	<.2	.8
11/4/82	56.92	8.6	617	.32	.3	.8
3/17/83	54.33	8.7	632	.4	.4	.9
3/17/83	54.33	8.7	632	.4	.4	.9
4/15/83	NS	7.6	554	.1	<.2	NR
8/26	NS					
AVG	55.4	8.5	560	.4	.2	.8
STD DEV	1.01	.4	104.66	.16	.26	.09
MAXIMUM	56.92	8.7	657	.6	.4	.9
MINIMUM	54.33	7.6	410	.1	-.2	.7

1983

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DATE	DEPTH TO H2O	PH	COND	NO3-N	NH3-N	F
-----	-----	-----	-----	-----	-----	-----
3/25/82	60	6.8	342	.2	<.2	.3
6/2/82	59.58	6.7	260	.2	<.2	.2
8/11/82	59.25	6.9	585	.2	.5	.3
11/4/82	61	6.9	672	.4	<.2	.4
3/17/83	58.08	6.4	256	.1	.8	.2
3/17/83	58.08	6.4	256	.1	.8	.2
4/15/83	NS	7.1	424	.5	<.2	NR
8/26	NS					
AVG	59.3	6.7	427.9	.2	.2	.3
STD DEV	1.13	.26	190.35	.15	.49	.08
MAXIMUM	61	7.1	672	.5	.8	.4
MINIMUM	58.08	6.4	256	.1	-.2	.2

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DATE	DEPTH TO H20	Ph	COND	NO3-N	NH3-N	F
3/25/82	34.08	5	672	129	<.2	1.3
6/2/82	34.58	5.1	700	135	<.2	1.2
8/11/82	35.42	6.5	890	47	1.4	.6
11/4/82	37.17	6.9	645	12	<.2	1.2
3/17/83	32.33	4.7	981	89	<.2	1.5
3/17/83	32.33	4.7	981	89	<.2	1.5
4/15/83	NS	5.9	1065	105	<.2	NR
8/26	NS					
AVG	34.3	5.5	847.7	86.6	.1	1.2
STD DEV	1.86	.89	172.39	44.01	.65	.33
MAXIMUM	37.17	6.9	1065	135	1.4	1.5
MINIMUM	32.33	4.7	645	12	-.2	.6

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DATE	DEPTH TO H2O	Ph	COND	NO3-N	NH3-N	F
-----	-----	-----	-----	-----	-----	-----
3/25/82	94.67	6.9	613	26	<.2	.4
6/2/82	92.5	6.8	700	38	<.2	.4
8/11/82						
11/4/82	99.92	6.8	904	7.64	1.3	.4
3/17/83	76.5	7.0	531	4.3	.6	.3
3/17/83	76.5	7.0	531	4.3	.6	.3
4/15/83	NS	8.1	1280	6.0	.9	NR
8/26	NS					
AVG	88	7.1	759.8	14.4	.5	.4
STD DEV	10.85	.5	290.25	14.23	.6	.05
MAXIMUM	99.92	8.1	1280	38	1.3	.4
MINIMUM	76.5	6.8	531	4.3	-.2	.3

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DATE	DEPTH TO H20	Ph	COND	NO3-N	NH3-N	F
3/25/82	77.43	12.2	1730	.1	20	.7
6/2/82	77.42	11.9	1900	<.1	22	.6
8/11/82	77.58	12.1	3930	.1	37	.5
11/4/82	77.5	12.1	3150	.12	28	.6
3/17/83	77.17	12.2	3620	.1	45	.3
3/17/83	77.17	12.2	3620	.1	45	.3
4/15/83	NS	10.9	1850	.6	8.0	NR
8/26	NS					
AVG	77.4	11.9	2828.6	.1	30.6	.5
STD DEV	.17	.47	965.74	.21	13.23	.17
MAXIMUM	77.58	12.2	3930	.6	45	.7
MINIMUM	77.17	10.9	1730	-.1	8	.3

S-8

1983

S-9

DATE	DEPTH TO H2O	Ph	COND	NO3-N	NH3-N	F
----	----	----	----	-----	-----	----
3/25/82	77.92	11.1	586	.1	8.7	.9
6/2/82	77.5	10.9	650	<.1	5.7	.7
8/11/82	77.33	10.9	975	.1	6.9	.7
11/4/82	79.17	10.8	916	.08	7.3	.8
3/17/83	75.83	11.0	937	.4	12	.8
3/17/83	75.83	11.0	937	.4	12	.8
4/15/83	NS	9.8	770	<.1	2.9	NR
8/26	NS					
AVG	77.3	10.8	824.4	.1	7.9	.8
STD DEV	1.28	.45	156.33	.21	3.3	.08
MAXIMUM	79.17	11.1	975	.4	12	.9
MINIMUM	75.83	9.8	586	-.1	2.9	.7

S-9

1983

S-10C

DATE	DEPTH TO H20	Ph	COND	NO3-N	NH3-N	F
3/25/82	10.42	6.8	95	.2	<.2	.3
6/2/82	11.08	6.8	100	<.1	<.2	.2
8/11/82	24.08	7	330	.1	<.2	.2
11/4/82	28.75	6.8	380	.12	<.2	.3
3/17/83	7.67	6.5	107	<.1	<.2	.2
3/17/83	7.67	6.5	107	<.1	<.2	.2
4/15/83	NS	7.3	173	<.1	<.2	NR
8/26	NS					
AVG	14.9	6.8	184.6	0	-.2	.2
STD DEV	9.11	.28	120.2	.14	0	.05
MAXIMUM	28.75	7.3	380	.2	0	.3
MINIMUM	7.67	6.5	95	-.1	-.2	.2

1983

S-11C

DATE	DEPTH TO H2O	PH	COND	NO3-N	NH3-N	F
-----	-----	-----	-----	-----	-----	----
3/25/82	12.25	6.5	125	.2	<.2	.2
6/2/82	12.67	6.4	90	.2	<.2	.1
8/11/82	17.67	6	140	.2	<.2	.2
11/4/82	22.75	6.7	436	.2	<.2	.3
3/17/83	12.58	6.3	133	<.1	<.2	.2
3/17/83	12.58	6.3	133	<.1	<.2	.2
4/15/83	NS	6.4	159	.1	<.2	NR
8/26	NS					
AVG	15.1	6.4	173.7	.1	-.2	.2
STD DEV	4.29	.21	117.5	.12	0	.06
MAXIMUM	22.75	6.7	436	.2	0	.3
MINIMUM	12.25	6	90	-.1	-.2	.1

S-11C

1983

S-12C

DATE	DEPTH TO H2O	Ph	COND	NO3-N	NH3-N	F
3/25/82	19.17	6.7	66	.2	.2	.3
6/?/82	19.33	6.7	60	.1	<.2	.1
8/11/82	21.17	6.8	265	.2	<.2	.4
11/4/82	29.92	6.8	278	.12	.2	.3
3/17/83	16.08	6.3	69	.1	<.2	.1
3/17/83	16.08	6.3	69	.1	<.2	.1
4/15/83	NS	6.8	78	.1	<.2	NR
8/26	NS					
AVG	20.3	6.6	126.4	.1	-.1	.2
STD DEV	5.12	.23	99.32	.05	.21	.13
MAXIMUM	29.92	6.8	278	.2	.2	.4
MINIMUM	16.08	6.3	60	.1	-.2	.1

S-12C

Table 9B

1984 FACILITY OPERATIONS MONITORING

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	2.1	77.5	19.3	1.7	81.5	20	.1
STD DEV	.32	72.3	6.95	.13	31.3	0	.05

