Site Elliot Shooting Park
ID# MOD980968333
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Other Burns & McDonnell
11/13/85
0758

WORK PLAN FOR INITIAL LEAD REMOVAL AND SAMPLING AND ANALYSIS AT THE ELLIOTT SHOOTING PARK RAYTOWN, MISSOURI

Burns & McDonnell
ENGINEERS ARCHITECTS - CONSULTANTS
Kansas City Missouri

40163471
SUPERFUND RECORDS

Burns & McDonnell
ENGINEERS ARCHITECTS CONSULTANTS

November 13 1985

Mr David V Crawford
U S Environmental Protection Agency
Waste Management Division/Superfund Branch
726 Minnesota Avenue
Kansas City KS 66101

Work Plan for Initial Removal and Sampling
Elliot Shooting Park
Project No 85-170-4

Dear Mr Crawford

Please find enclosed the subject work plan for your evaluation The Bank is attempting to proceed rapidly and your prompt action is appreciated

Please feel free to call me if you have any questions

Sincerely

Tom Brown

H Tom Brown P E

HTB/kas

4800 EAST 63 d STREET PO BOX 173 KANSAS CITY MISSOURI 64141 TEL 816 333 4375 TWX 910-7 1 305

WORK PLAN FOR
INITIAL LEAD REMOVAL AND
SAMPLING AND ANALYSIS
AT THE
ELLIOTT SHOOTING PARK
RAYTOWN, MISSOURI

FOR
BOATMEN'S FIRST NATIONAL BANK
BOATMEN'S RAYTOWN BANK

1985
PROJECT NO. 85-170-4

BURNS & MCDONNELL
ENGINEERS-ARCHITECTS-CONSULTANTS

BTMCOV WKP

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PART I

INTRODUCTION

A GENERAL

The Elliott Shooting Park has been a trap and skeet range since 1887 and is currently the home of the Kansas City Trap Club Recently, Boatmen's First National Bank of Kansas City foreclosed on the Elliott Shooting Park Further transfer of the property title is being held up because of suspected lead contamination of the site Lead in the form of shot from shot gun shells is present on the site

Periodically, the site has been "mined" by a company which removes the shot from the soil and recycles the lead The site was last mined approximately 4 years ago However, the concentration of lead shot may have built up to unacceptable levels through continued use

B PURPOSE

Boatmen s First National & Boatmen's Raytown Bank have retained Burns & McDonnell to prepare this work plan and sample the soil at the Elliott Shooting Park If necessary, Burns & McDonnell will determine a suitable remedial action beyond mining the site

The purpose of this work plan is to document the lead removal plans sampling methods, record keeping, safety and quality assurance for field investigation Also, this plan will be submitted to EPA for approval

C SCOPE

This work plan includes the following

1 LEAD REMOVAL PLAN

This plan discusses the methods for removal of lead shot from the site

2 SAMPLING PLAN

This plan discusses the sampling methods, sample handling preparation and equipment decontamination

3 RECORDKEEPING AND DOCUMENTATION

This part discusses the chain-of-custody procedures and recordkeeping methods

4 HEALTH AND SAFETY PLAN

This plan outlines the safety precautions necessary to protect the health and safety of the investigation team

5 QUALITY ASSURANCE AND QUALITY CONTROL PLAN

This plan documents the quality assurance and quality control provided by the analytical laboratory

PART II

LEAD REMOVAL PLAN

A GENERAL

Prior to closing the Elliott Shooting Park, signs will be posted near the parking lot, which read "Danger, enter at your own risk " Also, the shooting park manager or some other individual, who lives on-site, will provide security during lead removal and sampling operations

Prior to sampling of the soil, the lead shot will be removed This removal is referred to as mining and has been standard practice at shooting ranges, since it provides additional income The lead is removed and sold as scrap, however, this practice has declined recently with the decline in price of scrap lead

During mining the contractor's personnel will wear dust masks during excavation and rubber or plastic gloves when handling soil

1" MAY BE TOO SHALLOW

B REMOVAL METHOD

The site will be prepared by mowing the grass and clearing brush Then the site will be tilled to a depth of approximately 1 inch Following tilling a motor grader will pile the loose soil into windrows for pickup by a front-end loader Lead shot in gullies and swales will be removed by a laborer with a shovel After the soil is removed, the site will be swept with brooms to remove any lead, which falls out of the loader

The equipment needed to clear and loosen the soil is a tractor with a mower rake and tiller One operator will be needed for this equipment To excavate the soil, a grader and a front-end loader are needed This equipment can be operated concurrently by two operators or alternately by one operator Two or three laborers will be needed to sweep the site after excavation

The excavated soil will be stockpiled near the center of the trap range adjacent to the fluidization machine which will separate the lead shot from the soil, rock and other material A wet separation process was selected in order to minimize dust production The process includes pumping water through a vessel while continuously adding soil The water will have sufficient velocity to fluidize the soil and rock Since lead has a specific gravity of 11 35 and rock and soil have a specific gravity of between 2 6 and 3 0 the soil and rock will overflow and the lead will remain in the machine A bucket-type elevator will raise the lead from the bottom of the vessel and dump the lead back into the water This serves to agitate the contents of the vessel and to remove soil from the lead shot When the lead builds up to a predetermined volume in the vessel, no more soil will be added Water will continue to be pumped through the vessel until it clears Then a chute will be placed under the bucket elevator and the lead will be loaded into drums One operator and a part-time laborer will be required for this task

Adjacent to the soil stockpile, a pit will be excavated prior to initiating the fluidization process This pit will serve as a sedimentation basin so

that process water use can be minimized through recyling The exact dimensions of this pit will be determined by the volume of soil stockpiled for lead removal The soil and rock will settle in the pit and the water will be recycled to the separation system After the lead removal is completed, this water will be analyzed for lead and either sprayed over the site or hauled to a wastewater treatment plant

After removing the lead, the soil, both in place and in the pit, will be sampled according to the Part III Sampling Plan If the lead concentration in the soil is below 500 mg/kg, the site will be regraded and sold If the concentration is above 500 mg/kg, additional studies will be required to determine a course of action

C LEAD DISPOSAL

The lead will be sold to a smelter for scrap

D TRANSPORTATION

The contractor will be responsible for transportation of the lead Since the lead will be reclaimed it will not be considered a waste Therefore, the transportation will not be subject to 40 CFR 263 The lead will be transported in drums which meet DOT requirements

E REPORTING

During the initial removal, a weekly report will be sent to EPA discussing the progress of the work

F COMPLIANCE WITH EPA POLICIES AND PROCEDURES

All procedures under these plans will comply with EPA policies and procedures

G SCHEDULE

The initial removal activities are scheduled to begin December 2 1985 and require two to three weeks to complete

PART III

SAMPLING PLAN

A BACKGROUND

In trap shooting, clay targets are propelled through the air and the participants attempt to break the targets with a shotgun blast The shotguns fire either steel or lead pellets to break these targets Trap and skeet shooters generally prefer lead pellets because they are softer and are alleged to cause less damage to shotgun barrels After the pellets are spent, they fall to the ground Because of their low velocity at this point, the pellets are generally found in the top few inches of soil Therefore, this investigation will concentrate on the top few inches of soil at the site

B EXISTING DATA

On October 12 1984, Kansas City Testing Laboratory presented Boatmen's Bank with a report on their earlier sampling at the Elliott Shooting Park Analysis of these samples indicated very high concentrations of lead in the upper 3 inches of the soil These concentrations were highest in the northern portion of the site However, they dropped off significantly at the northern property line To the south, east and west, concentrations dropped off gradually However, the concentrations were higher to the west than to the south or east This is probably because the direction of shooting has changed over the years and the western part of the site may have been down range at some time Also, the western stands may be used more often

Because of the lack of quality control and quality assurance data, the Kansas City Testing Laboratory test data was not acceptable to EPA However, this data can be used to determine locations for future sampling

C PARAMETERS OF CONCERN

Lead is the only chemical parameter of concern at this site There is no indication that any other constituent which may cause contamination may be present at the site The soil will be analyzed using EPA Method 3050, 7420 or 7421 as described in "Test Methods for Evaluating Solid Waste " Also Method 200 7 published in the October 26, 1984 Federal Register, may be used with modifications approved by EPA

Five samples from the upper layer will be analyzed for lead using the EP toxicity test as described in 40CFR 261

In addition, 5 soil samples will be tested for the following physical parameters

- o Cationic Exchange Capacity
- o pH
- o Grain Size

Cation exchange capacity and pH will be performed by the University of Missouri Extension Service using "Methods of Soil Analysis," C A Black, et al, American Society of Agronomy, 1985 Grain size will be performed by a local soils laboratory

Permeability testing will be performed in the field at three locations The Percolation Test as described in 10 CSR 20-8 (See Appendix A) will be used

D SAMPLE TYPES

Soil samples will be taken at several locations around the site and at various depths Samples will be taken at elevations of 0 to 3 inches, 3 to 6 inches and 6 to 9 inches below the surface to determine the lead concentration in the various layers

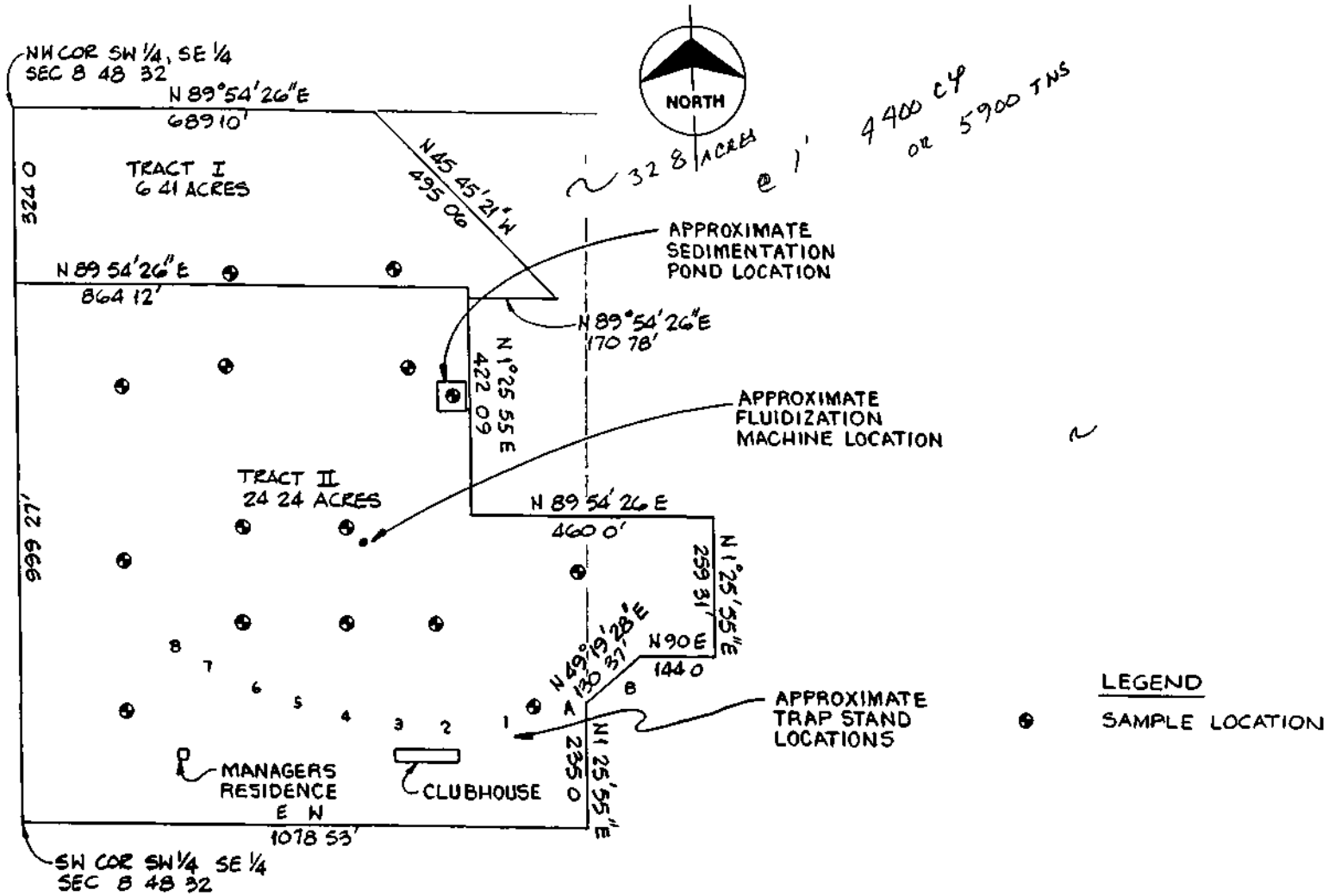
E SAMPLE LOCATION AND FREQUENCY

Soil samples will be collected at 15 locations across the site (See Figure III-1) and at three depths at each location However, only the samples from the two higher levels will be analyzed The sample collected at the lower level (6 to 9 inches below the surface) will be retained and only analyzed if the samples at 3 to 6 inches show high lead concentrations At present only one sampling episode is planned The attached drawing shows the proposed sample locations

F SAMPLE PREPARATION

1 SAMPLE CONTAINERS

Plastic sealable bags will be used to collect the soil samples These containers are more than adequate since they will not affect the sample composition and preservatives are not necessary with soil The samples will be placed in a shipping container for transport to the laboratory



SCALE 1" 200'

date 9 5 85 designed J PARKS Burns & McDonnell Engineers Architect Consultants	ELLIOTT SHOOTING PARK SAMPLE LOCATIONS	project 85 170-A contract dwg no. FIGURE III 1 rev

2 EQUIPMENT

Soil samples will be collected using a shovel and a small garden trowel The shovel will be used to dig a small pit, approximately 12 inches depth, and the trowel will be used to obtain samples from the pit walls at the appropriate elevations

3 PROTECTIVE CLOTHING AND SAFETY EQUIPMENT

The only exposure at this site is through physical contact with lead therefore, plastic or rubber gloves will be worn during sampling No other protective clothing or safety equipment will be necessary

