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August 10, 1987

Evelyn R. Matson
Nuclear Regulatory Commission
Region III Licensing Section
799 Roosevelt Road
Glen Ellyn, Illinois 60137

RE: Amendment No. 9, License No. 24-13365-01, Control Number 83747.

Dear Ms. Matson:

In reply to your request for additional information concerning the above referenced amendment, we submit the following information:

- 1) Expanded personnel training details (Attached). All listed individuals we would want to be considered users of ^{14}C -materials. I believe the listed personnel have more than adequately complied with the 40 clock hours of training you have recommended for authorized users.
- 2) The training we submitted to you in the Amendment is given annually to all laboratory personnel who may directly or indirectly become involved. We maintain training records on all individuals as required by EPA/FDA Good Laboratory Practice regulations. The course was designed by Dr. Phillip Lee, University of Missouri Health Physics Department as a training tool for laboratory personnel, not authorized users.
- 3) The land application sewage system is described in detail (Attached). The site plan in Figure 2 shows the physical location of the lagoon on ABC property. Although we have not been required in the past to sample our lagoons, we have voluntarily at infrequent times, sampled our system for ^{14}C -levels. We have never determined that any significant contamination has resulted in our ^{14}C -usage. The only ^{14}C -wastes that typically would enter the system are from the Aquatic Toxicology Laboratories where diluter solutions are used. Most of our "wastes" are samples and are either subsequently shipped back to clients, or are disposed of via our Radioactive Waste Shipments to ADCO, Inc. in Chicago. There is no formal program for sampling the application area, but we would be receptive to your recommendations. We routinely deal with radiotagged materials that are specifically designed to degrade in the environment, and feel that most degradation results in gaseous $^{14}\text{CO}_2$ at very low levels.
- 4) Specifically referencing your letter, items 6e, f and g on page 3;
 - a) There is negligible potential for ^{14}C entry into the ground water due to the design of the land application

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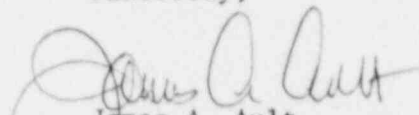
REGION III

system, underlying clay soils and the lack of significant amounts of ^{14}C -materials at the application site.

- b) Worst case estimated dose to an individual from the application site is no greater twice background levels.
 - c) Again, we have no requirements to sample the site from the State of Missouri's Department of Natural Resources who approved the design of the system (as did the county of Boone and City of Columbia). Our action level in all areas is any significant level detectable above background.
- 5) We note our misrepresentation on soil contamination and have taken steps to advise all personnel that soils used in studies must have no detectable ^{14}C to be treated as routine waste. All soils contaminated will be returned to our clients, or shipped as radioactive waste.
- 6) Our proposed final survey of the area referenced on page 6, item 6 refers again to the restricted area, after the studies have been completed. Our intent is to comply with NRC recommendations, and any soils contaminated will be disposed of via ADCO, Inc., Any tanks or containers that displays activity will be cleaned and decontaminated (removable). Non removable activity does not occur frequently, but when it has in the past, we remove the whole and dispose of the material as a radioactive waste.
- 7) Item 9, page 4 of your letter requests information on disposal of "contaminated equipment (see item 6 above) weeds, plants samples, etc." Most of the items mentioned will be analyzed chemically by the design of the experiment or will be analyzed for degradation and metabolism products. Thus, the ^{14}C will be isolated and analyzed by liquid scintillation. Reserved samples are generally returned to the client or disposed of as radioactive waste at the clients' request.

I hope these responses will answer your questions. We anticipate that this weekend, our rice study will be invalid if we cannot treat as proposed, and request as quick a response as possible. If you should have any questions, please feel free to contact me at your earliest convenience.

Sincerely,



James A. Ault
Radioactive Safety Officer

Attachment

PERSONNEL

The following personnel are involved in handling or have direct control over radioactive substances at ABC. Some of the persons listed are not directly involved with radioactive substances but have had formal training and would be available for consultation.