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	1.59	185	6	1.8	116	32	.19
05/24	2.16	79	5	1.4	78	<20	0.07
08/21	2.16	498*H	1	1.2	460	34	.14
09/07	NR	539*H					
09/13	1.33	540*H	1				
09/20	1.33	922*H	3.0				
09/28	1.32	1100*H	.8				
10/05	1.50	1129	.6				
10/11	1.41	384	.9				
10/19	1.33	342	1.6				
10/27	1.00	795	1				
11/02	1.50	830	.3				
11/09	1.32	776	1				
11/16	1.33	1217	1.2				
11/30	1.16	1609*H	.2	1.5	1910	135	0.18
12/05	2.25	2732	.2	CL=25			
12/13	.83	2733	.4				
12/20	.66	1660	.8				
12/29	1.50	1470	.2				
AVG	1.4	1081	1.4	1.5	641	55.3	.1
STD DEV	.43	720.39	1.64	.25	863.27	53.52	.05
MAXIMUM	2.25	2733	6	1.8	1910	135	.19
MINIMUM	.66	79	.2	1.2	78	20	.07

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2302

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	2.1	22	47.4	.5	14.4	19.5	.2
STD DEV	2.97	11.95	12.8	.09	3.9	1.5	.11

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	2.25	24	47	.5	16	<20	
02/24	2.08	17	40	.5	18	<20	.13
03/30	NS	24	41	.5	26	<20	
04/27	.83	12	52	.5	15	<20	
05/24	1.58	16	51		21	<20	0.22
06/29	1.83	12	48	.6	12	<20	
07/19	1.33	15	47	.4	17	<20	
08/31	2.17	18	49	.4	14	<20	.27
09/28	2.17	23	47	.4	<10	<20	
10/29	1.42	11	53	.4	<10	<20	
11/30		3	52	.5	<10	<20	0.19
12/05	.50		52	CL=87			
12/29		< 7	53	.4	<10	<20	
AVG	1.7	15.4	48.6	.5	14.9	20	.2
STD DEV	.6	6.19	4.27	.07	5.05	0	.06
MAXIMUM	2.25	24	53	.6	26	20	.27
MINIMUM	.5	5	40	.4	10	20	.13

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2302

1984

2303

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	7.2	16.5	108.3	.6	13.9	20	.1
STD DEV	4.6	8.6	34.9	.1	6.45	0	.02

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	3.33	15	110	.7	27	<20	
02/24	2.75	22	82	.8	19	<20	.12
03/30	.25	26	82	.7	28	<20	
04/27	2.25	20	152	.6	23	<20	
05/24	4.33	27	149	.9	51	<20	0.20
06/29	15.50	20	127	.6	27	<20	
07/19	14.00	22	104	.5	13	<20	
08/31	11.50	23	89	.6	24	<20	.19
09/22	11.00	18	85	.5	14	<20	
10/29	.50	16	66	1.2	19	<20	
11/30		16	124	.7	21	<20	0.11
12/05	1.25		132	CL=22			
12/29		17	152	.6	21		
AVG	6.1	20.2	111.8	.7	23.9	20	.2
STD DEV	5.74	3.95	29.69	.2	9.76	0	.04
MAXIMUM	15.5	27	152	1.2	51	20	.2
MINIMUM	.25	15	66	.5	13	20	.11

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2303

1984

2306

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	8	9.1	6.7	.2	10	20	.1
STD DEV	4.66	6.7	3.3	.04	0	0	.07

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	4.58	< 7	13	.2	<10	<20	
02/24	5.17	< 7	9.3	.2	<10	<20	.17
03/30	3.75	< 7	9.5	.2	<10	<20	
04/27	4.17	< 7	17*H	.2	11	<20	
05/24	4.58	< 7	17*H	.3	<10	<20	0.14
06/29	9.00	< 7	14*H	.2	<10	<20	
07/19	11.33	< 7	5.5	.2	11	<20	
08/31	14.00	8	13	.3	11	<20	.16
09/28	13.33	< 7	13	.2	<10	<20	
10/29	4.83	< 7	15*H	.3	<10	<20	
11/30	4.58	< 7	38.5*H	.3	<10	<20	0.07
12/05	4.83		42*H	CL=58			
12/29	9.00	< 7	40*H	.2	<10	<20	
AVG	7.1	4.1	19	.2	10.3	20	.1
STD DEV	3.75	1.73	[illegible].5	.05	.45	0	.05
MAXIMUM	14	8	42	.3	11	20	.17
MINIMUM	3.75	2	5.5	.2	10	20	.07

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2306

1984

2315

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	4.2	14.3	9.6	.3	10	20	.1
STD DEV	2.3	10.2	5.7	.1	1	1	.02

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	3.92	7	2.2	.3	11	<20	
02/24	3.83	15	1	.3	<10	<20	.06
03/30	3.50	< 7	3	.3	<10	<20	
04/27	3.42	8	4	.3	<10	<20	
05/24	2.75	7	2	.3	<10	<20	0.06
06/29	1.83	12	1	.4	<10	<20	
07/19	3.17	8	1	.3	17	<20	
08/31	3.33	11	.1	.2	<10	<20	.10
09/28	2.83	7	.4	.3	<10	<20	
10/29	3.00	25	10	.8	27	<20	
11/30	2.92	< 7	10	.7	24	<20	0.10
12/05	3.08		9	CL=13			
12/29	3.28	9	10	.4	20	<20	
AVG	3.1	9.8	4.1	.4	14.1	20	.1
STD DEV	.53	5.69	4.04	.18	6.29	0	.02
MAXIMUM	3.92	25	10	.8	27	20	.1
MINIMUM	1.83	3	.1	.2	10	20	.06

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2315

1984

2316

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	11.7	11	12.5	.3	10	20	.1
STD DEV	1.38	5.8	2.1	.08	1	1	.03

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	11.92	10	14	.8	<10	<20	.13
05/24	11.67	9	16	.3	12	<20	0.10
08/31	10.83	23*H	19*H	.5	<10	<20	.21
11/30	10.17	18	17*H	.3	<10	<20	0.11
12/05	10.83		21*H	CL=56			
AVG	11.1	15	17.4	.5	10.5	20	.1
STD DEV	.71	6.68	2.7	.24	1	0	.05
MAXIMUM	11.92	23	21	.8	12	20	.21
MINIMUM	10.17	9	14	.3	10	20	.1

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

2321

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	10.5	13.8	26	.7	11.3	20	.1
STD DEV	1.5	5.2	4.97	.14	2.5	1	.04

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	13.67	13	27	.5	<10	<20	.04
05/24	10.16	< 7	48	.6	14	<20	0.03
08/31	11.66	19	52*H	.3	<10	<20	.04
11/30	12.50	< 7	40*H	.6	12	<20	0.04
12/05	12.16		51*H	CL=27			
AVG	12	9.8	43.6	.6	11.5	20	0
STD DEV	1.28	7.63	10.41	.13	1.91	0	.01
MAXIMUM	13.67	19	52	.8	14	20	.04
MINIMUM	10.16	3	27	.5	10	20	.03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2321

1984

2322

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	1	1	1	1	1	1	1
STD DEV	1	1	1	1	1	1	1

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
02/24	DRY						
05/24	DRY						
08/31	DRY						
11/30	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2322

1984

2323

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	1	1	1	1	1	1	1
STD DEV	1	1	1	1	1	1	1

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	DRY						
05/24	DRY						
08/31	DRY						
11/30	18.17	7*H	1	.2	12	<20	0.24
12/05	18.25		1.4	CL=13			
AVG	18.2	7	1.2	.2	12	20	.2
STD DEV	.06	0	.28	0	0	0	0
MAXIMUM	18.25	7	1.4	.2	12	20	.24
MINIMUM	18.17	7	1	.2	12	20	.24

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2323

1984

2324

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	24.9	19.8	2.4	1.2	17.8	20	.1
STD DEV	1.67	3.95	2.04	.41	5.74	1	.06

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	23.50	19	1.3	.9	12	<20	.27
05/24	25.92	15	1.9	.9	15	<20	0.13
08/31	24.50	17	.6	.8	<10	<20	.17
11/30	23.25	< 7	1.2	.8	11	<20	0.16
12/05	23.75		.8	CL=12			
AVG	24.2	13.8	1.2	.9	12	20	.2
STD DEV	1.08	6.7	.5	.06	2.16	0	.06
MAXIMUM	25.92	19	1.9	.9	15	20	.27
MINIMUM	23.25	4	.6	.8	10	20	.13