4 SAMPLE PRESERVATION

No preservatives are necessary for soil samples

5 SAMPLING PROCEDURE

a Locate the sampling point remove rocks twigs and other nonsoil material

b Dig a small hole approximately 12 inches deep and 12 inches in diameter using a shovel

c With the trowel, cut a minimum of 100 grams of soil for the sample from the side walls at the appropriate depth Three samples will be

taken from each hole at 0 to 3, 3 to 6 and 6 to 9 inches below the surface

d Transfer the sample to the sample container

e Seal the container, attach label and record data in the field log book

f Place the sample in the shipping carton

g Brush off and wipe the samplers clean, then rinse with deionized water

h Repeat steps a through g at each sample location

i Complete the chain-of-custody record, and package the samples for shipment to the laboratory

Sampling will be under the direction of H Tom Brown, P E of Burns & McDonnell Engineering Company Sampling will be performed by Ms Mary Erio of Burns & McDonnell Mr Brown's and Ms Erio s resumes are in Appendix B

G SAMPLING HANDLING AND SHIPMENT

A label will be attached to or placed inside each sample bag This label will contain the sample number, date, time and the analysis to be performed The sample containers will be placed in a shipping carton One chain-of-custody form will be sent with each shipping carton

The shipping carton will be sent by Federal Express One Federal Express form will be completed for each carton The analytical laboratory will be contacted prior to each shipment and informed of the number of packages, the air bill number and method of shipment

H DECONTAMINATION

Before use, the sampling equipment will be thoroughly cleaned with detergent and water, rinsed with tap water, and rinsed again with deionized water Prior to use the sampling equipment will be rinsed again with deionized water After each use loose soil will be brushed from the sampling equipment more stubborn soil will be scrapped using a clean spatula or knife, then the sampler will be rinsed with tap water to remove the other soil and rinsed again with deionized water

After sampling any material generated during decontamination will be returned to the sampling hole along with the excess soil removed from the hole

I REPORT TO EPA

Following performance of the sampling and analytical activities, a report shall be submitted to EPA including

1 Summary of activities

2 Sampling and analytical results

3 Quality assurance documentation

J SCHEDULE

Sampling will be completed within three working days following the completion of the initial lead removal activities

PART IV

RECORDKEEPING AND DOCUMENTATION

A FIELD LOG BOOK

A field log book will be kept during sampling at the site The following information will be recorded in the log book on a daily basis date name of sampler, approximate temperature, weather conditions, description of the task performed, description of any unusual circumstances and visitors to the site For each individual sample, the following information will be recorded sample number, sample location, time and date of sample, the depth, appearance and any odor to the sample Also to be recorded in the field log book are the dates samples were shipped, the carrier and the air bill number

B LABELS AND SEAL

Each soil sample will be labeled with the date, time, sample number and the name of the sampler Depending on the method of shipment, either the entire carton will be sealed with the date and time and signature of the person shipping the box or each individual sample bag will be sealed with the above information A copy of the label and seal is shown in Figure IV-1

C CHAIN-OF-CUSTODY FORMS

A chain-of-custody form will be used to track the samples through analysis The chain-of-custody form is shown on Figure IV-2

Burns & McDonnell Eng Co
4800 E 63rd Street
P O Box 173
Kansas City MO 64141
Telephone (816) 333 4375

Date _____ Time _____

Sample No _____

Collector _____

Preservative _____

LABEL

Burns & McDonnel

Date _____ Time _____

Signature _____

SEAL

FIGURE IV-1

Chain Of Custody Form

Burns & McDonnell
ENGINEERS ARCHITECTS CONSULTANTS

4800 E 63rd St
Kansas City Missoun 64130

Project No _____

From Client _____
Address _____
City _____ State _____ Zip _____
Telephone No (_____) _____
Attention _____

Laboratory
Name _____
Address _____ Phone (_____) _____
City _____ State _____ Zip _____

Sample Identification

Facility _____ Sample No _____
Type of Sample _____ Start Date _____ Time _____
End Date _____ Time _____

Contents

Custody

Laboratory _____ Date _____
Contents Prepared By _____ Laboratory No _____
Signature _____ Seal No _____

Sampled By _____ Date _____ Time _____
Signature _____ Remarks _____

Name _____ Date _____ Time _____
Signature _____ Remarks _____

Name _____ Date _____ Time _____
Signed _____ Remarks _____

Sealed By _____ Date _____ Time _____
Signature _____

Laboratory _____ Date _____ Time _____
Opened By _____
Signature _____

Condition _____

FIGURE IV-2

PART V

HEALTH AND SAFETY PLAN

The health and safety of the field team is of the utmost importance during a site investigation However, at this site, the potential risks are low Lead is the only constituent of concern and is in the metallic form Therefore, protection from ingestion is the only requirement Because of the low risk during mining and sampling, no medical surveillance program or safety training will be necessary The Contractor will be responsible for safety during mining The Burns & McDonnell project manager will be responsible for safety during sampling at the site

A EQUIPMENT

During the field investigation, level D protection will be required However, gloves will be used to prevent direct contact with the soil during mining and sampling Steel toe and shank boots or shoes will be worn on site Hard hats and dust masks will be required during mining Coveralls hard hat and safety glasses or goggles will be optional during sampling

B GENERAL SAFETY

Before the field investigation team enters the site, approval from the shooting park manager will be obtained No mining or sampling will be done during normal operation hours or when shotguns are in use The investigation team will move off the range if someone approaches a stand with a shotgun or at the first sound of gun fire

No food will be consumed or brought on site Also, hands will be washed with soap and water prior to eating or drinking

C HAZARD EVALUATION

1 ROUTE OF EXPOSURE

The lead found on site is in the pure metallic form In this form, the only route of exposure is through ingestion and much of the lead passes through the body unabsorbed The greatest portion of the lead that is absorbed is caught by the liver and partially excreted in the bile Therefore, large amounts of lead are necessary to cause poisoning through ingestion However, lead is an accumulative poison Disability occurs when increasing amounts of lead build up in the body

2 SYMPTOMS OF EXPOSURE

Lead produces brittleness of the red blood cells causing them to be destroyed more rapidly Usually, anemia is a symptom of lead poisoning Also, lead has a damaging effect on other organs and tissues with which it comes into contact Lesions of the kidneys, liver, gonads, nervous system, blood vessels and other tissues are not uncommon Common symptoms of lead poisoning include abdominal pain or discomfort, colic, constipation, and/or diarrhea, loss of appetite, metallic taste, nausea and vomiting, lassitude, insomnia weakness, joint and muscle pain, irritability, headache and dizziness Pallor, pyorrhea weight loss and an increase in the blood lead content may accompany the above

symptoms Any team member exhibiting any of these symptoms, will be barred from further work and sent to a doctor immediately

3 TOXICITY

Lead is generally considered highly toxic However, this is generally based upon inhalation or absorption through the skin exposure routes At this site, there are no lead fumes, mist or vapors to be inhaled or organic forms of lead to be absorbed through the skin Therefore, the potential toxicity level of the site is low

D DECONTAMINATION

After mining, soil will be scraped from the equipment to prevent lead from leaving the site Also, a visual inspection will be conducted and any lead pellets found will be removed from the equipment After sampling, personnel will remove any loose soil particles from clothing, boots and gloves Gloves will be rinsed with water prior to removal

No shower facilities are available on site Therefore, field personnel should shower as soon as possible after returning home Clothing should be washed separately before they are worn again Also, hands should be washed with soap prior to eating No food or drink will be allowed on the site

E EMERGENCY INFORMATION

A list of emergency phone numbers are provided below and should be carried on site by the investigation team

Ambulance 911/471-1111 - MAST
Fire 911/353-2121 - Raytown, Missouri
Police 911/353-8100 - Raytown, Missouri
Hospital 361-4321 - Emergency Room, Baptist Medical Center, Kansas City, Missouri
Poison Control 234-3000 - Children's Mercy Hospital Kansas City, Missouri
Project Manager Tom Brown, 333-4375

PART VI

QUALITY ASSURANCE PLAN

The objectives of the quality assurance plan are to establish and monitor the investigation procedures so that quality, reliable results are achieved The plan should require that all activities, findings and results follow the approved procedures and are documented Wilson Laboratories of Salina, Kansas, will be responsible for all quality assurance/quality control in the laboratory The project manager will be responsible for sampling quality control and will be responsible for overall quality assurance Wilson Laboratories Quality Assurance Plan is attached in Appendix C

Sampling will be performed by Burns & McDonnell personnel, therefore, Section VII of the Quality Assurance Plan is not applicable A resume of the person who will be sampling the soil is attached in Appendix B

APPENDIX A

FIELD PERMEABILITY TEST PROCEDURE

(V) When possible the outlet structure should be located on the windward side

E General Features

(I) The lagoon area shall be enclosed with a suitable fence to preclude livestock and discourage trespassing The fence shall be so located to permit mowing of the embankment top and slopes A gate of sufficient width to accommodate mowing equipment is required

(II) Appropriate signs shall be provided to designate the nature of the facility and discourage trespassing

(III) An all weather access road should be provided to the lagoon site

(IV) Selection of the site should consider a clear sweep of the surrounding area by prevailing winds Heavy timber should be removed to a distance of at least 100 feet from the water's edge

(V) Means for measuring flows are recommended

(VI) Lagoon Shape Round square or rectangular lagoons with a length not exceeding three times the width are considered most desirable The shape of all cells should be such that there are not narrow or elongated portions No islands peninsulas or coves should be permitted Dike should be rounded at the corners to minimize accumulation of floating materials

(7) Appendix I Percolation Test Procedure—Percolation tests should be conducted by or under the supervision of an architect or engineer registered in the state of Missouri or by an employee of a local health department

(A) Dig or bore the holes with horizontal dimensions of from 4 to 12 inches and vertical sides to the depth of the bottom of the proposed absorption device Holes can be bored with a 4 inch diameter post hole type auger

(B) Roughen or scratch the bottom and sides of the holes to provide a natural surface Remove all loose materials from the hole Place about 2 inches of coarse sand or fine gravel in the hole to prevent bottom puddling

(C) Fill the hole with clear water to a minimum depth of 12 inches over the gravel By refilling if necessary or by supplying a surplus reservoir of water (automatic siphon) keep water in hole for at least four hours and preferably overnight In sandy soils i e GW GP SW or SP classified according to the Unified Soils Classification System the above saturation procedure is not necessary and the test can be made after the water from one filling has seeped away

(D) Percolation rate measurements should be made on the day following the saturation process except in sandy soils

(E) If water remains in the test hole after overnight saturation adjust the depth to 6 inches over the gravel From a fixed reference point measure the drop in water level at approximately 30 minute intervals over a 4 hour period The drop which occurs during the final 30 minute period is used to calculate the percolation rate Note The engineer should determine if the water in the test hole is due to a high ground water condition or the permeability of the soil

(F) If no water remains in the hole after overnight saturation add clear water to a depth of about six inches over the gravel From a fixed reference point measure the height of the water surface at approximately 30 minute intervals over a 4 hour period refilling the hole to a depth of 6 inches when the percolation rate indicates the hole will run dry before the next reading is made The drop which occurs during the final 30 minute period is used to calculate the percolation rate If a hole must be refilled to obtain a final 30 minute reading determine from the previous reading the water level drop during that interval Add water until the level above the bottom equals this figure plus one half inch Continue to measure drop during the final 30 minute period

(G) In sandy soils or other soils in which the first 6 inches of water seeps away in less than 30 minutes after the overnight saturation period the time interval between measurements can be taken as 10 minutes and the test run over a period of one hour The drop which occurs in the final 10 minute period is used to calculate the percolation rate

(8) Appendix II Design of soil absorption fields required absorption area per 100 gallons waste flow The following table permits direct conversion of the results of soil absorption tests to the required area of trench bottom per 100 gallons of waste flow Absorption tests must be conducted in accordance with procedures outlined in Division of Health publication A Guide for the Construction of Septic Tank and Soil Absorption System

Time for Water To Fall One Inch	Sq Ft of Trench Bottom Required For 100 Gal Waste Flow
10 seconds or less	45
15 seconds	48
30 seconds	51
45 seconds	54

APPENDIX B

RESUMES

APPENDIX C

QUALITY ASSURANCE PLAN

WILSON LABORATORIES

QUALITY ASSURANCE PLAN

WILSON LABORATORIES
P O BOX 1884
SALINA, KANSAS 67402-1884
(913) 825-7186

Approved By _____ 22 AUG 1985
Stephen E Ascher — Date
Laboratory Director

_____ 22 Aug. 1985
Lynn R Newcomer — Date
Chief Chemist

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SECTION I
PLAN DESCRIPTION

PURPOSE

The purposes of this Quality Assurance (Q A) Plan are (a) to define the nature and extent of Quality Assurance for all chemical analyses performed by the Laboratory, (b) to set forth the requirements for preparation of Quality Assurance procedures, and (c) to provide a description of the methods to be used in carrying out the Quality Assurance Program

SCOPE

This Quality Assurance Plan is intended to encompass the entire measurement system from initial sampling to final reporting of results and any other project requirements