Radiation Safety Officer:

James A. Ault - Business Manager/Corporate Safety Officer

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Missouri	1 semester	54
University of Missouri	2 semesters	108

Mr Ault's training at the University of Missouri consisted of 3 courses in nuclear chemistry. The first course was entirely lecture and covered radiation chemistry and instrumentation, radiation biology, radiation protection, mathematics relating to radiation and design of experiments. The second two courses were combination of lecture, laboratory, research and report writing to fulfill the requirements for graduating with honors in the chemistry degree program. The instructor for the courses was Mr. Dennis Grev, while the research work at the reactor facility was supervised by the University Reactor professors, technicians, and health physics department. A grade of "A" was received in all three courses.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Atomic numbers 3 to 83		University of Missouri	12 months	Lab Experiments
C-14	10 mCi	ABC Labs	6 years	Research Studies
Ni-63	20 mCi	ABC Labs	8 years	CG-ECD operation and leak/wipe testing

Mr Ault served as Assistant Radiation Safety Officer for a period of 2 years prior to being appointed RSO. He presently is ABC Corporate Safety Officer.

Assistant Radiation Safety Officers:

Kevin F. Yount - Quality Assurance Officer

Phillip M. Buckler - Quality Assurance Supervisor

Mr Yount's and Mr. Buckler's training has been on-the-job training at ABC Labs. Training for all of the ARSO duties was given by the former RSO or the present RSO. Both gentlemen have performed or assisted in all of the ARSO duties for a duration of greater than 2 years. Additional formal course work is planned for Mr. Yount and Mr. Buckler in the future.

Ralph H. Waltz

Training:

<u>Where Trained</u>	<u>Duration</u>
F & M Scientific Corporation (Hewlett Packard)	7 years on job and formal training
Nuclear Chicago	3 years on the job

Mr. Waltz is not actively engaged in the use of any of the isotopes, but as president, has the final responsibility for the safety of ABC personnel and ABC's service to its customer. The formal training he received at F & M Scientific covered theory, safety, calculations and biological effects and covered multi 2-hour sessions over several weeks. The carbon-14 usage listed below was a combination of C-14 and H-3 organic compounds (steroids, fatty acids, amino acids, etc.) used to develop applications of the proportional counter radioactive monitor accessory for G.C. effluents. Mr. Waltz attended a refresher course of 6-10 hours taught by our consultant, Mr. Jamieson G. Shotts in May 1977. An outline of the course is included at the end of this section (page 14).

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Nickel-63	45 mc	F & M Scientific (Hewlett Packard)	7 years	Electron Capture Detectors for Gas Chromatography
Hydrogen-3	900 mc	F & M Scientific (Hewlett Packard)	7 years	"
RA 226	10 nc	Nuclear Chicago	3 years	"

Carbon-14	10 mc	Nuclear Chicago	3 years	Applications re- search for radio active monitoring chromatography
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Lyle D. Johnson
Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Missouri	1 semester	198

Mr. Johnson's formal training at the University of Missouri consisted of three credit hours of lecture and two credit hours of laboratory experience. Theory, calculations, measurements, safety, biological effects, etc. were covered in depth. Mr. Johnson also attended the refresher course taught by Jamieson G. Shotts in May 1977.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Atomic No. 3 to 83	1 m Ci	University of Missouri	4 Months	Lab experiments
Nickel-63	20 m Ci	ABC Laboratories	10 years	Electron Capture Detectors for Gas Chromatography

Mr. Johnson is responsible for managing the direct usage of any C-14 and H-3 in laboratory research.

Floyd Kaiser
Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Missouri	1 semester	198

Mr. Kaiser's formal training at the University of Missouri consisted of three credit hours of lecture and two credit hours of laboratory experience. Theory, calculations, measurement, safety, biological effects, etc. were covered in depth. Mr. Kaiser also attended the refresher course taught by Jamieson G. Shotts in May 1977.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Atomic No. 3 to 83	1 mCi	University of Mo.	4 Months	Lab experiments
Nickel-63	20 mCi	ABC Laboratories	17 years	Electron Capture Detectors for Gas Chromatography
Carbon-14	10 mCi	ABC Laboratories	6 years	Soil degradation and fish metabolism of C-14 labeled compounds

Mr. Kaiser served as radiation safety officer of ABC Labs, Inc. for 12 years and was responsible for maintaining the manual on regulations, notices, etc., related to NRC. Mr. Kaiser was responsible for maintaining the records regarding quantities of radioactive material received and disposal of the material.