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2324

1984

2334

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	NS						
03/30	NS						
04/27	NS						
05/24							
06/29	NS						
07/19	NS						
08/31	NR						
09/13	55.42						
09/28	NS						
10/05	46'0"						
10/11	46'2"						
10/29							
11/30	45.92		1.6				
AVG	48.3		1.6				
STD DEV	4.72	0	0	0	0	0	0
MAXIMUM	55.42	0	1.6	0	0	0	0
MINIMUM	45.92	10000	1.6	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2334

1984

2335

DATE	DEPTH TO H_2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	NS						
03/30	NS						
04/27	NS						
05/24							
06/29	NS						
07/19	NS						
08/31	NR						
09/13	56.03						
09/23	NS						
10/05	57'2"						
10/11	56'10"						
10/29							
11/30	DRY						
AVG	56.4						
STD DEV	.51	0	0	0	0	0	0
MAXIMUM	57	0	0	0	0	0	0
MINIMUM	56	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2335

1984

2336

DATE	DEPTH TO H2O ft	U mg/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
02/24	NS						
03/30	NS						
04/27	NS						
05/24							
06/29	NS						
07/19	NS						
08/31	NR						
09/13	DRY						
09/28	NS						
10/05	DRY						
10/11	DRY						
10/29							
11/30	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2336

1984

2337

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
02/24	NS						
03/30	NS						
04/27	NS						
05/24							
06/29	NS						
07/19	NS						
08/31	NR						
09/13	42.42						
09/28	NS						
10/05	42'10"						
10/11	42'8"						
10/29							
11/30	42.67		2				
AVG	42.3		2				
STD DEV	.33	0	0	0	0	0	0
MAXIMUM	42.67	0	2	0	0	0	0
MINIMUM	42	10000	2	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

2337

1984

F-1

****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	7.6	6.3	15.3	.6	10.8	20	.1
STD DEV	3.95	4.45	7.06	.08	1.69	1	.04

****

DATE	DEPTH TO H2O ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	DRY						
02/24	DRY						
03/30	.42	< 7	17	.9	<10	<20	
04/27	3.75	< 7	19	.7	<10	<20	
05/24	5.25	13	14	.9	<10	<20	
06/29	7.42	< 7	19	1.1	<10	<20	
07/19	8.67	< 7	11	1	<10	<20	
08/31	10.09	< 7	9	.8	<10	<20	.007
09/28	11.59	< 7	16	1	<10	<20	
10/29	.84	< 7		.6	<10	<20	
11/30	.67	< 7	1.1	1	<10	<20	0.01
12/05	2.30		1.5	CL=6			
12/29	.34	< 7	2.2	1	<10	<20	
AVG	4.7	5	11	.9	10	20	0
STD DEV	4.15	3.16	7.21	.16	0	0	0
MAXIMUM	11.59	13	19	1.1	10	20	.01
MINIMUM	.42	2	1.1	.6	10	20	7E-03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

F-1

1984

F-2

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	5.4	8.3	.9	.9	10.2	20	.1
STD DEV	1.64	5.77	.32	.17	.41	1	.05

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/26	DRY						
02/24	DRY						
03/30	DRY						
04/27	DRY						
05/24	DRY						
06/29	DRY						
07/19	DRY						
08/31	DRY						
09/28	DRY						
10/29	DRY						
11/30	DRY						
12/29	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

F-2

1984

F-3

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	15.7	17.6	1.1	.9	14.9	20	.1
STD DEV	.47	9.62	1.9	.16	4.45	1	.02

****

DATE	DEPTH TO H2O	U	NO3-N	F	Alpha	Beta	Ra
	ft	ug/l	mg/l	mg/l	pci/l	pci/l	pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	DRY						
02/24	DRY						
03/30	DRY						
04/27	16.33	27	.1	1.1	17	<20	
05/24	15.50	14	1	1.3	22	<20	0.05
06/29	15.25	10	.1	1.3	11	<20	
07/19	15.50	9	.4	1.4	12	<20	
08/31	DRY						
09/28	DRY						
10/29	15.25	< 5	.2	1.2	<10	<20	
11/30	DRY						
12/29	15.66	7	.7	1.1	<10	<20	
AVG	15.6	12	.4	1.2	13.7	20	.1
STD DEV	.4	7.95	.36	.12	4.84	0	0
MAXIMUM	16.33	27	1	1.4	22	20	.05
MINIMUM	15.25	5	.1	1.1	10	20	.05

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	26.5	31.3	675.4	1.3	37.4	20	1.6
STD DEV	1.96	10.93	194.5	.16	11.2	1	.28

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	28.84	44	126				
01/19	28.84	57*H	135				
01/26	28.67	18	570	1.2	40	<20	
02/02	29.25	31	139				
02/09	24.00	29	139				
02/16	29.00	42	141				
02/24	28.92	< 7	520	1.4	31	<20	1.39
03/01	29.17	42	260				
03/08	29.59	41	340				
03/15	29.50	34	348				
03/22	29.17	29	101				
03/30	29.17	40	290	1	35	20	
04/05	29.34	47	81				
04/12	29.58	45	89				
04/19	29.59	43	624				
04/23	29.50	NR	620				
04/27	29.50	41	630	1.2	44	<20	
05/02	29.66	38	375				
05/10	29.58	36	540				
05/17	29.66	49	570				
05/24	29.58	< 7	610	1.1	42	<20	1.0
05/31	31.58	27	195				
06/07	29.17	23	525				
06/14	21.34	47	515				
06/22	29.34	55*H	500				
06/29	31.91	33	620	1.5	27	<20	
07/12	30.41	34	500				
07/19	30.41	32	560	1	29	<20	
07/26	30.67	35	535				
08/02	30.67	40	550				
08/10	30.50	38	485				
08/17	30.41	27	535				
08/23	30.41	24	515				
08/31	30.16	28	550	1.2	26	<20	.78
09/06	31.41	34	490				
09/13	31.08	43	490				
09/20	31.00	35	40				
09/28	30.92	35	350	1.0	26	<20	
10/05	30.16	14	485				
10/11	31.16	35	290				
10/18	30.83	36	250				

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10/29	30.41	19	470	1	31	<20	
11/02	30.50	29	400				
11/09	30.83	25	485				
11/16	30.75	28	425				
11/30	30.33	13	440	.8	34	<20	1.16
12/05	31.41	25	415	CL=86			
12/13	32.58	10	355				
12/20	12.91	70*H	175				
12/29	14.50	< 7	195	.6	67	<20	
AVG	29.2	32.9	391.8	1.1	36	20	1.1
STD DEV	3.63	13.59	176.43	.24	11.53	0	.26
MAXIMUM	32.58	70	630	1.5	67	20	1.39
MINIMUM	12.91	1	40	.6	26	20	.78

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9.5	10.6	2.6	.3	11.1	20	.3
STD DEV	9.52	7.08	2.54	.13	1.7	1	.43

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	2.00	9	12*H	.2	<10	<20	
02/24	2.00	25	9.2	1.4	<10	<20	.11
03/30	0.17	< 7	7.7	.2	<10	<20	
04/27	2.08	< 7	2.3	.3	15	<20	
05/24	6.41	32	.7	.2	<10	<20	0.06
06/29	12.00	< 7	2.7	.5	<10	<20	
07/19	14.66	< 7	1.4	.3	10	<20	
08/31	19.16	10	.3	.4	<10	<20	.08
09/28	19.92	< 7	2	.2	<10	<20	
10/29	9.58	< 7	8.4	.3	<10	<20	
11/30	9.58	< 7	1.2	.2	<10	<20	0.08
[illegible]	[illegible]		1.2	CL*7			
12/29	.83	63	.8	.2	<10	<20	
AVG	7.5	13.8	3.8	.4	10.4	20	.1
STD DEV	6.92	18.22	3.97	.34	1.44	0	.02
MAXIMUM	19.92	63	12	1.4	15	20	.11
MINIMUM	.17	1	.3	.2	10	20	.06