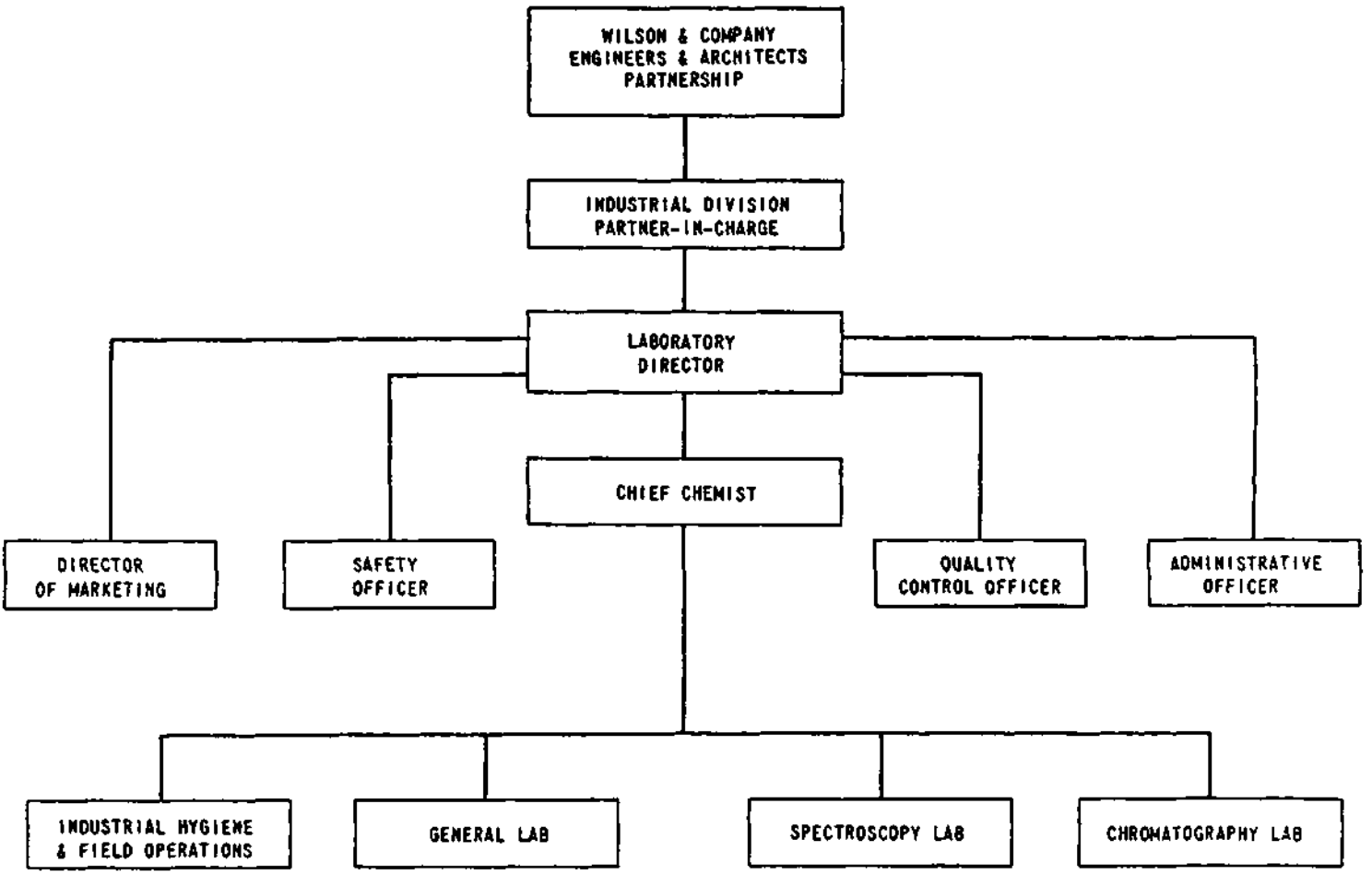
OBJECTIVES

The overall objective of this Q A Plan is to assure that Wilson Laboratories produces valid data for all analytical procedures utilized by the Laboratory This is accomplished by (a) verifying that work procedures and practices are adequate and acceptable to the client and regulatory agencies, (b) coordinating an interlaboratory Quality Control program to assess the continuing capability and relative performance of Wilson Laboratories with other laboratories, and (c) participation in an intralaboratory Quality Control program which assists Wilson Laboratories in maintaining the accuracy and precision of data produced by its personnel

SECTION II
ORGANIZATION STRUCTURE

ORGANIZATION STRUCTURE

The structure of Wilson Laboratories within the Company organization is shown below



PROJECT MANAGER

A Wilson Laboratories staff member is designated Project Manager for each client s program The Project Manager receives requirements and specifications for the program and is responsible for

a Scheduling the work in consultation with Department Heads,

b Monitoring work progress and responding to client inquiries,

c Verifying that chemical analysis activities are documented and coordinated with the client s program,

d Verifying that all chemistry procedures and practices are correct and adequate for the intended usage and required accuracy and reliability of results,

e Assuring that the procedures and practices conform to the client s specifications with respect to methods and frequency of sampling and analysis,

f Verifying that procedures and practices are appropriate for and consistent with the client s specifications and other regulatory criteria

CLIENTS

Wilson Laboratories' clients are an integral part of the Laboratory Quality Assurance Program Policies and procedures governing work performed for a client are subject to review and approval by the client and by the Laboratory Quality Assurance staff Wilson Laboratories is responsible to its clients for the implementation of policies and procedures stated or referenced in this document

LABORATORY DIRECTOR

The Laboratory Director is responsible for the overall operation of the laboratory His duties include

a Overall direction and general administration

b Overall direction of Quality Assurance Program

c Recruitment, hiring, assignment and evaluation of personnel

d Facilities planning, evaluation and purchase of analytical instruments

e Review of all work procedures and practices

f Training and professional development

g Coordination of marketing and client development

h Review of proposals bids, pricing and quotations

QUALITY CONTROL OFFICER

The Quality Control Officer reports directly to and receives Q A direction directly from the Laboratory Director The Q C Officer has sufficient authority and organizational freedom to identify quality problems, to initiate, recommend or provide solutions, and to verify implemention of solutions The Q C Officer's duties and responsibilities are as follows

a Development of Quality Assurance procedures, instructions and plans,

b Maintaining surveillance over all routine and non-routine aspects of the Quality Assurance plan,

c Evaluating Q C data reports,

d Performing inspections writing reports and providing follow-up action,

e Making recommendations for resolution of problems, further evaluation by management, or stop-work orders,

f Coordinating Q A activities (e g , propose changes of policy or procedures) among Directors, Managers and Supervisors

g Managing the interlaboratory comparison program to assure full and prompt participation, evaluation of results and derivation of all benefits relating therefrom

h Forwarding audit reports to the responsible Directors Managers and Supervisors for corrective actions,

i Maintaining records of proficiency analyses results and of the certification certificates

DEPARTMENT SUPERVISORS

The Department Supervisors assure that Q A policy and procedures are carried out in their areas of responsibility They are responsible for

a Assisting in development of Quality Assurance procedures instructions and plans for their department

b Making all individuals in their department aware of relevant Quality Assurance practices

c Maintaining surveillance over all routine and non-routine aspects of the Quality Assurance plan as it pertains to their department

d Informing the Quality Control Coordinator of any situation requiring immediate attention as it relates to Quality Assurance

e Making recommendations to the Quality Control Coordinator in any pertinent area of Quality Assurance,

f Assuring that qualified personnel are provided with continued training, as necessary, for proper performance of the analytical work,

g Verifying that records are completed and maintained for each analysis conducted in their department,

h Maintaining and calibrating equipment to the extent and at the frequency necessary for accurate results

i Assuring that all other areas of concern having a direct effect on their department contain adequate Quality Control features and that such Quality Controls are practiced as part of a normal routine

CHIEF CHEMIST

The Chief Chemist is responsible for

a Development and review of Quality Assurance procedures

b Making recommendations for technical decisions

c Evaluating and reviewing test procedures

d Ensuring that approved analytical procedures are used when possible or that state-of-the-art methods are used when approved methods are not available

e Issuing stop-work orders for work which is not in compliance with requirements

f Directing laboratory certification programs

g Reviewing and signing all laboratory reports

h Project Manager assignments

ADMINISTRATIVE OFFICER

The Administrative Officer is responsible for

a General office operations, correspondence and filing

b Computer operations

c Production scheduling and expediting

d Shipping and receiving

e Chain of custody and sample security

f Sample management

g Report and document generation

h Purchasing and inventory control

i Client billing and accounts receivable collection

TECHNICIANS

Technicians are responsible for

a Performing sample preparations and analyses

b Maintaining a clean working environment

c Performance of Q A analyses in accordance with laboratory policy and recording of all quality control data on the Shewhart charts

d Informing their immediate supervisor of any results out of specifications for a specific analysis

e Making recommendations to their immediate supervisor regarding Q A performance

SECTION III
QUALIFICATIONS OF PERSONNEL

GENERAL

All persons hired or assigned to the positions described in this document receive OJT by working with experienced personnel Their work is closely supervised and evaluated The principal criterion for employment or assignment is demonstrated professional proficiency at Wilson Laboratories or elsewhere

LABORATORY STAFF MEMBERS

Individual laboratory staff members are introduced by the appended resumes We have developed an organization of technical specialists in all major disciplines of the environmental sciences Each person is thoroughly trained and experienced in his respective field and qualified to function with other staff members to form an integrated team

Required educational and experience qualifications of Laboratory personnel are described below

Laboratory Director Minimum B S Degree in Chemistry from an ACS accredited school, with a minimum of 15 years of experience

Chief Chemist Minimum M S Degree in Chemistry from an ACS accredited school, with a minimum of 10 years of experience

Quality Assurance Officer Minimum B S Degree in Chemistry from an ACS accredited school, with a minimum of 8 years of experience

Section Chiefs Spectroscopy, Chromatography Minimum B S Degree in Chemistry from an ACS accredited school with a minimum of 5 years of experience Directs, plans and performs analytical effort within the section

Chemists Minimum B S Degree in Chemistry from an ACS accredited school with a minimum of 2 years of experience

Technicians B S or B A Degree in Scientific Discipline or equivalent laboratory experience

PROFESSIONAL AFFILIATIONS

Maintaining Quality Assurance requires that staff members be aware of the changing requirements and advancements in their fields This requirement is partially met by staff members belonging to the following organizations

American Chemical Society
American Industrial Hygiene Association
American Water Works Association
Water Pollution Control Federation
American Academy of Environmental Engineers
National Society for Professional Engineers
American Institute of Chemical Engineers
American Society of Civil Engineers
American Society for Testing Materials
National Association of Corrosion Engineers
Air Pollution Control Association
American Public Works Association
Association of Official Analytical Chemists

SECTION IV
RECORDS

GENERAL

Records of all steps in the processing of a client's order, from the specifications of the order to the delivery of the results are maintained These records detail the sample identification, the date of performance, the analytical procedures followed, the results obtained, the measure of precision and accuracy achieved and the identities of those who performed the analyses, and reviewed and approved the results

SPECIFIC RECORDS MAINTAINED

Records providing information in the following areas are maintained either in laboratory notebooks, files or computer storage

- a Statements of Laboratory Policy
- b Analytical Procedures
- c Client's orders, proposals and contracts
- d Sample collection
- e Sample receipts
- f Sample description and laboratory identification number
- g Sample preparation
- h Analytical results
- i Reviews and approvals
- j Reports submitted to clients
- k Precision checks of instruments
- l Results of analyses of quality control samples
- m Results of interlaboratory analyses
- n Verifications of computer and personnel computations
- o Quality assurance reports
- p Preparation of standards and carrier solutions

PERIOD OF RECORD RETENTION

Statements of policies and procedures are signed and dated by the Laboratory Director Superseded procedures are retained permanently on file Records of all chemical analyses and reports are retained permanently on microfilm and on tape

SECTION V
CHAIN-OF-CUSTODY PROCEDURES

Sample chain-of-custody is maintained when required by the client or the Regulatory agency All samples that are collected by Wilson Laboratories personnel are maintained under chain-of-custody control This procedure insures that the samples are collected, transferred, stored, analyzed and disposed of only by authorized personnel

Immediately upon receipt, samples are logged into the computer which tabulates test assignments and analytical data This program assures that all tests are performed in a timely manner, while assuring quality and completeness After being logged in, the samples are placed in a designated, clean, dry room with refrigeration Once the sample analyses are completed, the unused portion of the sample, together with identifying labels and other documentation are returned to storage

SECTION VI
COMPUTERIZED INFORMATION MANAGEMENT SYSTEM

The Laboratory utilizes computerized sample tracking and scheduling procedures, beginning with the log-in procedure upon receipt of sample and ending with a computer generated final report

All client and sample information are entered into the computer at log-in Included are date received, date and time sampled, sample collector and any field data, such as pH and temperature Note is made of physical condition and appearance of each sample Daily schedules are issued for control of the work load and for adherence to required holding and turn-around times for the various analyses Sample storage locations are also tracked by the computer All new data are kept in bound notebooks and hard copies of all completed reports are retained All data are permanently retained on tape also

Wilson Laboratories utilizes a Perkin-Elmer LIMS system for computerized information management All program development and software development have been developed by in-house personnel and the computerized system has been operational since September 1983 Copies of typical computer information detail are appended in this document

SECTION VII
QUALITY CONTROL IN SAMPLING

GENERAL

Sample collection is an assigned laboratory function The Quality Control Officer interfaces with sample collectors to assure understanding of selection, collection and storage and transportation practices For data to be meaningful, a sample must be representative of existing conditions and properly handled to avoid contamination or deterioration before it reaches the laboratory

For routine activities, the location of each sampling site is selected and the number, type and size of containers is specified before a sample collector goes to the field The sample source, amount to be collected, analyses and instructions are indicated on the sample container Other pertinent information is written in waterproof, ballpoint ink on a sample tag sample number, date and time taken, source of sample, preservative, analyses to be performed and name of sample collector

Environmental Samples

Composite or grab sampling requirements are predetermined Composite samples are preferred when "average concentrations" are the objective (e g , wastewater treatment plant efficiency determinations), grab samples are preferred when the objective is documenting the extent, frequency and duration of variations in the sample In some cases, both composite and grab sampling data are required

Industrial Hygiene Samples

NIOSH or other recognized procedures are used for sample collection, preservation and storage

Sampling equipment and sampling media utilized are approved for industrial hygiene samples

Sampling times and rates are as required by the methodology protocol Pumps are calibrated in the laboratory immediately prior to use

When sampling is performed by others, using Wilson equipment, specific instructions are supplied for the use of the equipment The pumps are precalibrated before use If long-term use is contemplated, equipment is either returned to the laboratory for recalibration or calibration equipment is supplied to the client for field use

All sample containers are sealed and tagged before they are shipped to the laboratory Shipping procedures vary with the analyses to be performed Refrigeration, as with ice or freeze packs, is used for samples for biochemical oxygen demand (BOD), phenol, nitrogen, cyanide, oil or chlorinated hydrocarbon analyses Appropriate labels as Do Not Freeze " or "Fragile are used when applicable

A field notebook (logbook) is completed at the site by the sample collector Infomation equivalant to that on the tag is included, together with results of measurements taken in the field (e g , temperature, dissolved oxygen [DO], pH, conductivity, flow) and pertinent observations at the time of sampling Chain-of-custody forms are completed in the field at time of sample collection and accompany the samples to the Laboratory

CONTINUOUS SAMPLING

a The accuracy of devices used for continuous sampling of liquids and gases involving the measurement of sample flow rates and/or sample volumes is determined on regularly scheduled basis

b Adjustment of these devices is made as needed to bring the performance of the devices within specified limits

c The frequency of sampling device calibrations is specified and is based on the required accuracy, purpose, degree of usage, stability characteristics and other conditions affecting the measurement

d Tests are conducted to verify that continuous sampling is representative of the material volumes sampled

GRAB SAMPLES

a Tests are conducted to verify that grab samples are representative of the material sampled

b Replicate samples are taken periodically to demonstrate the reproducibility of sampling