Donald Strong
Training:

<u>Where Trained</u>	<u>Duration</u>
Barber Colman Company	10 years informal on-the-job training
Nuclear Chicago	6 years informal on-the-job training
ABC Laboratories	6 years informal on-the-job training

Mr. Strong attended the refresher course in 1977 taught by our consultant. His training at Barber Colman and Nuclear Chicago included principles, safety, usage and mathematics relating to radioactivity.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Hydrogen-3	10 curies	Barber Colman	10 years	Ionization Detectors
"	"	(Nuclear Chicago)	years	"
"	"	ABC Laboratories	6 years	"

Nickel-63	200 mc	Barber Colman	5 years	"
"	"	(Nuclear Chicago)	6 years	"
"	"	ABC Laboratories	6 years	"
Strontium-90	100 mc	Barber Colman	10 years	"
"	"	(Nuclear Chicago)	6 years	"
Radium-226		Barber Colman	10 years	"
"		(Nuclear Chicago)	6 years	"

Mr. Strong has several years experience with Barber Colman and Nuclear Chicago with the type of work we perform in relation to gas chromatography ionization detectors. He has been ABC's user in this area during the past 3 years. While at Barber Colman he was specifically identified on their license. His experience included maintaining radiological records, manufacturing and repairing ionization detectors, performing leakwipe tests, storing sealed and unsealed sources, inspecting incoming foils from vendors and testing of electron capture detectors. During his 6 years of experience listed at ABC he continued these functions. His experience with organic tagged compounds has been limited to μ Ci amounts of C-14 and H-3 used in testing radioactive proportional counter G.C. accessories. Mr. Strong now acts as a back-up source of information on the safe handling of radioactive materials, especially Ni⁶³ ECD cells.

Daniel Newhouse
Training:

<u>Where Trained</u>	<u>Duration</u>
Bendix Corporation	10 years
ABC Laboratories	6 years

Mr. Newhouse received informal training at Bendix on the principles, mathematics, use and safety involving radioactivity. He attended the refresher course taught by our consultant, Mr. Jamieson Shotts in 1977.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Hydrogen-3	900 m Ci	Bendix Corporation	10 years	Ionization Detectors

Nickel-63	300 m Ci	ABC Laboratories	6 years	"
"	150 m Ci	Bendix Corporation	10 years	"
Carbon-14		ABC Laboratories	6 years	"
"	10 μ Ci	ABC Laboratories	6 years	Calibration of radioactive monitoring g.c. accessory

Mr. Newhouse has 10 years experience with Bendix in manufacturing and testing gas chromatographs containing Ni-63 and H-3 detectors. Three years of this experience consisted of research and development on detectors. His 6 years of experience at ABC Labs involved performing wipe tests on sealed sources in a customers facility, removing and installing sealed sources for a customer, and checking sealed sources at ABC to insure they are functioning properly. These duties are no longer performed due to the discontinuance of these services by ABC Laboratories. Mr. Newhouse acts as a back-up source of information on the safe handling of radioactive materials, especially Ni⁶³ ECD cells.

William A. McAllister
Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
Columbia National Fisheries Lab	7 years	---
Columbia National Fisheries Lab	---	32
ABC Laboratories	9 years	---

Mr. McAllister received on-the-job schooling (1974) in radiation protection instructions, regulations and procedures for radiation workers which consisted of 6-four hours sessions with an examination to pass. This was in the form of a course taught by Dr. Phillip Lee of the University of Missouri Health Physics Department. He took a refresher course (8 hours) taught by the same gentleman in 1977.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Hydrogen-3		Columbia National Fisheries Lab	7 years	Research Studies

Phosphorus-32	Columbia National Fisheries Lab	7 years	"
Iodine-131	Columbia National Fisheries Lab	7 years	"
Carbon-14	Columbia National Fisheries Lab	7 years	"
"	20 m Ci ABC Laboratories	9 years	"

James P. Swigert

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
Purdue University	1 semester	54

Mr Swigert's formal training at Purdue University consisted of 3 credit hours of radiation biology coursework. Types and sources of radiation, measurement, biological effects and safety were covered in depth.