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	1	1	1	1	1	1	1
STD DEV	1	1	1	1	1	1	1

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	DRY						
05/24	DRY						
08/31	DRY						
11/30	DRY						
AVG							
STD DEV	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

ED-6

1984

ED-8

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	23.5	12.3	4.3	1.3	31.5	20	.2
STD DEV	.42	1.53	2.32	.01	26.2	1	.11

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
02/24	23.33	11	3	.2	46	<20	.05
05/24	24.84	[illegible]	5.2	1.6	37	<20	0.04
08/31	24.67	44	2.4	1.5	35	<20	.13
11/20	?			1.2	37	<20	0.08
12/05	23.50		6	CL=9			
AVG	24.1	20.3	4.2	1.1	38.8	20	.1
STD DEV	.78	20.65	1.72	.64	4.92	0	.04
MAXIMUM	24.84	44	6	1.6	46	20	.13
MINIMUM	23.33	6	2.4	.2	35	20	.04

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1984

ED-10

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	22.5	20.6	2.5	1.5	24.5	20	.1
STD DEV	.49	7.12	.46	.19	3.17	1	.03

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	22.42	14	10*H	1.4	24	<20	
02/24	22.42	7	1.9	1.4	19	<20	8E-03
03/20	17.75	102*H	43*H	1.4	79	<20	
04/27	14.67	33	86*H	1.3	66	<20	
05/24	17.42	41*H	90*H	1.2	40	<20	0.06
06/29	17.75	< 7	81	1.2	<10	<20	
07/19	19.00	< 7	16	1	19	<20	
08/31	20.08	< 7	16	1	20	<20	.24
09/28	22.08	15	15	.6	20	<20	
10/29	16.08	61	.5	1.1	77	<20	
11/30	.08	38	77	.9	77	<20	0.15
12/05	4.17		89	CL=13			
12/29	.25	< 7	92	.7	76	<20	
AVG	14.9	27.1	47.5	1.1	43.9	20	.1
STD DEV	8.07	30.24	38.45	.27	28.42	0	.1
MAXIMUM	22.42	102	92	1.4	79	20	.24
MINIMUM	.08	2	.5	.6	10	20	8E-03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	16.2	20.7	1.3	.6	14.8	20	.3
STD DEV	.42	10.93	.68	.08	1.69	1	.15

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/26	15.75	30	.1	.5	<10	<20	
02/24	16.33	12	1.5	.5	13	<20	.29
03/30	16.67	21	.7	.5	14	<20	
04/27	16.67	10	1.3	.5	17	<20	
05/24	16.92	21	1.4	.6	21	<20	0.19
06/29	16.67	16	2.7	1.2	<10	<20	
07/19	17.42	12	2.6	.4	<10	<20	
08/31	10.83	27	.7	.6	<10	<20	.20
09/28	16.50	< 7	2.1	.4	<10	<20	
10/29	15.75	< 7	.5	.5	<10	<20	
11/30	15.42	< 7		.5	<10	<20	0.20
12/05	17.42		.3	CL=6			
12/29	16.25	45	.5	.4	<10	<20	
AVG	16	17.1	1.3	.6	12.1	20	.2
STD DEV	1.68	12.52	.82	.22	3.6	0	.05
MAXIMUM	17.42	45	2.7	1.2	21	20	.29
MINIMUM	10.83	2	.3	.4	10	20	.19

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	10.1	12.7	56.2	1	1	1	1
STD DEV	5.06	9.78	29.69	1		1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	13.92	27	124*H				
01/19	12.67	< 7	131*H				
01/26	12.33	< 7	133*H				
02/02	11.08	20	136*H				
02/09	11.00	7	158*H				
02/16	6.58	< 7	120*H				
02/24	7.83	< 7	94				
03/01	4.33	8	44				
03/08	4.00	8	55				
03/15	3.75	9	48				
03/22	3.83	< 7	31				
03/30	3.33	10	67				
04/05	3.83	17	30				
04/12	2.58	9	22				
04/19	5.66	9	48				
04/27	7.33	< 7	60				
05/03	8.08	< 7	76				
05/10	3.66	< 7	14				
05/17	7.08	9	15				
05/24	8.50	12	15				
05/31	7.66	< 7	16				
06/07	10.00	< 7	19				
06/14	11.00	248*H	21				
06/22	12.17	9	27				
06/29	11.50	< 7	21				
07/12	12.00	< 7	37				
07/19	12.00	< 7	99				
07/26	13.92	< 7	96				
08/02	14.33	< 7	109				
08/10	14.67	17	111				
08/17	13.91	< 7	100				
08/23	13.91	< 7	135*H				
08/31	14.16	7	130				
09/06	14.66	< 7	133*H				
09/13	14.75	11	130*H				
09/20	5.41	7	127*H				
09/28	15.00	< 7	116				
10/05	15.16	7	129*H				
10/11	15.50	< 7	157*H				
10/18	15.50	< 7	24				
10/29	15.25	< 7	166				

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11/02	12.50	< 7	193*H				
11/08	7.50	< 7	184*H				
11/16	10.33	7	385*H				
11/30	2.50	39	295				
12/05	7.25	16	625	CL=29			
12/13	7.83	25	660*H				
12/20	1.50	12	437*H				
12/29	4.41	11	337				
AVG	9.5	13	131.4				
STD DEV	4.37	35.05	141.39	0	0	0	0
MAXIMUM	15.5	248	660	0	0	0	0
MINIMUM	1.5	1	14	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
			1983 DATA				
AVERAGE	18.8	32.5	77.7	1	1	1	1
STD DEV	.22	14.38	20.01	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO2-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	19.08	44	89				
01/19	19.41	89*H	89				
01/26	19.41	77*H	94				
02/02	19.41	67*H	93				
02/09	19.41	52	93				
02/16	19.00	59	91				
02/24	19.67	64	74				
03/01	19.91	90*H	75				
03/08	19.41	69*H	51				
03/15	19.16	47	75				
03/22	19.25	41	68				
03/30	19.08	33	72				
04/05	19.00	55	63				
04/12	19.00	41	68				
04/19	19.00	36	106				
04/27	18.92	< 7	115				
05/03	18.92	41	121*H				
05/10	18.92	33	113				
05/17	18.92	39	117				
05/24	18.92	< 7	131				
05/31	18.83	30	113				
06/07	18.58	33	112				
06/14	19.00	46	108				
06/22	22.00	47	131*H				
06/29	19.00	51	104				
07/12	19.08	46	119*H				
07/19	DRY						
07/26	18.75	35	124*H				
08/02	18.75	51	137*H				
08/10	18.66	64*H	134*H				
08/17	18.92	38	112				
08/23	18.92	33	132*H				
08/31	18.75	64	134				
09/06	18.83	55	135*H				
09/13	18.75	37	113				
09/20	18.93	40	132*H				
09/28	18.83	45	124				
10/05	18.75	51	125*H				
10/11	18.83	49	136*H				
10/18	18.83	49	124*H				
10/29	12.58	32	150				

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11/02	19.00	55	142*H				
11/08	18.83	37	139*H				
11/16	19.00	39	205				
11/30	18.92	< 7	195				
12/05	19.50	51	175	CL=17			
12/13	DRY						
12/20	20.08	26	175*H				
12/29	.92	23	185				
AVG	18.6	45	117.3				
STD DEV	2.85	18.14	34.26	0	0	0	0
MAXIMUM	22	90	205	0	0	0	0
MINIMUM	.92	3	51	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	17.9	12.2	15.4	.2	10	20	.1
STD DEV	4.08	10.06	9.28	.09	1	1	.03