MAINTENANCE OF SAMPLE INTEGRITY

Procedures for sampling, packaging, shipping and storage of samples provide for the maintenance of the integrity of the samples

A summary of sampling and handling requirements for chemical and physical analyses followed by Wilson Laboratories, taken from Standard Methods for the Examination of Water and Wastewater follows Time-sensitive samples are analyzed within the period specified for holding

SUMMARY OF SPECIAL SAMPLING OR SAMPLE HANDLING REQUIREMENTS[1]

Determination	Container[2]	Minimum Sample Size ml	Storage and/or Preservation
Acidity	P G(B)	100	24 hr refrigerate
Alkalinity	P G(B)	200	24 hr refrigerate
BOD	P G	1 000	6 hr refrigerate
Boron	P	100	--
Carbon organic total	G(brown)	100	Analyze as soon as possible refrigerate or add HCl to pH ≤2
Carbon dioxide	P G	100	Analyze immediately
COD	P G	100	Analyze as soon as possible add H_2SO_4 to pH ≤2
Chlorine dioxide	P G	500	Analyze immediately
Chlorine residual	P G	500	Analyze immediately
Chlorophyl	P G	500	30 days in dark freeze
Color	G	500	--
Cyanide	P G	500	24 hr add NaOH to pH 12 refrigerate
Fluoride	P	300	--
Grease and Oil	G wide-mouth calibrated	1 000	Add HCl to pH ≤2
Iodine	P G	500	Analyze immediately
Metals	P G		For dissolved metals separate by filtration immediately add 5 ml conc HNO_3/l
Nitrogen			
Ammonia	P G	500	Analyze as soon as possible add 0 8 ml conc H_2SO_4/l refrigerate
Nitrate	P G	100	Analyze as soon as possible add 0 8 ml conc H_2SO_4/l refrigerate
Nitrite	P G	100	Analyze as soon as possible add 40 mg $HgCl_2$/l and refrigerate or freeze at 20° C
Organic	P G	500	Analyze as soon as possible refrigerate or add 0 8 ml conc H_2SO_4/l
Odor	G	500	Analyze as soon as possible refrigerate
Oxygen dissolved[3]	G BOD bottle	300	Analyze immediately
Ozone	G	1 000	Analyze immediately
Pesticides (organic)	G (S)		--
pH	P G (B)		--
Phenol	G	500	24 hr add H_3PO_4 to pH ≤4 0 and 1 g $CuSO_4 \cdot 5H_2O$/l refrigerate
Phosphate	G (A)	100	For dissolved phosphates separate by filtration immediately freeze at ≤-10° C and/or add 40 mg HgCl/l
Residue	P G (B)		-
Salinity	G wax seal	240	Analyze immediately or use wax seal
Silica	P		-
Sludge digester gas	G gas bottle		-
Sulfate	P G		Refrigerate

Determination	Container[2]	Minimum Sample Size, ml	Storage and/or Preservation
Sulfide	P G	100	Add 4 drops 2N zinc acetate/100 ml
Sulfite	P G		Analyze immediately
Taste	G	500	Analyze as soon as possible refrigerate
Temperature	-	-	Analyze immediately
Turbidity	P G		Analyze same day store in dark for up to 24 hrs

Source Standard Methods[4]

[1]For determinations not listed no special requirements have been set use glass or plastic containers preferably refrigerate during storage and analyze as soon as possible

[2]P = plastic (polyethylene or equivalent) G = glass G(A) or P(A) = rinsed with 1+1 HNO_3 G(B) = glass borosilicate G(S) = glass rinsed with organic solvents

[3]If Winkler procedure is followed mix in the field by adding flocculating reagents ($MnSO_4$ and alkaline KI) and dissolving precipitate with H_2SO_4 Keep bottles protected from light Fixed samples should be refrigerated for transport and analyzed as soon as possible Refer to Standard Methods[4] for preserving and handling special samples

[4]Standard Methods for the Examination of Water and Wastewater 14th Edition APHA-AWWA-WPCF 1975

SECTION VIII
FACILITIES

GENERAL

Facilities are maintained to provide optimum conditions for laboratory analysis Support facilities include

DESIGNATED USAGE AREAS

a Water Chemistry Laboratory
b Spectroscopy Laboratory
c Chromatography Laboratory
d Gas Chromatograph/Mass Spectrometer Laboratory
e Research Laboratory
f Biological Laboratory
g Soils Laboratory
h Shipping and Receiving
i Technical Library
j Offices
k Utility and Gas Storage Areas
l Refrigerators
m Sample Preparation Laboratory

WORKING SPACE

a 16,000 square feet of floor space
b 20 linear feet of bench space per analyst
c Bench space designed appropriate for tests performed
d Optimized lighting
e Heated, air conditioned and humidity controlled

WATER SUPPLIES AND UTILITIES

a Hot and cold running water
b High-capacity sinks and drains, capable of accepting acid waste
c Distilled/deionized water
d Ultrahigh-purity water for trace-level analyses
e 110/220-volt circuits for instrumentation
f Centralized vacuum source (pump)
g Oil-free centralized air compressor

EXHAUST HOODS

a High-capacity withdrawal to vent organic solvents and acid fumes
b Laminar flow hood for carcinogens and biologicals
c Total of eleven (11) strategically located hoods

AUXILIARY SPACE

a Closets/cabinets to keep working areas free of accumulated sample containers, reagents, etc
b Desks for analysts to calculate results, write reports, etc

CLEANLINESS

a. Frequent cleaning of surfaces to reduce dust contamination
b. High-capacity washing machine, no phosphate detergents
c. Restricted area for acid washing of glassware
d. Filtered circulating air to reduce contamination
e. Restricted-traffic clean areas for trace analyses

SAFETY FEATURES

a. Compliance with state and Federal Occupational Safety and Health Administration regulations
b. Fire extinguishers, safety showers, eyewash stations
c. Mandatory eye protection requirements
d. First aid equipment
e. Protective garments
f. Chemical dispensing devices, restrictions on mouth pipetting

TECHNICAL REFERENCE LIBRARY

a. Major journals and reference texts
b. Interlibrary loan agreements
c. Special topic computer search service, as needed
d. Appropriate AIHA, AOAC, EPA, ASTM, FDA and other manuals as required

COMPUTERIZED DATA MANAGEMENT SYSTEM

Principal functions

a. Sample log-in and computer labeling
b. Sample storage location
c. Work Schedules
d. Computerized Reports

SECTION IX
GENERAL WORK INSTRUCTIONS AND PROCEDURES

General work instructions and procedures used in all chemical analyses are written or referenced in an on-site reference and made available to all analysts The department supervisor is responsible for assuring that each analyst and technician is familiar with all pertinent operating procedures Applicable instructions and procedures include

- a General rules
- b Records
- c Cleaning
  - (1) Glass and plastics laboratory ware
  - (2) Absorption cells
  - (3) Stopcock grease removal
- d Weighing and balance care
- e Standard samples
- f Reagents storage and handling
- g Operations
  - (1) General
  - (2) Gravimetric
  - (3) Volumetric
- h Calibration
  - (1) Electrodes
  - (2) pH meter
  - (3) Other
- i Quality control
- j Laboratory safety

SECTION X
LABORATORY EQUIPMENT

GENERAL

All equipment is maintained in proper working order with a written log for maintenance, repair and calibration of each appropriate piece of equipment All major instrumentation is under service contract with the manufacturer and provided with required maintenance at regular intervals Where applicable, reference materials certified by the National Bureau of Standards including thermometers, are used for calibration purposes Wilson Laboratories maintains the operating, service and calibration manuals provided by the manufacturer for all laboratory equipment Maintenance files and service records are maintained for all instruments Wilson Laboratories meets or exceeds certification requirements regarding mandatory calibration and/or maintenance of equipment

MAJOR INSTRUMENTATION

A list of Wilson Laboratories major instrumentation follows

Gas Chromatography/Mass Spectrometry

Finnigan OWA-30 Automated GC/MS System equipped with Tekmar LSC-2 Automated Liquid Sample Concentrator System also equipped with syringe autosampler for liquid samples Nine track magnetic tape drive interfaced to system for archival storage Capability for packed column and capillary chromatography

Gas Chromatography

1 Tracor, Model 560 - Split/splitless capillary injection system
Model 700A Hall Detector for halogens, nitrogen and sulfur
Tracor, Model 702 Alkali Flame Ionization Detector for nitrogen and phosphorous
Flame Ionization Detector for general organics analysis
Autosampler

2 Perkin-Elmer Model 900
HNU Photoionization Detector for volatile hydrocarbons
Flame Ionization Detector
Flame Photometric Detector for phosphorus and sulfur
Thermal Conductivity Detector

3 Hewlett-Packard Model 5710A - Split/splitless capillary injection system
Electron Capture (N_i 63) Detector
Western Scientific Modified Coulson Detector for halides and nitrogen
Autosampler

4 Data Processors for Gas Chromatographs
Perkin-Elmer Sigma 10 with Basic
Hewlett-Packard Model 3380A
Spectro Physics 4100 with Basic

5 Tekmar, Model LSC-1
Purge and Trap Apparatus for analysis of volatile organics

6 Varian, Model 3700
Flame Ionization Detector (FID)
Alkali FID
Electron Capture Detector

Liquid Chromatography

Perkin-Elmer Series 3B liquid chromatograph with variable wave length UV detector, with auto control, auto sampler and Sigma 10 Data Processor This versatile instrument allows Wilson Laboratories to perform a multiplicity of analyses Gel permeation chromatography and molecular weight distributions are two special analyses this system performs Additional detectors Weskan ED-110 Electrochemical Detector Refractive Index detector and Weskan 2130 Conductivity Detector

Infrared Spectrophotometry

Perkin-Elmer Model 283 research grade unit coupled with the ASTM Sirch computer program to aid in identification of unknown compounds This program contains spectra of over 200,000 compounds and is run on the IBM-360

Atomic Absorption for Metals Analysis

1 Perkin-Elmer Model 5000 with Model HGA-500 furnace with temperature programming and an AS-50 autosampler

2 Perkin-Elmer Model 503 with HGA-2100 furnace temperature programmer and autosampler Arsenic and selenium are run by hydride generation

3 Mercury is analyzed using a Coleman MAS-50 flameless AA analyzer

UV Visible Spectrophotometry

Varian Model 635 double beam recording spectrophotometer with cells from 1 cm to 10 cm Spectra are recorded on a Hewlett-Packard Model 235 X-Y recorder

Technicon Autoanalyzer II

The system has both colormetric and ISE (ion specific electrode) detection systems Modules are available for all analyses which are EPA approved for automated procedures

Sulfate	pH
Nitrate/Nitrite	Conductivity
Phosphate ortho	Fluoride
Chloride	Alkalinity
Phenol	

Thin-Layer Chromatography

Samples to be analyzed by thin-layer chromatography are prepared by the same procedures used for pesticide analysis After K-D concentration the thin-layer chromatograms are developed The following equipment is utilized

1 Thin-layer plates - Glass plates (200 x 200 mm) coated with 0 25 mm layer of Silica Gel G (gypsum binder)
2 Spotting Template
3 Developing Chamber
4 Sprayer - 20 ml capacity

The methods used are published in NPDES, Appendix A Federal Register 38 No 75, Part II

Total Organic Carbon Analysis

Beckman 915 unit with Beckman Model 865 Infrared Analyzer

Total Organic Halogen Analysis

Dohrmann DX-20 Analyzer with an AD-2 adsorption module

Inductively Coupled Argon Plasma

Perkin-Elmer 6000 with a 7500 Data Station

SECTION XI
CHEMICALS/REAGENTS

Chemicals no less pure than "analytical reagent grade" are used in the Laboratory A higher quality grade chemical or reagent is used when required by a particular procedure "Pesticide grade" organic solvents are used for the organic extractions, and acids suitable for mercury determinations are used for metal analyses Reagent blanks, methods blanks and working reagents are made with distilled/deionized water having a specific conductance of less than 2 0 micromhos/cm at 25° C

Wilson Laboratories has a centralized distilled/deionized water system which is protected from the atmosphere and its quality is checked daily and documented Activated carbon cartridges are located in the chromatography laboratories, atomic absorption laboratory and the preparation laboratory and provides polishing treatment, resulting in distilled/deionized water having less conductivity than 1 0 micromhos/cm at 25° C Compressed gases used are of a grade equal to or higher than that specified by the procedure

Chemical standards are traceable to NBS Standards where traceability is possible All standards used are certified standards or are ACS reagents quality materials

SECTION XII
METHODOLOGY

Analytical methods used by Wilson Laboratories are published in Standard Methods for the Examination of Water and Wastewater, EPA Methods of Chemical Analysis of Water and Wastes (600/4-79-020, March 1983), USEPA document Test Methods for Evaluating Solid Waste" SW-846, NIOSH Manual of Analytical Methods, Methods of Analysis of AOAC, and Annual Book of ASTM Standards, Water of the American Society for Testing and Materials

All analyses are performed by use of standard procedures As a general methodology guide, Standard Methods published jointly by the American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WPCF), is used for environmental samples The review requirement associated with this text (i e , at intervals no greater than five years) assures current, on-going evaluation of adequacy and appropriateness of the methods By definition a 'standard method in this text is one that has undergone a structural program of collaborative testing, a 'tentative method is one that has been used with a high level of confidence, but has not been collaboratively tested

EPA published the Manual of Chemical Methods which contains valid, rapid test methods having sufficient precision, accuracy and specificity to measure specific parameters in the presence of common interferences using the skills and equipment that are usually available in water and wastewater laboratories Additional EPA methods are published periodically in the Federal Register and are reviewed and adopted by Wilson Laboratories

Industrial hygiene procedures utilized are as published by the U S Department of Health, Education and Welfare, NIOSH Manual of Analytical Methods 2nd Ed , Volumes 1 through 7 or other recognized analytical procedure

ASTM methods are used when applicable All reported analyses reference the specific procedure that was followed If data are to be used to support National Pollutant Discharge Elimination System permit requirements, compliance with stream or effluent quality standards or enforcement actions EPA-approved methods are used These methods are published from time to time in the Federal Register A list of the methods routinely used by Wilson Laboratories follows