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type Of Use</u>
Cadmium-109		Purdue Univ.	3 Months	Microcosim Research Study
Carbon-14	20 mCi	ABC Labs	9 Months	Toxicology Studies

Stanley R. Shaffer

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Missouri	1 semester	198

Mr. Shaffer's training at the University of Missouri consisted of 3 credit hours of lecture and 2 credit hours of laboratory work in Nuclear Chemistry. Sources and types of radioactivity, detection systems, effects and safety were covered.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Carbon-14		Univ. of Mo.	1 semester	$^{14}\text{CO}_2$ Plant Uptake Study
Carbon-14	20 mCi	ABC Labs	5 years	Animal Studies

Mr. Shaffer has served on the ABC Labs safety committee for 2 years.

Walter L. Cranor

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
U. S. Navy	3 years	---
University of Mo.	1 semester	54

Mr. Cranor's formal training includes training provided by the U.S. Navy while on active duty at a submarine base in New London, CT. His training at the University of Missouri consisted of a 3 credit hour course in advanced radiochemistry. Training included types and sources, effects, shielding, safety and containment of radioactivity.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Various secondary reactor activated components	mCi amounts	U.S. Navy	3 years	Safety and Containment
Am,Co	250 Ci	U.S. Navy	3 years	Non-destructive testing of secondary reactor system repairs
Ni-63	20 mCi	ABC Labs	10 years	GC-ECD operation
C-14	45 mCi	ABC Labs	6 years	Environmental Fate Studies

Mr. Cranor helped begin ABC Labs Environmental Fate testing program. He has and continues to control and monitor the use of all radioactive material used in this type of testing.

Brian R. Bowman

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Mo.	1 semester	54

Mr Bowman's training at the University of Missouri consisted of 3 credit hours of coursework covering radiotracer methodology including safety procedures.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Ni-63	30 mCi	ABC Labs	6 years	GC-ECD operation
C-14	10 mCi	ABC Labs	3 years	Environmental Fate Studies

Mr. Bowman serves as a supervisor in ABC Labs Environmental Fate group, supervising three study directors and the safe handling of radioactive material by them and their subordinates.

Jamieson G. Shotts

Mr. Shotts is only a consultant at ABC Laboratories and does not handle any radioactive materials at our facilities.

<u>Type of Study</u>	<u>Where Trained</u>	<u>Duration</u>
Principles & practices of radiation protection	University of Oklahoma	On job and formal training
Radioactivity measurement, standardization and monitoring techniques, and instruments	University of Oklahoma	On job and formal training
Mathematics and calculations basic to the use and measurement of radioactivity	University of Oklahoma	On job and formal training
Biological effects of radiation	University of Oklahoma	On job and formal training

Jamieson G. Shotts

<u>Isotope</u>	<u>Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Cobalt-60	25 mc	Univ. of OK	several weeks	Survey instrument calibration
Cesium-137	25 mc	Univ. of OK	several weeks	Survey instrument calibration
Radium	10 curies	Univ. of OK	several weeks	Determining a safe place to store these sources
Uranium-235	806.34 gm in AGN-211 reactor	Univ. of OK	one semester	Nuclear reactor lab experiments, surveys and inspections
Cesium-137	1 curie	Univ. of OK	several weeks	Fluorescent excitation
Cobalt-60	500 curies	Univ. of OK	several days	Determining a safe place to store this source until proper facilities to accommodate their source
X-Ray Machines	10-15 MA about 250	Univ. of OK	several months	Surveys & exploratory research
70 Mevelectron accelerator	less than 300 mc	Univ. of IL	4 years	Radiation safety officer and administration of control program, surveys, leak tests, inspections and waste disposal for NRC License

Jamieson G. Shotts

<u>Isotope</u>	<u>Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
Various by product	microcurie to multicurie to activities	Univ. of MO	about 2 years	Health physicist for Columbia campus responsibility for control of operations on campus

Cobalt-60	1000 curies	Univ. of Mo	2 days	Supervision and monitoring for open air reloading of irradiator
Tritium	1 curie	Univ. of MO	several days	Supervision and monitoring of research studies involving use of curie tritium foils (scantium) for a Varian Electron Capture Detector for a gas chromatograph

Jennifer Heitkamp M.S.