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/11	20.25	21	21				
01/19	20.41	48	24				
01/26	20.25	13	28	1.3	<10	<20	
02/02	20.91	15	27				
02/09	20.58	11	41*H				
02/16	14.16	< 7	18				
02/24	18.92	< 7		.5	60	<20	.07
03/01	8.41	10	13				
03/08	12.41	7	7				
03/15	8.66	9	9				
03/22	10	< 7	10				
03/30	2.00	9	9	.6	14	<20	
04/05	9.08	8	7				
04/12	10.92	8	6.4				
04/19	18.50	< 7	10				
04/27	18.83	< 7	6	.3	<10	<20	
05/03	19.58	< 7	8				
05/10	9.50	< 7	4.2				
05/17	17.92	< 7	4.4				
05/24	19.08	45	5	.3	<10	<20	0.07
05/31	4.92	9	3				
06/07	12.58	10	3.2				
06/14	14.58	23	4.4				
06/22	16.83	10	4.6				
06/29	17.75	< 7	3	.5	<10	<20	
07/12	19.00	< 7	3.4				
07/19	19.08	< 7	5	.6	<10	<20	
07/26	19.75	< 7	3.8				
08/02	19.83	< 7	4.2				
08/10	19.91	19	3.6				
08/17	20.00	< 7	3.4				
08/23	19.00	< 7	3.4				
08/31	19.92	11	7	.5	<10	<20	.12
09/06	21.33	10	17				
09/13	20.08	14	15				
09/20	21.33	18	18				
09/28	18.92	< 7	34	.4	<10	<20	
10/05	19.33	< 7	2.6				
10/11	18.17	< 7	24				
10/18	14	< 7	20				
10/29	18.92	32	4	.5	<10	<20	

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11/02	2.50	8	6				
11/08	11.25	< 7	5.2				
11/16	11.83	12	5				
11/30	2.42	< 7	5	.3	<10	<20	0.03
12/05	10.58	< 7	3.8	CL=13			
12/13	.50	< 7	4.4				
12/20	.58	< 7	4.2				
12/29	8.75	< 7	4	.3	<10	<20	
AVG	14.8	9.7	10	.5	14.5	20	.1
STD DEV	6.24	9.85	9.13	.27	14.37	0	.04
MAXIMUM	21.33	48	41	1.3	60	20	.12
MINIMUM	.5	1	2.6	.3	10	20	.03

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	15.9	8.1	75	1	1	1	1
STD DEV	4.2	5.45	19.22	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	18.50	11	104				
01/19	18.75	12	98				
01/26	19.00	< 7	111				
02/02	18.75	11	114*H				
02/09	19.16	< 7	120*H				
02/16	16.25		103				
02/24	16.33	9	93				
03/01	8.25	8	64				
03/08	11.16	7	63				
03/15	9.00	< 7	62				
03/22	9.08	< 7	57				
03/30	8.00	7	59				
04/05	9.08	< 7	45				
04/12	7.75	< 7	48				
04/19	15.41	< 7	66				
04/27	16.75	< 7	66				
05/03	17.33	< 7	61				
05/10	17.83	< 7	62				
05/17	18.08	< 7	64				
05/24	18.41	7	65				
05/31	18.00	< 7	56				
06/07	20.08	< 7	59				
06/14	20.08	< 7	61				
06/22	20.00	11	62				
06/29	19.08	10	42				
07/12	19.41	< 7	59				
07/19	19.58	< 7	59				
07/26	21.25	< 7	57				
08/02	20.83	< 7	64				
08/10	20.58	11	53				
08/17	19.26	< 7	46				
08/23	18.16	< 7	58				
08/31	19.08	10	59				
09/06	19.08	< 7	57				
09/13	18.75	9	43				
09/20	18.75	10	58				
09/28	18.50	< 7	29				
10/05	18.50	< 7	57				
10/11	18.66	< 7	37				
10/18	18.00	< 7	49				
10/29	3.41	< 7	114				

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11/02	6.59	10	104				
11/08	15.43	< 7	110				
11/16	16.42	< 7	111				
11/20	10.41	< 7	90				
12/05	15.16	< 7	95	CL=17			
12/13	15.33	< 7	160*H				
12/20	9.41	< 7	90				
12/29	12.58	< 7	85				
AVG	16	5.4	72.2				
STD DEV	4.53	3.25	26.7	0	0	0	0
MAXIMUM	21.25	12	160	0	0	0	0
MINIMUM	3.41	1	29	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	13.9	9	6.3	1	1	1	1
STD DEV	1.12	6.01	14.42	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	15.17	8	4.8				
01/19	15.75	37*H	4.2				
01/26	15.50	10	3.8				
02/02	15.34	< 7	4.6				
02/09	15.09	< 7	4.2				
02/16	15.42	< 7	5.6				
02/24	15.67	12	4				
03/01	15.17	< 7	3.6				
03/08	15.17	8	3.6				
03/15	1525	7	3.8				
03/22	15.00	< 7	3.4				
03/30	14.59	9	3.6				
04/05	14.25	< 7	3.4				
04/12	14.00	17	3.2				
04/19	13.75	10	4				
04/27	13.59	< 7	4.2				
05/03	13.59	< 7	4				
05/10	13.50	< 7	4.4				
05/17	13.50	< 7	3.8				
05/24	13.42	< 7	4				
05/31	14.84	< 7	3.2				
06/07	13.34	< 7	4				
06/14	13.34	135*H	3.8				
06/22	18.09	< 7	2.4				
06/29	13.59	31	3.4				
07/12	13.92	< 7	3.6				
07/19	13.92	8	3.6				
07/26	14.25	< 7	3.4				
08/02	14.67	< 7	3.8				
08/10	14.67	12	3.8				
08/17	14.59	< 7	3.8				
08/23	14.75	< 7	4.8				
08/31	14.84	13	3.2				
09/06	14.92	< 7	2.4				
09/13	14.84	9	2				
09/20	15.00	9	2				
09/28	15.09	< 7	9.4				
10/05	15.09	7	28				
10/11	15.25	15	1.4				
10/18	15.25	< 7	1.8				
10/29	15.25	< 7	1.8				

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11/02	15.42	< 7	2.2				
11/08	15.00	< 7	2.4				
11/16	15.25	7	2.6				
11/30	15.00	< 7	1.2				
12/05	15.84	17	1.6	CL=13			
12/13	14.34	< 7	1.6				
12/20	14.09	< 7	1.6				
12/29	13.67	16	1.8				
AVG	45.5	10.2	3.9				
STD DEV	215.76	19.47	3.77	0	0	0	0
MAXIMUM	1525	135	28	0	0	0	0
MINIMUM	13.34	1	1.2	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	15.5	9	.8	1	1	1	1
STD DEV	3.17	4.83	.46	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	18.08	15	1.5				
01/19	18.08	12	1.1				
01/26	18.08	38*H	1				
02/02	18.00	9	1.4				
02/09	18.33	10	1.2				
02/16	18.08	8	.6				
02/24	18.17	< 7	.8				
03/01	18.17	7	.5				
03/08	18.08	21*H	.3				
03/15	16.92	< 7	.5				
03/22	12.50	< 7	1.2				
03/30	9.75	10	.9				
04/05	12.08	< 7	.9				
04/12	11.67	< 7	1.4				
04/19	12.25	< 7	2.4				
04/27	12.00	< 7	3				
05/03	12.42	13	2.8				
05/10	9.33	< 7	2.3				
05/17	12.17	< 7	2.2				
05/24	14.50	< 7	2.4				
05/31	12.42	< 7	1.2				
06/07	16.50	< 7	1.6				
06/14	16.50	40*H	1.6				
06/22	12.33	< 7	1.2				
06/29	17.00	< 7	1.2				
07/12	16.92	< 7	.7				
07/19	18.92	< 7	.7				
07/26	17.00	< 7	.4				
08/02	17.33	< 7	.6				
08/10	17.42	14	.4				
08/17	17.42	< 7	.7				
08/23	17.50	< 7	1				
08/31	17.58	7	.6				
09/06	18.00	< 7	.8				
09/13	17.67	< 7	1.2				
09/20	17.92	< 7	.6				
09/28	17.92	9	2.8				
10/05	17.92	7	1.2				
10/11	17.83	< 7	.6				
10/18	17.67	< 7	1.1				
10/29	17.67	< 7	.8				