TABLE I LIST OF APPROVED TEST PROCEDURES
UTILIZED BY WILSON LABORATORIES

Parameter and Units	Method
Acidity, as $CaCO^3$, milligrams per liter	Electrometric end point (pH of 8 3) or phenolphthalein end point
Alkalinity, as $CaCO^3$, milligrams per liter	Electrometric titration (only to pH 4 5) manual or automated, or equivalent automated methods
Ammonia (as N) milligrams per liter	Electrode
BACTERIA	
Coliform (fecal), number per 100 ml	MPN membrane filter
Coliform (fecal) in presence of chlorine, number per 100 ml	MPN, membrane filter
Coliform (total) number per 100 ml	MPN, membrane filter
Coliform (total) in presence of chlorine, number per 100 ml	MPN, membrane filter with enrichment
Fecal streptococci, number per 100 ml	MPN membrane filter, plate count
Biochemical oxygen demand, 5-d (BOD_5), milligrams per liter	Winkler (Azide modification) or electrode method
Bromide, milligrams per liter	Titrimetric, iodine-iodate
Chemical oxygen demand (COD), milligrams per liter	Dichromate reflux
Chloride, milligrams per liter	Mercuric nitrate or automated colorimetric-ferricyanide
Chlorinated organic compounds (except pesticides) milligrams per liter	Gas chromatography
Chlorine--total residual milligrams per liter	Iodometric titration amperometric or starch-iodine endpoint

Parameter and Units	Method
Color, platinum cobalt units or dominant wave length, hue, luminance, purity	Colorimetric
Cyanide, total, milligrams per liter	Distillation followed by automated colorimetric - Chloramine T titration or ion-specific electrode
Cyanide amenable to chlorination, milligrams per liter	Distillation followed by silver nitrate titration or ion-specific electrode
Dissolved oxygen, milligrams per liter	Winkler (Azide modification) or electrode method
Fluoride, milligrams per liter	Ion electrode
Hardness--Total, as $CaCO_3$, milligrams per liter	EDTA titration
Hydrogen ion (pH), pH units	Electrometric measurement
Kjeldahl nitrogen (as N), milligrams per liter	Digestion and distillation followed by titration
METALS	
Aluminum--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Eriochrome Cyanine R)
Aluminum--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced methods for total aluminum
Antimony--Total milligrams per liter	Digestion followed by atomic absorption
Antimony--Dissolved, milligrams per liter	0 45 micron filtration followed bv referenced method for total antimony
Arsenic--Total, milligrams per liter	Digestion followed by silver diethyldithiocarbamate, or atomic absorption
Arsenic--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total arsenic
Barium--Total milligrams per liter	Digestion followed by atomic absorption
Barium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total barium

Parameter and Units	Method
Beryllium--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Aluminon)
Beryllium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total beryllium
Boron--Total, milligrams per liter	Colorimetric (Curcumin)
Boron--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total boron
Cadmium--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Dithizone)
Cadmium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total cadmium
Calcium--Total, milligrams per liter	Digestion followed by atomic absorption or EDTA titration
Calcium-Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total calcium
Chromium VI, milligrams per liter	Colorimetric (Diphenylcarbazide)
Chromium VI--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for chromium VI
Chromium--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Diphenylcarbazide)
Chromium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total chromium
Cobalt--Total, milligrams per liter	Digestion followed by atomic absorption
Cobalt--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total cobalt
Copper--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Neocuproine)
Copper--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total copper
Gold--Total, milligrams per liter	Digestion followed by atomic absorption

Parameter and Units	Method
Iridium--Total, milligrams per liter	Digestion followed by atomic absorption
Iron--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Phenanthroline)
Iron--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total iron
Lead--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Dithizone)
Lead--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total lead
Magnesium--Total, milligrams per liter	Digestion followed by atomic absorption or gravimetric
Magnesium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total magnesium
Manganese--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Persulfate or periodate)
Manganese--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total manganese
Mercury--Total milligrams per liter	Flameless atomic absorption
Mercury--Dissolved milligrams per liter	0 45 micron filtration followed by referenced method for total mercury
Molybdenum--Total, milligrams per liter	Digestion followed by atomic absorption
Molybdenum--Dissolved milligrams per liter	0 45 micron filtration followed by referenced method for total molybdenum
Nickel--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Heptoxime)
Nickel--Dissolved milligrams per liter	0 45 micron filtration followed by referenced method for total nickel
Osmium--Total, milligrams per liter	Digestion followed by atomic absorption

Parameter and Units	Method
Palladium--Total, milligrams per liter	Digestion followed by atomic absorption
Platinum--Total milligams per liter	Digestion followed by atomic absorption
Potassium--Total, milligrams per liter	Digestion followed by atomic absorption, colorimetric (Cobaltinitrite) or by flame photometric
Potassium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total potassium
Rhodium--Total, milligrams per liter	Digestion followed by atomic absorption
Ruthenium--Total, milligrams per liter	Digestion followed by atomic absorption
Selenium--Total, milligrams per liter	Digestion followed by atomic absorption
Selenium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total selenium
Silica--Dissolved, milligrams per liter	0 45 micron filtration followed by colorimetric (Molybdosilicate)
Silver--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Dithizone)
Silver--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total silver
Sodium--Total, milligrams per liter	Digestion followed by atomic absorption or by flame photometric
Sodium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total sodium
Thallium--Total, milligrams per liter	Digestion followed by atomic absorption
Thallium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total thallium
Tin--Total, milligrams per liter	Digestion followed by atomic absorption

Tin--Dissolved milligrams per liter	0 45 micron filtration followed by referenced method for total tin
Titanium--Total, milligrams per liter	Digestion followed by atomic absorption
Titanium--Dissolved milligrams per liter	0 45 micron filtration followed by referenced method for total titanium
Vanadium--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Gallic acid)
Vanadium--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total vanadium
Zinc--Total, milligrams per liter	Digestion followed by atomic absorption or by colorimetric (Dithizone)
Zinc--Dissolved, milligrams per liter	0 45 micron filtration followed by referenced method for total zinc
Nitrate (as N), milligrams per liter	Automated cadmium reduction
Nitrite as N, milligrams per liter	Automated colorimetric
Oil & grease, milligrams per liter	Liquid-liquid extraction with trichlorotrifluoroethane-gravimetric or infrared spectroscopy
Organic carbon, total (TOC), milligrams per liter	Combustion--infrared method
Organic nitrogen (as N) milligrams per liter	Kjeldahl nitrogen minus ammonia nitrogen
Orthophosphate (as P), milligrams per liter	Automated ascorbic acid reduction
Phenols, milligrams per liter	Colorimetric, (4AAP)
Phosphorus total (as P), milligrams per liter	Persulfate digestion followed by automated ascorbic acid reduction

RESIDUE

Total milligrams per liter	Gravimetric 103 to 105° C
Total dissolved (filterable) milligrams per liter	Glass fiber filtration 180° C

Parameter and Units	Method
Total suspended (nonfilterable), milligrams per liter	Glass fiber filtration 103 to 105° C
Settleable, milliliters per liter or milligrams per liter	Volumetric
Total volatile milligrams per liter	Gravimetric, 550° C
Specific conductance, micromhos per centimeter at 25° C	Wheatstone bridge conductimetry
Sulfate (as SO_4), milligrams per liter	Automated colorimetric (barium chloride)
Sulfide (as S), milligrams per liter	Titrimetric--Iodine
Sulfite (as SO_3), milligrams per liter	Titrimetric iodine-iodate
Surfactants, milligrams per liter	Colorimetric (Methylene blue)
Temperature, degrees C	Calibrated glass or electrometric thermometer
Turbidity, NTU	Nephelometric
Ignitability, degrees C	Closed cup flash tester

ORGANICS

Endrin, mg/l	GC-ECD
Lindane, mg/l	GC-ECD
Methoxychlor, mg/l	GC-ECD
Toxaphene, mg/l	GC-ECD
2,4-D, mg/l	GC-ECD
2,4,5-TP Silvex, mg/l	GC-ECD
Acid Extractable Organics	GC/MS
Base/Neutral Extractable Organics	GC/MS
Volatile Organics	GC/MS
Acrolein & Acrylonitrile	GC-FID
Chlorinated Hydrocarbons	GC-ECD
Haloethers	GC-HECD
Nitroaromatics & Isopherone	GC-FID
Nitrosamines	GC-NPD
Organochlorine Pesticides & PCB	GC-ECD
Phenols	GC-FID/ECD

Parameter and Units	Method
Phthalate Esters	GC-ECD
Polynuclear Aromatic Hydrocarbons	LC-UV/Fluor
Purgeable Aromatic Hydrocarbons	GC-FID
Purgeable Halocarbons	GC-HECD
Triazine Pesticides	GC-NPD
Trihalomethanes	GC-Conlson

SECTION XIII
QUALITY CONTROL

GENERAL

All analysts practice quality control routinely Routine quality control practices are established as part of every analytical measurement to assure reliability of final results Every variable that can affect results is considered, evaluated and controlled, i e , quality of reagent water, precision and accuracy of the analysis, daily performance of equipment and the analyst, and ongoing laboratory review

Quality control requirements are met or exceeded for analyzing water as specified by pertinent certification requirements All quality control data and performance records are maintained and available for inspection by the Client

INTERLABORATORY QUALITY CONTROL

Interlaboratory quality control is maintained through certification by the Kansas Department of Health and Environment, the Oklahoma Water Resources Board, and the American Industrial Hygiene Association Wilson Laboratories participates in all analysis and quality assurance programs which are a part of these certification requirements Copies of certificates are appended

The American Industrial Hygiene Association certification program requires the analyses of performance samples four times each year In addition, an on-site certification is performed by an industrial hygienist site visitor prior to initial certification and recertification

The Kansas certification encompasses water, wastewater and hazardous wastes analyses by standard wet and instrumental procedures including GC/MS analysis of priority pollutants The certification requirements include on-site visits by certification officers, review of Quality Assurance practices and analysis of performance evaluation samples

Performance evaluation samples are provided each six months by the Oklahoma Water Resources Board as a requirement for the Oklahoma certification

A list of all parameters tested along with the results of the most current test rounds is appended

Results of the intralaboratory control results are evaluated by the Laboratory Director and Quality Control Coordinator with appropriate action taken if necessary This action generally constitutes a stop-work order on the method of concern until Quality Assurance is assured

Wilson Laboratories has consistently proven proficiency in all areas tested

INTRALABORATORY QUALITY CONTROL

Intralaboratory quality assurance is performed as described in the Handbook for Analytical Quality Control in Water and Wastewater Laboratories (EPA-600/4-79-019), Manual of Analytical Quality Control for Pesticides in Human and Environmental Media (EPA-600/1-76-017) and the American Industrial Hygiene Association (AIHA) Quality Control Manual Shewhart quality control charts for precision and accuracy have been developed and are used to ensure data reliability in accordance with the AIHA and the EPA manuals Tabulated quality control data are reviewed by the Quality Control Officer and the analyst Each analyst is provided with a quality control number which identifies him with each analysis he performs

Duplicate samples are run for every tenth analysis of any given constituent If any difference between duplicate analyses exceeds the critical range value, then analyses are stopped until the problem is identified and resolved After resolution, the problem and its solution are documented and all analyses since the last in-control check are repeated or discarded A known amount of standard sample of the constituent of interest is added on a 1 1 concentration basis to every tenth analysis of any given parameter In applying the accuracy control chart, either of the following two conditions would indicate an out-of-control situation

a Any point beyond the control limits

b Seven successive points on the same side of the average percent recovery line

When an out-of-control situation occurs analyses are stopped until the problem has been identified and resolved The problem and its solution are documented, and all analyses since the last in-control point are repeated or discarded

GC/MS QUALITY CONTROL

Gas Chromatograph/Mass Spectrometer analyses for priority pollutants are performed in accordance with EPA Methods 624, Volatile Organics and 625, Base/Neutrals, Acids and Pesticides published in the Federal Register Vol 44, No 233, Monday, December 3, 1979 Details of the quality control procedures are discussed below

a Sample Preparation The extraction procedure is critical to the quality of the work produced by Wilson Laboratories Technicians are thoroughly trained in the specific extraction and cleanup procedures to be used, as well as proper utilization and maintenance of the Kuderna-Danish glassware

b Mass Calibration At the beginning of each eight hour shift the mass calibration of the system is checked by injecting a solution of BFB if volatiles are being analyzed, or DFTPP if extractable analyses are to be performed Key ions and ion abundance criteria are listed in table 1 A listing of the calibration ions is retained as documentation that the calibration was performed and was within specifications

c Analyte Calibration The GC/MS system is initially calibrated at a minimum of three concentrations of all of the priority pollutants to determine response factors as described in Section 6 of Method 624 or 625 Once the initial calibration has been performed, the calibration is verified at least once per eight hour shift by analyses of representative compounds from each fraction If the mean percent change for these calibration check compounds is greater than twenty percent, the system is recalibrated using a minimum of three concentrations for each compound Response factors for the calibration check compounds are recorded daily and monitored for signs of change in the performance of the system

$$\text{Percent Change} = \frac{\text{RF Check} - \text{RF initial}}{\text{RF initial}} \times 100\%$$

d Surrogate Standards Before each sample is extracted a minimum of two surrogate standards are added to produce a final concentration of 50 µg/l The sample is then processed through the entire procedure including GC/MS analyses The percent recovery of the surrogate standards serves as a check on the analytical procedure including sample preparation and quantitative GC/MS analyses If the recovery of the surrogate standard shows a deviation greater than two standard deviations, the data are suspect and supervisory personnel must investigate the cause of the error

e Blank Analyses A reagent blank analysis is performed either once per sample set or once per 20 samples and whenever a new lot of reagents is utilized in the analyses If priority pollutants are detected in the blank, no analyses are performed until the source of the contamination can be determined

f Replicate Analyses A minimum of one in twenty samples is a duplicate analyses The results of this analysis give a value for the precision of the method under normal operating conditions

g Spike Samples A minimum of one in twenty samples is spiked with a mixture of priority pollutants and analyzed in the same manner as other samples The percent recovery for each compound is calculated to provide an indication of the accuracy of the method for priority pollutant analyses under typical operating conditions

h Outliers Outliers are defined as any result greater than three standard deviations from the mean (R±3S) for both duplicate and spiked results Corrective action for outliers involves one or more of the following repreparation and reanalysis, recalculation of the sample based on alternate ions preparation of new standards, and recalibration of the instrument Documentation of the corrective action is included in the laboratory notebook