As an undergraduate at St. Cloud State University Ms. Heitkamp completed a 2 hour radiochemistry course that included both lecture and laboratory sections. As a graduate student at the University of Nebraska-Lincoln Ms. Heitkamp completed a 2 hour graduate radiochemistry course. Both courses involved the theory of radioactivity the difference in energy of different emitters, and the safe handling of radioactive substances.

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
St. Cloud State Univ.	1 semester	36
University of Nebraska-Lincoln	1 semester	36

Brenda Bunch Franklin

Training:

<u>Where Trained</u>	<u>Duration</u>	<u>Clock Hours</u>
University of Missouri Research Reactor	2 semesters	108
University of Missouri	1 semester	54
MRI	2½ years	
MRI - Radiation Safety Course		40
ABC Laboratories	3 years	

Ms Franklin worked for 2 years part time at the University of Missouri Research Reactor. Her main responsibilities included neutron activation techniques to analyze for Boron. Her training included radioactive safety procedures.

In 1981 Ms. Franklin completed a 3 hour graduate course on radio-chemistry. The course covered the theory of radioactivity, its measurement, safety and uses.

From 1982 to 1984 Ms. Franklin was employed by Midwest Research Institute. During this time she worked extensively with ^3H and ^{14}C labeled compounds. Ms. Franklin was also required to attend a 5 day (40 hour) seminar on the theory of radioactivity and radiation safety. The course concluded with an exam. A passing grade was required before she could handle radioactive compounds on the job.

Since September of 1984 Ms. Franklin has served as a supervisor in an analytical support division which utilizes ^{14}C compounds in most of its projects. Ms. Franklin has been responsible for training and supervision of employees handling ^{14}C compounds.

Experience:

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Gained</u>	<u>Duration</u>	<u>Type of Use</u>
^3H	100 mCi	Midwest Research Inst.	1982-84	Analytical Confirmation of Custom Synthesis
^{14}C	50 mCi	MRI, ABC	1982-present	MRI-Same as ^3H ABC-radiotracer in toxicology studies

Outline of Refresher Course - May 1977

I. Introduction

A. Atomic Theory

1. Nuclear structure
particles - mass - charge - energy
2. Radioactivity nuclear transformation
?, B and Y
3. Particle theory
4. Electro magnetic theory
5. Interactions with matter

B. Natural man-made radioactivity

II. Radiation Measurements

- A. Background radiation
- B. Statistical fluctuations
- C. Counting schedules
- D. Resolving time

- E. Self absorption
- F. Backscattering
- G. Detection systems and their operation
- H. Activity calculations
- III. Radiation Protection and Biological Effects
 - A. Standards and terms
 - B. Exposure effects
 - C. Exposure (external and internal)
 - D. Dose calculation
- IV. Isotope Handling and Safety
(demonstrations and laboratory use)

All ABC Labs personnel are required to read and accept the radiation safety program prior to beginning work at the lab. Their performance in handling radioactive materials is monitored by the previously listed people. All personnel are also required to attend periodic in-house radiation safety seminars.

SEWAGE SYSTEM DESCRIPTION

The following description is of the present lagoon system used by ABC.

The sewage system used by ABC is known as Land Application. This system returns water to the soil. The lagoon has a continuous discharge utilizing a gated pipe distribution system.

The application system and rate depend greatly on the slope of the land and the soil type to which the water will be applied. The slope of the land at the lagoon site ranges from 5 to 7 percent. The soil is a Lindley loam (La) and a clay loam. The soil has a permeability of 1.2 inches per hour. This soil is additionally characterized as deep, moderately well drained, moderately sloping, eroded soils of the uplands. The soil layer of 4" to 7" overlays significant amounts of plastic, sandy clay that was used for construction of the lagoon.

The area below the application site is Westerville silt loam (Wf). This soil is deep, poorly drained, and medium textured.

As mentioned before the land application system used is a continuous discharge gated pipe distribution system.

Because of the natural slope of the land at the site, a gravity-gated pipe system works well on the grassed slopes. With an annual flow of 2.7 MG, this facility meets the criteria of the Department of Natural Resources Management Guide WP83-3I entitled "Gated Pipe Irrigation Systems for Small Operations". This guide details several possible alternatives and typical design options. The guide generally provides for a typical pumped spray system providing wastewater for the enhancement of crop production. However, it also notes the use of this type of system for filtering and treatment where nutrient use is not the primary objective.