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11/02	17.83	< 7	.9				
11/09	15.83	< 7	7.2*H				
11/16	15.67	< 7	30*H				
11/30	12.17	< 7	81				
12/05	12.17	< 7	93	CL=14			
12/13	11.59	< 7	130*H				
12/20	10.50	< 7	160*H				
12/29	11.00	< 7	106				
AVG	15.6	8	13.4				
STD DEV	2.9	13.29	35.69	0	0	0	0
MAXIMUM	18.92	88	160	0	0	0	0
MINIMUM	9.33	1	.3	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	9.1	9.6	1	1	1	1	1
STD DEV	3.23	13.51	.88	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	DRY						
01/19	DRY						
01/26	DRY						
02/02	DRY						
02/09	DRY						
02/16	DRY						
02/24	DRY						
03/01	DRY						
03/08	DRY						
03/15	DRY						
03/22	7.33	< 7	1.3				
03/30	8.75	< 7	2.8				
04/05	9.50	< 7	2.1				
04/12	3.67	< 7	2.6				
04/19	10.58	12	3				
04/27	11.50	< 7	2.6				
05/03	DRY						
05/10	3.50	< 7	14				
05/17	8.83	< 7	1.8				
05/24	11.08	< 7	1.8				
05/31	7.08	< 7	.7				
06/07	9.75	< 7	1.2				
06/14	11.08	< 7	1.6				
06/22	DRY						
06/29	DRY						
07/12	DRY						
07/19	DRY						
07/26	DRY						
08/02	DRY						
08/10	DRY						
08/17	DRY						
08/23	DRY						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20	DRY						
09/28	DRY						
10/05	DRY						
10/11	DRY						
10/18	DRY						
10/29	DRY						

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11/02	DRY						
11/08	DRY						
11/16	DRY						
11/30	8.77	< 7	.7				
12/05	10.75	< 7	.6	CL=13			
12/13	10.00	< 7	2.4				
12/20	3.30	< 7	.6				
12/29	7.42	< 7	.5				
AVG	8.4	4.5	2.4				
STD DEV	2.7	2.24	3.11	0	0	0	0
MAXIMUM	11.5	12	14	0	0	0	0
MINIMUM	3.3	2	.5	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	5	7.4	26.4	1	1	1	1
STD DEV	3.91	4.71	12.1	1	1	1	1

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	DRY						
01/19	DRY						
01/26	DRY						
02/02	DRY						
02/09	DRY						
02/16	DRY						
02/24	DRY						
03/01	DRY						
03/08	DRY						
03/15	DRY						
03/22	1.67	< 7	12				
03/30	1.67	12	12				
04/05	1.58	< 7	13				
04/12	1.67	< 7	12				
04/19	3.42	13	15				
04/27	3.50	8	15				
05/03	2.50	< 7	13				
05/10	2.83	< 7	14				
05/17	3.50	< 7	17				
05/24	4.33	< 7	16				
05/31	2.67	< 7	12				
06/07	4.00	< 7	13				
06/14	4.83	< 7	13				
06/22	5.92	< 7	12				
06/29	6.33	10	14				
07/12	8.17	< 7	11				
07/19	8.92	< 7	9				
07/26	10.83	< 7	7.5				
08/02	12.00	< 7	10				
08/10	DRY						
08/17	DRY						
08/23	DRY						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20	DRY						
09/28	DRY						
10/05	DRY						
10/11	DRY						
10/18	DRY						
10/29	DRY						

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11/02	DRY						
11/08	DRY						
11/16	DRY						
11/30	DRY						
12/05	DRY						
12/13	4.67	< 7	9.5				
12/20	1.17	10	14				
12/29	1.92	< 7	9.5				
AVG	4.5	4.9	12.4				
STD DEV	3.08	3.42	2.37	0	0	0	0
MAXIMUM	12	13	17	0	0	0	0
MINIMUM	1.17	1	7.5	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	2.8	7.5	390.6	1.8	28.8	20	2.5
STD DEV	2.37	5.31	425.2	.85	6.5	1	.59

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
-----	-----	-----	-----	-----	-----	-----	-----
01/11	2.83	9	464				
01/19	4.17	9	464				
01/26	3.67	< 7	484	4.2	68	25	
02/02	3.42	14	512				
02/09	3.75	< 7	488				
02/16	2.17	11	336				
02/24	2.33	< 7		3.4	<10	<20	2.8
03/01	1.75	< 7	264				
03/08	1.75	8	244				
03/15	1.75	< 7	272				
03/22	1.58	< 7	280				
03/30	1.67	< 7	240	3	46	<20	
04/05	1.75	< 7	188				
04/12	1.67	< 7	192				
04/19	1.75	9	256				
04/27	1.67	14	240	1.6	37	<20	
05/03	1.75	< 7	260				
05/10	1.75	20*H	236				
05/17	2.83	7	236				
05/24	3.92	< 7	248	1.6	38	<20	4.01
05/31	2.25	49*H	188	Re U=55			
06/07	2.25	< 7	200				
06/14	4.50	< 7	232				
06/22	9.08	< 7	316				
06/29	10.67	17	312	.5	57	20	
07/12	DRY						
07/19	DRY						
07/26	DRY						
08/02	DRY						
08/10	DRY						
08/17	DRY						
08/23	DRY						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20	DRY						
09/28	DRY						
10/05	DRY						
10/11	DRY						
10/18	DRY						
10/29	2.67	< 7	576	3.6	58	<20	

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11/02	1.92	< 7	344				
11/08	2.92	< 7	348				
11/16	2.17	< 7	33[illegible]				
11/30	1.92	< 7	3[illegible]4	2.4	23	<20	6.81
12/05	2.00	7	292	CL=22			
12/13	1.83	< 7	260				
12/20	1.08	< 7	240				
12/29	1.92	< 7	216	1.5	22	<20	
AVG	2.8	7.2	306.8	2.4	39.9	20.6	4.5
STD DEV	1.99	8.73	103.77	1.21	19.23	1.67	2.06
MAXIMUM	10.67	49	576	4.2	68	25	6.81
MINIMUM	1.08	1	188	.5	10	20	2.8

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

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****

1983 DATA

	DEPTH	U	NO3-N	F	Alpha	Beta	Ra
AVERAGE	3.7	5.9	23.8	.5	1	1	1
STD DEV	2.63	3.6	9.8	.24	1	1	1

****

DATE	DEPTH TO H20 ft	U ug/l	NO3-N mg/l	F mg/l	Alpha pci/l	Beta pci/l	Ra pci/l
01/11	DRY						
01/19	DRY						
01/26	DRY						
02/02	DRY						
02/09	9.50	25*H	1.8				
02/16	9.00	18*H	18				
02/24	9.25	14	3.5				
03/01	3.83	< 7	18				
03/08	3.08	8	22				
03/15	2.00	< 7	19				
03/22	1.50	< 7	13				
03/30	2.17	< 7	11				
04/05	1.50	< 7	7.5				
04/12	1.42	< 7	11				
04/19	2.08	8	14				
04/27	2.17	21	13				
05/03	2.25	< 7	14				
05/10	1.67	< 7	13				
05/17	3.08	< 7	12				
05/24	3.58	< 7	12				
05/31	2.17	< 7	.1				
06/07	2.25	< 7	9				
06/14	3.75	< 7	11				
06/22	6.42	< 7	7				
06/29	7.17	< 7	7				
07/12	8.25	< 7	10				
07/19	DRY						
07/26	9.33	< 7	5				
08/02	DRY						
08/10	DRY						
08/17	DRY						
08/23	DRY						
08/31	DRY						
09/06	DRY						
09/13	DRY						
09/20	DRY						
09/28	DRY						
10/05	DRY						
10/11	DRY						
10/18	DRY						
10/29	DRY						