Table 1 DFTPP/BFB Key Dons and Abundance Criteria

Mass	Specifications - DFTPP
51	30 to 60 percent of mass 198
68	Less than 2 percent of mass 69
70	Less than 2 percent of mass 69
127	40 to 60 percent of mass 198
197	Less than 1 percent of mass 198
198	Base peak, 100 percent relative abundance
199	5 to 9 percent of mass 198
275	10 to 30 percent of mass 198
365	Greater than 1 percent of mass 198
441	Present but less than mass 443
442	Greater than 40 percent of mass 198
443	17 to 23 percent of mass 442

Mass	Specifications - BFB
50	50 to 40 percent of mass 95
75	30 to 60 percent of mass 95
95	Base peak, 100 percent relative abundance
96	5 to 9 percent of mass 95
173	Less than 2 percent of mass 174
174	Greater than 50 percent of mass 95
175	5 to 9 percent of mass 174
176	Greater than 95 and less than 101 percent of mass 174
177	5 to 9 percent of mass 176

1 Archival Storage All GC/MS sample data are stored on 9 track magnetic tape in EPA readable format The archival storage of data allows samples to be re-analyzed at any time, providing proof of previous identifications, and the ability to search for other non-priority pollutant compounds

SECTION XIV
SUMMARY

Quality Assurance procedures for water and wastewater chemical and physical analyses at Wilson Laboratories are summarized below

a Verify calibration curves

b Confirm instrumental calibrations (wavelength, temperatures, etc)

c Monitor precision by performing replicate analyses on 10 percent of the samples processed

d Document accuracy by adding known standard solutions to 10 percent of samples processed, determine percent recovery of the additions

e Use an internal laboratory standard to trace performance of a given analytical method, match matrix as closely as possible to sample(s)

f Analyze externally prepared reference samples (NIOSH, Kansas, Oklahoma)

g Analyze externally prepared performance samples (unknown) from (NIOSH, Kansas, Oklahoma)

h Develop quality control charts for precision and accuracy performance, use charts to monitor daily laboratory performance

i Develop correlation data between analyses of similar meaning and use as cross-checks on validity of results (e g , conductivity and total dissolved solids, turbidity and total suspended solids, total organic carbon [TOC] and BOD/COD [chemical oxygen demand], etc)

j Consult files of previous data from the same natural water sources, determine ranges and orders of magnitude, if significant differences are noted, interpret terms of natural processes, pollution or the possibility of analytical error or contamination

k Calibrate analytical balances when irreproducibility is noted, service balances on an annual basis

l Rotate chemical inventory to eliminate older chemicals and reagents

m Develop replacement schedule for standard solutions, discard sooner if calibration curves change and change cannot be related to instrumental variation

n Develop instrument maintenance records, enter all service, adjustments, etc , including problem diagnosis and resolution, indicate if data were reported when instrument was out of calibration, if so, explain disposition of the data

o Calibrate thermometers with an NBS-certified thermometer

p Validate all data entered into computer storage and retrieval systems

q Record data in bound notebooks, institute supervisory acceptance of data prior to release from the laboratory

r Scan current literature to maintain awareness of research progress and technical aids, subscribe to EPA documents, including the EPA Analytical Quality Control Newsletter

INDIVIDUAL RESUMES

LABORATORY CERTIFICATES

STATE OF KANSAS

DEPARTMENT OF HEALTH AND ENVIRONMENT

Certificate

This is to certify that WILSON LABORATORIES SALINA, KANSAS has been approved in accordance with KSA 65-171k for performing the following analyses on drinking water and/or pollution control samples

Microbiology (Total and Fecal Coliform by Membrane Filtration) Acid Extract (GC/MS) Acrolein and Acrylonitrile (G C) Alkalinity Aluminum (Al) Ammonia Antimony (Sb) Arsenic (As) Barium (Ba) Base/Neutral Extract (GC/MS) Beryllium (Be) Biochemical Oxygen Demand Boron (B) Bromide Cadmium (Cd) Calcium (Ca) Chemical O ygen Demand Chloride Chlorinated Hydrocarbons (G C) Chlorinated Hydrocarbon Pesticides Chlorine Chlorophenoxy Acid Herbicides Chromium (Cr Total & Hexa alent) Cobalt (Co) Specific Conductivity Copper (Cu) Cyanide Dissol ed Oxygen Fluoride Haloethers (G C) Hardness Iron (Fe) Kjeldahl Nitrogen Lead (Pb) Magnesium (Mg) Manganese (Mn) Mercury (Hg) Molybdenum (Mo) Nickel (Ni) Nitrate/Nitrite Nitroaromatics & Isophorone (G C) Nitrosamines (G C) Oil & Grease Orthophosphate pH Phenols (4AAP & G C), Total Phosphorus Phthalate Esters (G C) PolyChlorinated Biphenyls PolyNuclear Aromatics (H P L C) Potassium (K) Purgeable Aromatics (G C) Purgeable Halocarbons (G C) Purgeables (GC/MS) Selenium (Se) Silicon (Si) Silver (Ag) Sodium (Na) Total Solids Total Dissolved Solids Total Suspended Solids Sulfate Sulfide Sulfite Surfactants (M B A S) Temperature Thallium (Tl) Tin (Sn) Titanium (Ti) Total Organic Carbon Trihalomethanes Tu bidity Vanadium (V) and Zinc (Zn)

Certificate No 7-101 Date Issued 7-1-84 Expiration Date 7-31-85

Barbara J Sabel
Secretary Department of Health and Environment

Environmental Laboratory Certification Officer

WILSON LABORATORIES
Kansas Department of Health and Environment
Hazardous Waste Laboratory Certification

STATE OF KANSAS

DEPARTMENT OF HEALTH AND ENVIRONMENT

Certificate

This is to certify that WILSON LABORATORIES SALINA, KANSAS has been approved in accordance with KSA 1979 Supp 65-3406 for performing the following analyses on solid or hazardous waste samples

updated to KSA 1981 Supp 65-3431

Arsenic (As), Barium (Ba), Cadmium (Cd), Chlorinated Hydrocarbon Pesticides, Chloro Phenoxy Acid Herbicides, Chromium (Cr, Total & Hexavalent), Corosivity, E.P. Toxicity Extraction, Ignitability, Lead (Pb), Mercury, (Hg), pH, Selenium (Se), and Silver, (Ag)

Certificate No [illegible] Date Issued [illegible] Expiration Date 2-28 85

Secretary Department of Health and Environment

Environmental Laboratory Certification Officer

OKLAHOMA WATER RESOURCES BOARD

Hereby Recognizes That

Wilson Laboratories

Laboratory No 7204

is a participant in the Oklahoma Water Resources Board's LABORATORY CERTIFICATION PROGRAM and maintains on file a List of Parameters for which it is certified to perform analyses

Done this 9th day of June 19 81

This certificate is valid only for JULY 1 through DECEMBER 31 1984

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

Industrial Hygiene Laboratory
Wilson Laboratories
Salina, Kansas

has fulfilled AIHA criteria for
Industrial Hygiene Laboratory Accreditation
since February, 1980

This accreditation shall be effective until
the 1st day of February, 1986
subject to continued compliance with
AIHA accreditation criteria

Chairman
Laboratory Accreditation
Committee

President
American Industrial Hygiene
Association

141
Accreditation Number

November 18, 1983
Date

Wilson Laboratories provides comprehensive industrial hygiene services specializing in industrial hygiene chemical analyses In plant survey capabilities include

- Monitoring for dusts fibers fumes and heavy metals
- In plant noise and vibration measurements
- Personnel monitoring for heavy metals in blood and urine

Feasibility studies reports and facility design are included in Wilson Laboratories comprehensive services Liaison with regulatory agencies at the Federal State and local levels is also provided

INTERLABORATORY
PERFORMANCE SAMPLE RESULTS

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
PERFORMANCE SAMPLE RESULTS
FOR 1982-1983 CERTIFICATION

Parameter	Reported Value[1]	True Value[1]	Acceptable Range[1]	Proficient	Non-Proficient
COD	211	222	182-244	X	
BOD_5	90 0	95 6	63 5-138	X	
TOC	68 0	87	64 5-106	X	
Ammonia as N	0 21	0 13	0 008-0 284	X	
Nitrate as N	0 15	0 15	0 118-0 245	X	
Orthophosphate as P	ND(0 1)	0 014	0 0-0 073	X	
Kjeldahl Nitrogen	ND(1 0)	0 27	0 0-0 739	X	
Total Phosphorus	1 21	1 06	0 428-1 64	X	
ph	8 55	8 4	7 56-8 71	X	
Spec Cond umho/cm	514	505	340 -636	X	
TDS	325	298	246 -370	X	
TSS	25 0	29 5	12 1-50 0	X	
hardness	127	123	103 -140	X	
[illegible]	32 5	34 2	20 0-45 8	X	
Magnesium	10 0	9 2	5 28-12 7	X	
Sodium	40 5	41 7	31 1-51 4	X	
Potassium	7 63	7 9	4 96-11 2	X	
Alkalinit	75 3	79 3	65 4-88 3	X	
Chloride	78	75 3	64 7-87 5	X	
Fluoride	2 12	1 9	1 46-2 34	X	
Sulfate	78	80 3	63 6-92 0	X	
Oil and Grease	17 4	12 0	8 06-27 7	X	
Cyanide µg/l	187	171	107 -224	X	
Phenol (4AAP) µg/l	60 7	68	60 17-75 83	X	
Aluminum µg/l	56	60	14 9-164	X	
Arsenic µg/l	18	22	11 4-34 1	X	
Barium µg/l	370	391	242 -518	X	
Beryllium µg/l	0	0	3 [illegible]-35 6	X	
Cadmium µg/l	3 2	2 5	0 0-5 54	X	
Cobalt µg/l	20	20	4 23-37 0		

1 All units are mg/l unless otherwise noted

Parameter	Reported Value 2	True Value2	Acceptable Range2	Profi-cient	Non-Pro-ficient
Chromium	10 5	10	0 0-23 1	X	
Copper	11	11	0 0-27 1	X	
Iron	46	20	0 0-69 7	X	
Mercury	0 40	0 75	0 163-1 38	X	
Manganese	19	15	0 0-34 5	X	
Nickel	54	30	0 0-64 7	X	
Lead	25	24	4 33-48 1	X	
Selenium	9 2	6	1 06-11 4	X	
Silver	ND(0 1)	0 0	0 0-0 0	X	
Vanadium	73	70	0 0-207	X	
Zinc	20	16	0 0-42 6	X	
Aldrin	0 038	0 056	0 025-0 070	X	
Dieldrin	0 128	0 114	0 070-0 160	X	
DDD	0 149	0 170	0 100-0 230	X	
DDE	0 028	0 013	D L - 043	X	
DDT	0 111	0 156	0 110-0 190	X	
Heptachlor	0 015	0 028	D L -0 034	X	
Chlordane	1 08	1 07	0 58-1 20	X	
Arochlor 1016	ND(1 0)	0 0	0 0-0 0	X	
Arochlor 1254	1 45	2 18	0 235-3 46	X	
Total P C B	1 45	2 18	0 235-3 46	X	
Chloroform	65 3	74 0	59 7-90 0	X	
Bromoform	9 31	8 2	6 56-9 84	X	
Bromodichloro methane	8 9	9 4	7 52-11 28	X	
Chlorodibromo methane	31 2	45 1	30 08-54 12	X	
Total T H M	114 7	136 7	109 4-164 0	X	
Endrin	0 448	0 4	0 034-0 738	X	
Lindane	0 051	0 065	0 0-1 38	X	
Methoxychlor	0 748	0 62	0 0-5 25	X	
Toxaphene	4 14	4 4	0 0-13 0	X	

2 All values are µg/l unless otherwise noted

NIOSH PROFICIENCY ANALYTICAL TESTING (PAT) PROGRAM

PERFORMANCE SAMPLE RESULTS

ROUND 77 MAY 1984

Parameter	Reported Value	True Value (Arithmetic Mean)	Relative Standard Deviation	Pro-ficient	Non-Pro-ficient
Lead	0 0386 mg	0 0384	4 3%	X	
	0 0155	0 0151	5 8%		
	0 0502	0 0489	3 6%		
	0 0254	0 0252	5 0%		
Cadmium	0 0051 mg	0 0049	5 3%	X	
	0 0078	0 0077	4 7%		
	0 0194	0 0190	4 4%		
	0 0111	0 0109	4 8%		
Zinc	0 0935 mg	0 0924	5 2%	X	
	0 1855	0 1811	5 1%		
	0 2060	0 2021	4 5%		
	0 1275	0 1233	4 6%		
Silica	0 0510 mg	0 0559	24 4%	X	
	0 0833	0 0795	20 8%		
	0 0794	0 0643	19 1%		
	0 0969	0 1154	19 0%		
Asbestos	0784 6 F/mm^2	0912 0	31 0%	X	
	0440 4	0707 0	32 0%		
	0114 8	0174 2	44 0%		
	0248 1	0478 7	33 1%		
Carbon Tetrachloride	0 6091 mg	0 6434	7 7%	X	
	0 9516	1 0048	6 9%		
	0 3616	0 3789	9 3%		
	0 5106	0 4856	9 0%		
1,2-Dichloro-ethane	0 9525 mg	0 9371	5 6%	X	
	0 9850	1 0384	6 9%		
	0 6249	0 6204	6 4%		
	0 7457	0 7299	5 9%		
Trichloro-ethylene	1 2390 mg	1 1927	6 0%	X	
	0 9663	0 9862	7 2%		
	1 8025	1 7944	6 4%		
	1 3853	1 3739	6 5%		

OKLAHOMA WATER RESOURCES BOARD
PERFORMANCE SAMPLE RESULTS
FOR 1983 CERTIFICATION

Parameter	Reported Value	True Value	Acceptable Range	Proficient	Non-Proficient
Hardness	306	314	292-336	X	
Chloride	167	160	147-173	X	
Sulfate	218	223	199-247	X	
Dissolved Solids	699	587	508-666	X	
Specific Conductance	950	948	863-1032	X	
Ammonia-Nitrogen	9.2	9.15	7.6-10.7	X	
Nitrate Nitrogen	15.2	15.2	12.0-18.4	X	
Total Phosphorus	13.6	13.4	11.6-15.2	X	
pH	1.70	1.79	1.5-2.1	X	
Aluminum	1.2	1.16	0.9-1.4	X	
Arsenic	0.12	0.116	0.06-0.17	X	
Barium	0.9	0.94	0.6-1.3	X	
Cadmium	0.232	0.235	0.211-1.260	X	
Calcium	57	57.8	50.-66.	X	
Chromium	0.47	0.492	0.41-0.57	X	
Copper	0.48	0.487	0.42-0.56	X	
Lead	0.4	0.34	0.2-0.5	X	
Magnesium	41	40.4	34.-47.	X	
Manganese	0.90	0.879	0.78-0.98	X	
Mercury	0.301	0.307	0.215-0.399	X	
Nickel	1.1	1.11	0.9-1.3	X	
Potassium	41	41.8	35.-48.	X	
Selenium	0.770	0.755	0.516-0.994	X	
Sodium	65	65.7	59.-73.	X	
Zinc	1.17	1.14	1.03-1.26	X	