By protecting the discharge piping from freezing, a system can discharge the whole year. This was accomplished by installing the pipe in the lagoon berm so that the waste is discharged below the ground (Figure 1).

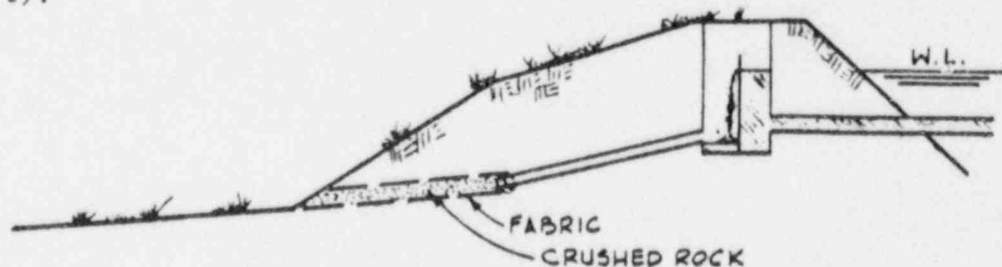


Figure 1

The discharge will occur at any time there is flow into the lagoon, unless the system is shut down. A valving system is used to shut off the system for mowing and to divert the discharge to a separate areas

(Figure 2). The discharge berm serves to divert stormwater from above, away from the irrigation area. The following design parameters are established for this type of system:

Operation average	10 hrs. per day
Irrigation volume	12,456 GPD
Gated pipe hear	4.6 feet minimum (2.0 PSI)
Rate of application	100 GPD per 650 sq. ft.
Length of pipe	540 feet
Length of slope	150' minimum
Non-application times	harvest time
Holes in pipe	1/8" at 6.94' intervals
Slope of pipe	0.2 percent

This system would be manually operated including:

- 1) Start up by opening valves for continuous operation.
- 2) Shut down for mowing.
- 3) Observation of flows to retain wastewater on the site.

Figure 2 is a copy of the site plan locating the lagoon site and outlining the ABC Laboratory property. The plan sheet (scale 1"=100') provides 2 foot contours of the proposed application area. The plan sheet locates the well serving the laboratory facilities. A site inspection did not reveal any exposed bedrock or any evidence of sink-holes or solution openings such as mines. There is one shallow hand-dug well (20'-4" deep) which will be left open for monitoring purposes. This is performed at the suggestion of the Missouri DNR. This well indicates that the high groundwater levels at that site is approximately 4 feet below the surface during wet weather (February, 1986).

The site required minor grading to spread the flow evenly over the width of the slope. The permeability of 1.2 inches per hour of this soil provides more than adequate capacity for the waste to percolate into the soil, except for extremely heavy rain events. Because of the low application rate and the soil thickness in that area, groundwater monitoring is not required.

The proposed system should eliminate any nuisance aspects of the land application systems by providing over 60 days retention for pathogen reduction and 0.25 inches per day overland flow to eliminate aerosols. The discharge on the slope during high precipitation events will be highly diluted. For example, in a 2 hour, one inch rain, the waste discharge on the slope would be 0.05 inches. This would dilute the waste by a factor of 20 parts rain to 1 part waste.

The lagoon and application area will be fenced and appropriate warnings will be posted.

The sewer has been designed to serve the maximum of developable area currently owned.

Storm water and water from the fish culture tanks (untreated bulk fish), in ABC's aquatic division is channeled into an existing pond. This lowers the overall flow to the lagoon.

To give an idea of ^{14}C levels discharged into ABC's sewage system, four sediment plug samples were taken from ABC's former lagoon system on September 8, 1983. At that time low level ^{14}C waste had been flowing into the system for approximately 6 years. The samples were composited, extracted and analyzed for ^{14}C activity. The composite results were determined to be 31 DPM/g (dry basis) or 1.4×10^{-5} $\mu\text{Ci/g}$.

We also surveyed the new lagoon for ^{14}C on August 5, 1987. Samples were taken from the application area, water from the overflows and in the lagoon. All sample displayed no counts (DPM) above background levels.

FIGURE 2