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11/02	DRY						
11/08	DRY						
11/16	DRY						
11/30	2.00	8	6.5				
12/05	2.33	< 7	7.5	CL=11			
12/13	.42	< 7	13				
12/20	.42	< 7	11				
12/29	1.67	< 7	9.5				
AVG	3.7	6.4	10.7				
STD DEV	2.93	5.96	5.08	0	0	0	0
MAXIMUM	9.5	25	22	0	0	0	0
MINIMUM	.42	1	.1	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

1984

S-1

NO DATA IN FILE

AVG											
STD DEV	0	0	0	0	0	0	0	0	0	0	0
MAXIMUM	0	0	0	0	0	0	0	0	0	0	0
MINIMUM	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 29, 1984 results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
127.67	11.8	0.6	2,280.	16.2	0.6

1984

S-2

1983 DATA

DATE	DEPTH DEPTH TO H2O	Ph Ph	COND COND	NO3-N NO3-N	NH3-N NH3-N	F F
12/05	125.08			4		CL=10
AVG	125.1			4		
STD DEV	0	0	0	0	0	0
MAXIMUM	125.08	0	0	4	0	0
MINIMUM	125.08	10000	10000	4	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 29, 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
125.0	7.7	4.0	1,790	0.2	0.8

S-2

1984

S-3

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	125.08	0	0	4	0	0
MINIMUM	125.08	10000	10000	4	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 29, 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
1.50	6.1	<0.4	260	<0.2	0.1

S-3

1984

S-4

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	125.08	0	0	4	0	0
MINIMUM	125.08	10000	10000	4	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
54.25	7.7	1.2	662.	<0.2	0.8

1984

S-5

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	125.08	0	0	4	0	0
MINIMUM	125.08	10000	10000	4	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
57.25	6.7	0.2	480.	<0.2	0.3

1984

S-6

1983 DATA

DATE	DEPTH DEPTH TO H20	Ph Ph	COND COND	NO3-N NO3-N	NH3-N NH3-N	F F
12/05	28.83			48		CL=10
AVG	28.8			48		
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 29, 1984 Results

Depth	pH	$NO_3(N)$	Cond	$NH_3(N)$	F
24.17	4.8	32.	345.	<0.2	0.6

1984

S-7

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
107.17	7.2	1.6	342.	<0.2	0.4

1984

S-8

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
75.0	11.5	<0.4	2,050	<0.2	0.9

S-8

1984

S-9

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
75.42	10.2	<0.4	862.	22.	0.8

1984

S-10C

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
3.33	6.0	<0.4	73.	<0.2	0.2

S-10C

1984

S-11C

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
10.67	5.5	<0.4	50.	<0.2	0.1

S-11C

1984

S-12C

NO DATA IN FILE

AVG						
STD DEV	0	0	0	0	0	0
MAXIMUM	28.83	0	0	48	0	0
MINIMUM	28.83	10000	10000	48	10000	10000

RESULTS MARKED WITH *H OR *L ARE MORE THAN 2 STD DEV DIFFERENT FROM 1983 AVERAGE

November 1984 Results

Depth	pH	$NO_3(N)$	Cond.	$NH_3(N)$	F
3.67	5.9	<0.4	29.	<0.2	0.1

SURFACE WATER MONITORING DATA FOR RUNOFFS AREAS

KERR-McGEE NUCLEAR CORPORATION

INTERNAL CORRESPONDENCE

TO: KGS, DN, JPS, DF, RH

DATE: May 5, 1982

FROM: C.A. Grosclaude

SUBJECT: Surface Water Run-Off Sampling

We will have to sample the following locations, if there is flowing water present, during periods of rainfall. (See attachment for locations).

Sample Location #1 (Culvert at the south drainage point west of Raff. Pond #2. You will have to go thru the gate of the exclusion area fence).

Sample Location #2 (Culvert at the north drainage point west of Raff. Pond #2. You will have to go thru the gate of the exclusion area fence).

Sample Location #3 (36" culvert in the drainage ditch west of Emergency Holding Basin #1. Sample may be taken on the upstream side of the culvert).

Sample Location #4 (Culvert at the NW corner of the UF_6 cylinder storage pad).

Sample Location #5 (Surface drainage ditch north of the contractor change room at the exclusion area fence).

Flow Information Required:

If there is flowing water present at locations 1-2-4 indicate on the Sample Analyses Request form the amount of flow ~~(culvert 1/4, 1/2, 3/4 or full flow)~~ in inches

At sample locations No's 3 and 5 record the approximate depth of water flowing, in inches, on the Sample Analyses Request form.

It there is no water flow at any of the locations turn a Sample Analyses Request form into me with a statment that there was no flow present.

Rainfall Information Required:

Just prior to taking the samples (1 thru 5) get the total amount of rain that has fallen up to that point in time (from the rain gauge in my office or from the outside rain gauge). Note this on the Sample Analyses Request form.

SURFACE RUNOFF FILE DUMP FOR 1983 — 6/15/83

ATE	TIME	RAIN inches	LOC # 1 FLOW inches	LOC # 1 U ug/l	LOC # 1 NO3-N mg/l	LOC # 2 FLOW inches	LOC # 2 U ug/l	LOC # 2 NO3-N mg/l	LOC # 3 FLOW inches	LOC # 3 U ug/l	LOC # 3 NO3-N mg/l	LOC # 4 FLOW inches	LOC # 4 U ug/l	LOC # 4 NO3-N mg/l	LOC # 5 FLOW inches	LOC # 5 U ug/l	LOC # 5 NO3-N mg/l
/26	1030	.26	0	0	0	2	26	88	2.5	2691	53	1.75	1319	3.3	3.5	1711	3
/31	1025	.28	.25	11	12	.75	9	16	2	478	21	3	576	.22	6	380	1.25
/31	1730	.98	3	6	23.7	3	11	43.4	4	1612	36.4	2	201	2	4	284	2.9
/1	0130	1.1	1.5	9	68	2	31	66	5	862	70	1	1563	7.5	4	1073	4.3
/1	1045	0	.25	28	42	.5	11	75	.5	1904	84.5	0	0	0	1	1512	7.6
/9	0930	.34	.25	5	67	1.5	11	68	1	2739	62	.25	705	2.06	1	813	3.62
/9	1710	.58	.5	4	38	1.25	6	113	1	5924	43	0	0	0	.5	1563	5.2
/20	1720	.3	.5	48	114	1	22	81	3	1505	92	.5	535	.9	3	505	1
/22	0109	1	0	0	0	1.25	10	114	1	7337	55	.5	2437	4	.75	1231	4
/4	1715	1.1	.75	8	61	1.25	6	116	2	6083	33	0	0	0	.5	1370	4.4
/4	1225	.25	0	0	0	.5	8	51	2	2036	17	2	300	.7	5	447	1.7
/26	0930	.47	0	0	0	2	6	148	2	3132	74	0	0	0	2	1858	2.11
/26	1700	.24	10	10	78.5	35	11	115	35	2385	46	5	535	1.08	25	873	4.96
/2	???	.35	0	0	0	0	0	0	2	6019	68.5	0	0	0	2	3226	4
/13	1640	.85	0	0	0	1	9	98	2.5	2978	95	0	0	0	1.5	1900	2.28
/21	1400	.25	.25	48	44.8	1.25	25	66.5	1.25	[illegible]	20.8	.5	192	.86	2	383	2.8
/21	2330	.37	0	0	0	1	17	138	1	4158	60.5	0	0	0	1	1561	2.88
/23	0100	.97	.75	524	81.5	1	15	88	3	2930	63.5	.5	2097	9.25	4	1656	2.5
/22	1800	.47	1	0	70.5	3	0	83.5	3	0	34	3	0	1.87	4	0	3.46
/14	0200	1.8	6	3	25.5	4	6	49	6	251	14.8	5	67	1.2	6	19	1.83
/14	1300	.5	5	13	37.4	4	29	59	6	19591	72.5	5	20	17.4	99	1167	2.46
/14	1925	.52	.75	15	36.4	1.5	14	48	2	8222	14.3	.75	0	.8	3	0	2.5
/15	0100	.75	0	0	0	.25	8	15.5	.5	11750	32.5	.25	4106	13.9	.5	1362	2.98
/18	0400	.4	0	0	0	.25	7	89.5	.5	2685	38	.25	495	2.8	.25	456	3.6
/21	0650	.65	.5	4	66	1	9	67	2	8	61	6	4303	47	3	1118	2.2
/28	NS	.8	0	0	0	2	8	84.5	2	7147	76	0	0	0	2	1610	5.08
/29	0700	.4	0	0	0	4	12	102	4	6314	11.9	2	635	1.37	4	546	4
/31	NR	.5	0	0	0	0	0	0	1	11753	70	0	0	0	1	2247	2.06
/5	1715	.53	.75	5	53	1	3	19.5	3.5	388	16.5	4.5	52	10.5	3.5	42	2.3