SAMPLE TRACKING AND SCHEDULING FORMS

Samples of forms utilized by Wilson Laboratories for tracking samples and for scheduling work are described below

1 Sample Test Data Generated at log-in, contains all sample and client information

2 List of All Order and Lab Numbers for Client Generated at log-in, lists all orders and samples for a given client

3 Schedule of Tests Due Daily schedule for each analysis due Note prep and due dates are included

4 Schedule of Tests Due Daily schedule for special preparations for samples, i e , acid digestion

5 Test Result Check Form After test results are entered into the computer from the notebooks, this form is produced and is checked for accuracy against the notebook before the report is printed Notebook and page number are printed on this form

Quality control precision and accuracy data are recorded in the lab notebooks in colored ink at the time of analysis Conformance to control limits is determined at the time of analysis and all data are reviewed daily by the Section Chiefs Out of control tests are reported to the Q A officer and remedial action is taken immediately

6 Final Report After all checking is completed and accuracy of results is verified, the report is generated All reports receive a final check by the project manager for completeness and reasonableness of the numbers Lab Director reviews all reports and signs all reports

7 Number of Tests Not Done in Group Work load per group, i e , all metals, or all tests

FORM 1

SAMPLE TEST DATA

LAB NUMBER(S)
8206-0123
06/11/82
CLIENT NAME: EPA
STREET ADDRESS P O BOX 15027(
CITY AND STATE: LAS VEGAS, NEVADA 89114
CLIENT CONTACT: PAT LASKA
FILE NUMBER LAB CERT
ORDER NUMBER: .2475
PURCHASE ORDER:
DATE RECEIVED. 06/04/82
DATE DUE 06/10/82
SAMPLE LOCATION: 4-14
CONTAINER TYPE 1 AMPULE, LRN
SAMP DESC ' SAMPLE 1 METALS
DATE SAMPLED:
TIME SAMPLED.
SPEC INS SEE WORKSHEET

TESTS ASSIGNED TO SAMPLE

115	ALUMINUM
125	ANTIMONY
126	ARSENIC
138	BARIUM
147	BERYLLIUM
154	BORON
169	CADMIUM
199	CHROMIUM, TOTAL
204	COBALT
210	COPPER
310	IRON, TOTAL
320	LEAD
330	MANGANESE
333	MERCURY
352	NICKEL
435	SELENIUM
440	SILVER
473	THALLIUM
476	TIN
507	VANADIUM
522	ZINC

FORM 2

LIST OF ALL ORDER AND LAB NUMBERS

FOR CLIENT EPA

CURRENT DATE 06/11/82

2475	8206-0123	SAMPLE 1 METALS
2475	8206-0124	SAMPLE 2 METALS
2475	8206-0125	SAMPLE 1 ANION A
2475	8206-0126	SAMPLE 1 ANION B
2475	8206-0127	SAMPLE 1 ANION C

FORM 3

SCHEDULE OF TESTS DUE

DATE 06/11/82 TEST CADMIUM (169) PAGE 1

LAB NUMBER	SAMPLE LOCATION	CONTAINER TYPE	CLIENT NAME	FILE NUMBER	SAMPLE DESCRIPTION	SPECIAL INSTRUCTIONS	PREP DATE	DUE DATE
8 0 0403	SHELF 2	1 SMALL JAR BKS	MONSANTO COMPANY	8 9 05	1 MCGF 01B 001	EP TOXICITY	06/07/82	06/14/82
8 0 0404	SHELF 2	1 SMALL JAR BKS	MONSANTO COMPANY	8 9 05	1 MCGF 01E 001	EP TOXICITY	06/07/82	06/14/82
8 0 0405	SHELF 2	1 SMALL JAR BKS	MONSANTO COMPANY	8 950	1 MCGF 01D 001	EP TOXICITY	06/07/82	06/14/82
8 05 0406	SHELF	1 SMALL JAR BKS	MONSANTO COMPANY	8 9 05	1 MCGF 0 B 001	EP TOXICITY	06/07/82	06/14/82
8 05 0302	4	EE T LRM	HE CULE INCORPORATED	3 9 9	MW 81 54	GROUND H O PARAMETERS PREP	06/02/82	06/08/82
8 0043	8 13	S E T G LRM	H FCULE INCORPORAT D	6 95 3	MW 81 37	G OUND H O PARAMETERS PREP	06/0 82	06/14/82
3 0 0 39	4 4	1 G LLON JAR LRM	THE COLEMAN COMPANY	8 9 5	PAINT SLUDGE 407 A	ACID DIGESTION		06/ 3/82
3206 0090	4 4	1 GALLON JAR LRM	THE COLEMAN COMPANY	8 9 05	COMPO ITE PAINT SLUDGE	ACID DIGESTION		06/23/82
3 0 0091	4 4	1 GALLON JAR LRM	THE COLEMAN COMPANY	8 9505	STRIPPER TANK SLUDGE	ACID DIGESTION		06/ 3/82
8 0 -0092	4 4	1 GALLON JAR LRM	THE COLEMAN COMPANY	8? 9505	PAINT SLUDGE 407-C	ACID DIGESTION		06/23/82
8 06 0 7D	4 2	1 SM LASTIC LRM	FLESSEY AE O PRECISION CO	8 95 5	SOLID	ACID DIGESTION	06/07/82	06/17/82
5 6 01 D	4 2	1 SM PLA TIC LRM	FLES EY AEXO PRECISION CO	82 9505	LIQUID	ACID DI ESTION	06/07/82	06/17/82
3 5 0119	4 4	SEE TAG LRM	HERCULE INCORPORATED	8 9 8	MW 81 36	G OUND H2O PARAMETERS PREP	06/04/82	06/11/82
8 5 0111	4 50	1 CUB LRM	HERCULES INCORPORATED	82 95 9	WASTE WATER 24147	TOTAL RECOVERABLE	06/04/82	06/19/82
5 06 1 3	4 14	1 AMPULE LRM	EPA	LAB CERT	SAMPLE 1 METALS	SEE WORKSHEET	06/04/82	06/10/82
8 01 4	4 14	1 AMPULE LRM	EPA	LAB CERT	SAMPLE 2 METALS	SEE WORKSHEET	06/04/82	06/10/82
8 05 31 8T	4 2	1 CUB	MARION LABORATORIES	82 9501	SAMPLE GROUP 1	TOTAL RECOVERABLE	06/05/82	06/12/82
8 06 013 D	4 38	METAL CAN BK	PHILLIPS PETROLEUM CO	8 9505	CHEMICAL POND LIQUID	ACID DIG STION	06/09/82	06/15/82
8? 6 01 4D	4 38	METAL CAN BKS	PHILLIPS PETROLEUM CO	8 9 05	CHEMICAL POND SLUDGE	ACID DIGESTION	06/09/82	06/15/82
8 06-014	4 49	SEE TAG LRM	HERCULES INCORPORATED	8 95 8	MW 81 40	GROUND H O PARAMETERS PREP	06/09/82	06/15/82
8 0 -01?7	4 49	SE TAG LRM	HERCULES INCORPORATED	82 9 8	MW 81 13	GROUND H?O PARAMETERS PREP	06/10/82	06/15/82
8 0 -02 E	4 38	3 00 ML GLASS LRM	PFIZER INC	8? 9505	SAMPLE 2	EP TOXICITY		06/21/82
3 C 0 T	4 50	L 1 CUB 1 2 0 TOC LRM	L THE WESTERN CO INC	82 9516	GROUNDWATER	TOTAL RECOVERABLE		06/18/82
8 0 T	4 0	1 GL L CUB 1 2 0 PL RLM	MARION LABORATORIE	82 9?01	SAMPLE BUILDING C	TOTAL RECOVERABLE	06/11/82	06/21/82
5	9 15	SEE TAG LRM	HERCULES INCORPORATED	8? 95 9	MW 81 59	GROUND H O PARAMETERS PREP		06/17/82
8 06 0273T	4 4	1 GL L 2 CUB 1 250 PL RLM	MARION LABORATORIES	82 9501	SAMPLE 3 R10	TOTAL RECOVERABLE		06/22/82
8 06 0289T	4 11	2 CUB BKS	WOODWARD-CLYDE CONSULTANTS	80 9530	CCD	TOTAL RECOVERABLE		06/ 4/82
8 06 0 81T	4 11	2 CUB BK	WOODWARD-CLYDE CONSULTANTS	80 9 30	CCU	TOTAL RECOVERABLE		06/24/82
8 06 0 8 J	4 11	CUB B S	WOODWARD-CLYDE CONSULTANTS	80 9 30	OW 1	FILTEPED IN FIELD		06/ 4/82
06-0 83J	4 11	CUB BK	WOODWARD-CLYDE CON ULTANT	80 9530	OW 3	FILTEPED IN FIELD		06/ 4/82
06 0 84J	4 11	2 CUB BKS	WOODWARD CLYDE CONSULTANTS	80 7 0	OW 4	FILTERED IN FIELD		0 / 4/82
8 06-0 8 J	4 11	CUB BKS	WOODWARD CLYDE CONSULTANTS	80 9 30	OW 6	FILTERED IN FIELD		06/24/82
06 0 86J	4 11	CUB BKS	WOODWARD CLYDE CON ULTANTS	80 9530	OW 10	FILT FED IN FIELD		06/24/82
8 06 0 87J	4 11	2 CUB BKS	WOODWARD CLYDE CONSULTANTS	80 9530	OW 16	FILTERED IN FIELD		06/ 4/82
8?06-0 88J	4 11	CUB BKS	WOODWARD CLYDE CONSULTANTS	80 9530	OW 1	FILTE ED IN FIELD		06/ 4/82
06 0 89J	4 11	CUB BKS	WOODWARD-CLYDE CONSULTANTS	80 95 0	OW 13	FILT FED IN FIELD		06/ 4/82

FORM 4

SCHEDULE OF TESTS DUE
WITH SPECIAL INSTRUCTIONS ACID DIGESTION

DATE 06/10/8

FILE NUMBER	ORDER NUMBER	LAB NUMBER	SAMPLE LOCATION	CLIENT NAME	DATE DUE	TEST NAME	CONTAINER TYPE	SAMPLE DESCRIPTION	PREP DATE
82 9505	462	8 06 0089	4 4	THE COLEMAN COMPANY	06/ 3/8	A^SENIC	1 GALLON JAR LRN	PAINT SLUDGE 407 A	
8 7 05	246	8 06 0089	4 4	THE COLEMAN COMPANY	06 3/8	SELENIUM	1 GALLON JAR LRN	PAINT SLUDGE 407 A	
8 9505	46	8206 0089	4 4	THE COLEMAN COMPANY	06/21/8	SILVER	1 GALLON JAR LRN	PAINT SLUDGE 407 A	
8 9.05	46	8 06 0089	4 4	THE COLEMAN COMPANY	0 / 3/82	P RIUM	1 G LLON JAR LRN	PAINT SLUDGE 407 A	
8 9505	462	8 06 0089	4 4	THE COLEMAN COMPANY	06/ 3/3	C DMIUM	1 GALLON JAR LRN	AINT SLUDGE 407 A	
8 9 05	462	8 06 0089	4 4	THE COLEMAN COMPANY	06/	CHROMIUM TOT L	1 GALLON JAR LRN	F INT LUDGE 407 A	
8 9 0	462	8 06-0089	4 4	THE COLEMAN COMPANY	0 / 3/3	LEAD	1 GALLON J R LRN	PAINT SLUDGE 407 A	
8 9 05	462	9 06 0089	4 4	THE COLEMAN COMPANY	06/ 3/8	ME CURY	1 GALLON JAR E N	PAINT LUDGE 407 A	
82 9 05	2462	8 06 0090	4 4	THE COLEMAN COMPANY	06/ 3/8	SILVER	1 GALLON JAR LRN	COMPOSITE PAINT SLUDGE	
8 9.05	46	8 06 0090	4 4	THE COLEMAN COMPANY	0 / 3/82	SELENIUM	1 G LLON JAR LRN	COMPOSITE PAINT SLUDGE	
8 9.05	46	8206 0090	4 4	THE COLEMAN COMPANY	06/ 3/82	CHROMIUM TOTAL	1 GALLON JAR LRN	COMPOSITE INT LUDGE	
8 9.05	46	8 06 0090	4 4	THE COLEMAN COMPANY	06/ 3/3	C DMIUM	1 G LLON JAR LRN	CO POSITE PAINT SLUDGE	
82 9 05	462	8 06 0090	4 4	THE COLEMAN COMPANY	06/ 3/3	LEAD	1 GALLON JAR LRN	COMPO ITE P INT SLUDGE	
82 9 05	462	8 06 0090	4 4	THE COLEMAN COMPANY	06/ 3/8	BARIUM	1 GALLON JAR LRN	C M O ITE PAINT SLUDGE	
8 950	2462	8 06 0090	4 4	THE COLE AN COMPANY	06 /8	ARSENIC	1 GALLON JAR LRN	COMPO ITE PAINT SLUDGE	
8 9 05	46	8 06 0090	4 4	THE COLEMAN COMPANY	06/ 3/8	ME CU Y	1 GALLON JAR LRN	COMPOSITE PAINT SLUDGE	
8 9505	46	8 06 0091	4 4	THE COLEMAN COMPANY	05 3/ 2	MERCURY	1 GALLON J LRN	TRIPPER WSK LUDGE	
8 9 05	462	8 06-0091	4 4	THE COLEMAN COMPANY	06/ 3/82	BARIUM	1 GALLON JAR LRN	STRIPPER TANK SLUDGE	
82 9505	46	8 06-0091	4 4	THE COLEMAN COMPANY	0 / 3 8	CADMIUM	1 GALLON JAR LRN	STRIP ER TANK SLUDGE	
82 9505	462	8^06 0091	4 4	THE COLEMAN COMPANY	06/23/82	LEAD	1 LLON JAR LRN	STRIPPER TANK SLUDGE	
8 9505	246	8 06 0091	4 4	THE COLEMAN COMPANY	06 3 8?	CHROMIUM TOTAL	1 GALLON JA LRN	STRIP ER TANK SLUDGE	
82 9505	2462	8 06-0091	4 4	THE COLEMAN COMPANY	06/ 3/8	ELENIUM	1 GALLON JAR LRN	ST IPPER TANK SLUDGE	
82 9505	462	8^06 0091	4 4	THE COLEMAN COMPANY	06 3/8	SILVER	1 GALLON JAR LRN	T IPPER TANK SLUDGE	
8 9 05	4	8 06 0091	4 4	THE COLEMAN COMPANY	06/ 3/8	ARSENIC	1 GALLON JAR LRN	IPPER TANK SLUDGE	
82 9505	462	8^06 0092	4 4	THE COLEMAN COMPANY	0 / 3/8	SELENIUM	1 GALLON JAR LRN	PAINT SLUDGE 407-C	
82 9505	462	8 06 009	4 4	THE COLEMAN COMPANY	06/ 3/8	LE D	1 GALLON JAR LRN	PAINT SLUDGE 407 C	
8^ 9505	2462	8^06 009	4 4	THE COLEMAN COMPANY	06/ 3/8	BARIUM	1 GALLON JAR LRN	PAINT SLUDGE 407-C	
82 9 5	2462	8 06 009	4 4	THE COLEMAN COMPANY	06/ 3/8	ME CURY	1 GALLON JAR LRN	PAINT SLUDGE 40 -C	
8 9505	246	8 06-0092	4 4	THE COLEMAN COMPANY	0 / 3/8	A ENIC	1 GALLON JAR LRN	PAINT SLUDG 407-C	
8 9505	462	8 06 0092	4 4	THE COLEMAN COMPANY	06/ 3/82	CHROMIUM TOTAL	1 GALLON J R LRN	PAINT SLUDGE 4 7 C	
8 9 05	462	8^06 0092	4 4	THE COLEMAN COMPANY	06/ 3/82	SILVER	1 GALLON JAR LRN	PAINT SLUDGE 40 -C	
8^ 9 05	462	8 06 0092	4 4	THE COLEMAN COMPANY	06/ 3 82	CADMIUM	1 GALLON JAR LRN	PAINT SLUDGE 407-C	
82 9 05	479	8 06 0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/8	ARSENIC	METAL CAN BKS	CHEMICAL POND LIQUID	
8 7 35	479	8^06 01 D	4 38	PHILLIPS PETROLEUM CO	05/ /8	LE D	METAL CAN BK	CHEMICAL POND LIQUID	
8 9505	479	8 06 0133D	4 38	PHILLIPS PETROLEUM CO	06 /8	SILVER	METAL CAN BKS	CHEMICAL POND LIQUID	
8 9505	479	8 06 0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/8	SODIUM	METAL C N KS	CHEMICAL POND LIQUID	
82 9505	479	8 06-0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/3	MA IUM	METAL CAN BK	CHEMICAL POND LIQUID	
8 9505	4 9	8^06 0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/	CADMIUM	METAL CAN BKS	CHEMICAL POND LIQUID	
8 9 05	479	8206 0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/8	CHROMIUM TOTAL	METAL CAN BKS	CHEMICAL POND LIQUID	
8 95 5	479	8206 0133D	4 38	PHILLIPS PETROLEUM CO	06/25/8	SELENIUM	METAL C N BKS	CHEMICAL POND LIQUID	
8 9 05	2479	8 06 0133D	4 38	PHILLIPS PETROLEUM CO	06/ 5/8	MERCURY	METAL CAN BK	CHEMICAL POND LIQUID	
8 9505	479	8 0 0134D	4 38	PHILLIPS PETROLEUM CO	06/ 5/8	CHROMIUM TOTAL	METAL CAN BKS	CHEMICAL POND SLUDGE	
8 9505	479	8^06-0134D	4 38	PHILLIPS PETROLEUM CO	05 5	CADMIUM	METAL CAN BKS	CHEMICAL POND SLUDGE	
8 9 05	479	8 06-0134D	4 38	PHILLIPS PETROLEUM CO	06/25/82	SODIUM	METAL CAN BKS	CHEMIC L POND SLUDGE	
8 9 05	479	8^06 0134D	4 38	PHILLIP PET OLEUM CO	06/ 3	BARIUM	METAL CAN BKS	CHEMICAL POND SLUDGE	
8 950	479	8 06 0134D	4 8	PHILLIPS PETROLEUM CO	06/ 5/3	SIL ER	METAL C N BKS	CHEMICAL OND SLUDGE	
8 9 05	479	8 06 0134D	4 8	PHILLIPS PET OLEUM CO	0 / 8	ARSENIC	METAL CAN BKS	CHEMICAL POND SLUDGE	
8 7 05	479	8 06 0134D	4 8	PHILLIPS PETROLEUM CO	06/ /8	LEAD	METAL C Y BKS	CH MIC L OND SLUDGE	
3 750	479	8 06 0134D	4 38	PHILLIPS E ROLEUM CO	06 5 3	SELENIUM	METAL C M	CHEMIC L POND SLUDGE	
3 9 05	4 9	8 06 0134D	4 3	PHILLIPS PETROLEUM CO	5 /8	ME CURY	METAL C	CHE C L POND SLUDGE	
3 7 16	480	06 0140T	4 4	MAR L COR O ATION	5 11	CA MIUM TOTAL	PL TIC L T LRN	J LL D	

FORM 5

TEST RESULT CHECK FORM

PREPARER S INITIALS MLB

06/10/82

CODE	NAME	LAB NO	RESULT	UNITS	ANALYST	BOOK/PAGE
387	PH	8206-0133	7		BAT	166 /17
387	PH	8206-0134	9		BAT	166 /17
387	PH	8206-0142	6.9		BAT	166 /17
387	PH	8206-0145	7.7		BAT	166 /17
387	PH	8206-0146	7.3		BAT	166 /17
387	PH	8206-0147	8.2		BAT	166 /17
387	PH	8206-0157	7.4		BAT	166 /18
387	PH	8206-0157X	7.4		BAT	166 /18
387	PH	8206-0157Y	7 4		BAT	166 /18
387	PH	8206-0157Z	7.4		BAT	166 /18
387	PH	8206-0248	7.0		BAT	166 /18
387	PH	8206-0253	8 2		BAT	166 /18
387	PH	8206-0255	7 8		BAT	166 /18
387	PH	8206-0256	8 9		BAT	166 /17
387	PH	8206-0257	7 5		BAT	166 /17
387	PH	8206-0260	11.2		BAT	166 /17
387	PH	8206-0261	7 8		BAT	166 /18

SAMPLE REPORT
WILSON LABORATORIES

528 NORTH NINTH STREET - P.O. BOX 1858 - SALINA,KANSAS 67401 - (913)825-7186

LABORATORY REPORT PAGE 1

CLIENT ABC INDUSTRIES
ATTN PURCHASING
P O BOX 549
NO STATE

DATE RPTD 02/05/82
DATE RCVD 02/05/82
PURCHASE AUTH 15928
FILE NO 82-9500

ANALYSIS	CONCENTRATION	UNITS	ANALYST	BOOK/PAGE
LAB NUMBER 8202-0000	SAMPLE DESCRIPTION GROUNDWATER MONITORING			
ORDER NUMBER XXXX	SPECIAL INSTRUCTIONS ANALYZED AS RECEIVED			
DATE SAMPLED 02/02/82	TIME SAMPLED 1800			
TEMPERATURE	18	DEGREES C	BTF	161 / 000
*********GROUP IA PARAMETERS**********				
ANALYZED 02/05/82				
ARSENIC	0 003	MG/L	BTF	161 / 000
BARIUM	0 31	MG/L	BTF	161 / 000
CADMIUM	0 0022	MG/L	BTF	161 / 000
CHROMIUM, TOTAL	0 032	MG/L	BTF	161 / 000
FLUORIDE	0 21	MG/L	JSB	108 / 62
LEAD	0 019	MG/L	BTF	161 / 000
MERCURY	ND(0 0002)	MG/L	BTF	161 / 000
NITRATE	ND(0 1)	MG/L AS N	JSB	108 / 62
SELENIUM	ND(0 002)	MG/L	BTF	161 / 000
SILVER	ND(0 0005)	MG/L	BTF	161 / 000
TURBIDITY	2	NTU	CAS	85 / 23
TOTAL COLIFORM	ND(1)	COLONIES/100 ML	JSB	108 / 62
ENDRIN	ND(0 0001)	UG/L	CJB	150 / 555
LINDANE	ND(0 001)	UG/L	CJB	150 / 555
METHOXYCHLOR	ND(0.05)	UG/L	CJB	150 / 555
TOXAPHENE	ND(0 005)	UG/L	CJB	150 / 555
2,4-D	ND(0 01)	UG/L	CJB	150 / 555
2,4,5-TP	ND(0 001)	UG/L	CJB	150 / 555
*********GROUP IB PARAMETERS**********				
ANALYZED 02/05/82				
ALPHA, TOTAL	5	PCI/L	BKS	189 / 001
BETA, TOTAL	5	PCI/L	BKS	189 / 001
RADIUM,TOTAL	1 6	PCI/L	BKS	189 001
*********GROUP II PARAMETERS**********				
ANALYZED 02/05/82				
CHLORIDE	36	MG/L	JSB	08 / 62
IRON, TOTAL	17 0	MG/L	BTF	161 000
MANGANESE	1 53	MG/L	BTF	161 / 000
PHENOLIC COMPOUNDS	ND(0 005)	MG/L	JSB	108 / 62
SODIUM	47	MG/L	BTF	161 000
SULFATE	90	MG/L	JSB	108 / 62

W I L S O N L A B O R A T O R I E S

LABORATORY REPORT

CLIENT ABC INDUSTRIES

DATE RPTD 02/05/82

ANALYSIS	CONCENTRATION	UNITS	ANALYST	BOOK/PAGE
*********GROUP III PARAMETERS**********				
ANALYZED 02/05/82				
PH	7 0		JSB	108 / 62
PH	7 0		JSB	108 / 62
PH	7 0		JSB	108 / 62
PH	7 0		JSB	108 / 62
SPECIFIC CONDUCTANGE	980.	UMHOS/CM	JSB	108 / 62
SPECIFIC CONDUCTANCE	980	UMHOS/CM	JSB	108 / 62
SPECIFIC CONDUCTANCE	980	UMHOS/CM	JSB	108 / 62
SPECIFIC CONDUCTANCE	980	UMHOS/CM	JSB	108 / 62
TOTAL ORGANIC CARBON	5 7	MG/L	JSB	108 / 62
TOTAL ORGANIC CARBON	5 7	MG/L	JSB	108 / 62
TOTAL ORGANIC CARBON	5 7	MG/L	JSB	108 / 62
TOTAL ORGANIC CARBON	5 7	MG/L	JSB	108 / 62
TOTAL ORGANIC HALOGEN	ND(1)	UG/L AS CL	JSB	108 / 62
TOTAL ORGANIC HALOGEN	ND(1)	UG/L AS CL	JSB	108 / 62
TOTAL ORGANIC HALOGEN	ND(1)	UG/L AS CL	JSB	108 / 62
TOTAL ORGANIC HALOGEN	ND(1)	UG/L AS CL	JSB	108 / 62

--CONCLUSION--LAB NUMBER 8202-0000

ND(),WHERE NOTED,INDICATES NONE DETECTED WITH THE DETECTION LIMIT IN PARENTHESES

ANALYSES WERE PERFORMED ON SAMPLES AS RECEIVED BY WILSON LABS UTILIZING APPROVED PROCEDURES PUBLISHED IN THE FEDERAL REGISTER, VOL 44, NO 233, DEC 3, 1979 (69568-69575) AND AS AMENDED IN THE FED REG , VOL 44, NO 244, DEC 18, 1979

WILSON LABORATORIES

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FORM 7

NUMBER OF TESTS NOT DONE IN GROUP ALL METALS

CURRENT DATE 06/10/82

CODE NO	TEST NAME	NO OF TESTS
115	ALUMINUM	5
125	ANTIMONY	6
126	ARSENIC	22
138	BARIUM	18
147	BERYLLIUM	6
154	BORON	4
169	CADMIUM	36
199	CHROMIUM, TOTAL	34
204	COBALT	2
210	COPPER	8
310	IRON, TOTAL	12
320	LEAD	30
328	MAGNESIUM	1
330	MANGANESE	8
333	MERCURY	26
346	MOLYBDENUM	1
352	NICKEL	13
836	NOX	5
435	SELENIUM	18
440	SILVER	21
441	SODIUM	7
473	THALLIUM	6
476	TIN	3
477	TITANIUM	1
567	TOTAL COPPER	1
507	VANADIUM	2
522	ZINC	6
	TOTAL TESTS	302

FORM 7

NUMBER OF TESTS NOT DONE IN GROUP ALL TESTS

CURRENT DATE: 06/11/82

CODE NO	TEST NAME	NO OF TESTS
361	NITROGEN, ORGANIC	5
838	NOX	5
517	O-XYLENE	1
370	OIL AND GREASE	14
519	P-XYLENE	1
541	PCB IN OIL	84
387	PH	13
402	PHENOLIC COMPOUNDS	9
404	PHOSPHORUS, TOTAL	6
544	QUALITATIVE IDENTIFICATION	3
597	RADIUM,TOTAL	24
435	SELENIUM	18
440	SILVER	21
441	SODIUM	7
443	SOLIDS, DISSOLVED	10
444	SOLIDS, SUSPENDED	17
449	SPECIFIC CONDUCTANCE	11
455	SULFATE	17
456	SULFIDE	8
457	SULFITE	1
770	SULFUR DIOXIDE	5
461	SURFACTANTS	1
104	TEMPERATURE	6
473	THALLIUM	6
476	TIN	3
477	TITANIUM	1
478	TOLUENE	1
481	TOTAL COLIFORM	1
567	TOTAL COPPER	1
482	TOTAL ORGANIC CARBON	59
524	TOTAL ORGANIC HALOGEN	59
526	TOTAL TRIHALOMETHANES	1
483	TOXAPHENE	10
489	TRICHLOROETHYLENE	7
505	TURBIDITY	3
507	VANADIUM	2
510	VINYL CHLORIDE	3
522	ZINC	6
TOTAL TESTS NOT DONE		1000