LOC # 1 SOUTH CULVERT - WEST OF RAFF. POND #2
LOC # 2 NORTH CULVERT - WEST OF RAFF. POND #2
LOC # 3 36 inch CULVERT WEST OF EMERGENCY BASIN #1
LOC # 4 CULVERT NW CORNER OF UF6 STORAGE PAD
LOC # 5 DITCH NORTH OF CONTRACTOR CHANGE-ROOM AT EXCLUSION AREA FENCE

SURFACE RUNOFF FILE DUMP [illegible]

			LOC # 1			LOC # 2			LOC # 3			LOC # 4			LOC # 5		
	TIME	RAIN inches	FLOW inches	U ug/l	NO3-N mg/l	FLOW inches	U ug/l	NO3-N mg/l	FLOW inches	U ug/l	NO3-N mg/l	FLOW inches	U ug/l	NO3-N mg/l	FLOW inches	U ug/l	NO3-N mg/l
	1640	.25	0	0	0	0	0	0	1	3430	135	.25	[illegible]	[illegible]	2	560	2
	0500	.35	0	0	0	0	0	0	1	3721	131	.25	2345	10	1	2741	4
[illegible]	0945	.75	1	13	107	1.5	26	138	4	509	16	.75	104	3	2	110	5
[illegible]	1645	1.25	1	29	93	2	13	94	4.5	3321	37	1.5	550	1	5	557	3
3	0030	1.82	.25	18	76.6	.25	44	65.8	.25	13318	15.6	.25	3406	8	.25	2146	2
3	0330	2.42	3	9	24	4	-7	50	12	781	16	2	505	2	6	359	2
3	1545	3.12	1	11	56	1.5	11	40	3	10185	28	1	2247	3	3	1326	7
[illegible]	0030	3.34	.25	10	104	.25	11	65	1.5	11554	35	.25	3128	6	1.5	2442	6
4	0330	3.44	0	0	0	.5	17	91	.75	12538	79	0	0	0	.75	4593	8
[illegible]	1530	.45	0	0	0	0	0	0	2	4012	19	.5	975	2	1	1425	4
3	NR	1.5	2	36	38	4	40	52	5	11657	15	3	1405	2	2	1877	3
3	1430	1.5	0	0	0	.25	27	72	.5	8910	80	0	0	0	.5	5280	8
	0400	.35	0	0	0	4	30	68	1	8027	38	0	0	0	1	3323	6
	1430	.47	0	0	0	.5	17	61	1.5	5871	33	1	824	.7	2	1098	8
	1710	.81	2	24	15	4	12	37.5	4.5	1013	10	.75	521	2.5	3	621	5
	0100	1.15	3	24	30	4.5	15	27	5	13222	15	.5	3716	6.5	3	2442	3
	1000	2.8	.25	23	33.5	1	15	49.5	.75	7440	72	0	0	0	1	4500	5
	2100	.5	0	0	0	0	0	0	1	910	1.3	0	0	0	0	0	0
[illegible]	NR	.89	.5	15	34	2	15	37	6	3030	16	.5	563	1	3	1092	5
5	1930	1.45	2	8	21	3	8	21	4	3132	14	1.5	509	1.1	4	819	1.1
5	100	2.4	1.5	7	14.5	1.75	6	23	2.5	807	21.5	.5	113	1	1	148	1.5
	0315	1.6	.75	43	89	1.25	34	26	2.5	7530	9	2	307	0	2.5	434	4
9	1115	.8	.25	35	52	.5	118	4	1.5	1172	5	.75	329	1	4	337	6
[illegible]	1700	3.1	1.5	25	24	2	30	13	4	2443	20	1	346	1	4.25	218	3
7	1940	.62	0	0	0	0	0	0	.5	745	7	.75	294	2	1.5	421	5
2	2100	.48	0	0	0	0	0	0	1.5	16	31	.5	500	1.1	1	524	16
8	1400	.37	0	0	0	0	0	0	1.5	1076	6	.75	385	.4	3	341	5
9	0130	1.1	.75	11	6	.5	16	6	2	23	25	.5	215	1	1.5	401	4
28	1400	.71	0	0	0	.5	12	4.8	3	1148	6.1	5	53	.4	6	100	1.7
28	1715	.95	0	0	0	0	0	0	3	4501	13.7	.5	456	1.1	2	872	3.7
1	1545	.49	0	0	0	0	0	0	3	4013	12.4	.5	911	2.2	2	975	3.9
2	0100	.9	0	0	0	0	0	0	.5	6552	15.6	.5	1025	1.8	.5	1123	2.7
22	1700	1.2	.5	20	19	0	0	0	.5	8765	53	.25	1454	2.37	1.5	1807	5.6
22	1000	.35	0	0	0	.5	21	8.8	3	2249	10.5	2	769	.44	8	549	4.5
27	0930	2.16	3	9	15.8	4	9	19.7	5	477	35.2	2	320	1.39	6	379	1.68
27	1715	.77	.5	8	17.2	1	13	27	2	8178	29	.5	2390	13	2	1220	3.84
27	0100	2	.25	12	103	.5	9	15	2	7739	20	.5	428	1.5	4	653	3
2	0030	1.24	2	14	21.2	4	11	16.8	6	282	34	2	125	.5	8	252	2.4
2	1720	1	0	0	0	2	11	34	2	6708	35.4	0	0	0	2	1514	1.9
3	0100	2	2	35	4.4	3	11	22.8	4	44	46.8	3	87	.3	4	75	.3
3	1000	.09	.5	43	22.4	1	178	15.4	3	2153	28.4	0	0	0	1.5	977	2.4
10	1100	.37	0	0	0	.25	10	47	.5	3573	61.6	.5	1025	.9	1.5	491	3.3
27	1700	.25	0	0	0	0	0	0	1.5	2542	70	0	0	0	1	1650	3.4
23	0137	.7	0	0	0	0	0	0	.75	5334	90	0	0	0	0	0	0

LOC # 1 SOUTH CULVERT - WEST OF RAFF. POND #2
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7. AUTHOR(S)	5. DATE REPORT COMPLETED MONTH August YEAR 1985
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16. ABSTRACT (200 words or less)

In response to an application for renewal of Source Material License SUB-1010 for the Sequoyah Fuels Corporation facility, the NRC staff prepared this Environmental Assessment.

The Environmental Assessment includes discussions of the need for the proposed renewal action, alternatives to the action, and the environmental impacts of the proposed action and alternatives.

17. KEY WORDS AND DOCUMENT ANALYSIS

17a. DESCRIPTORS

17b. IDENTIFIERS/OPEN-ENDED TERMS

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