JOHNSON-FERMELIA Co. Inc.
CONSULTING ENGINEERS, ARCHITECTS AND SURVEYORS

PHASE II REPORT

PINEDALE WATER SUPPLY PROJECT
LEVEL II

SUBMITTED TO

WYOMING WATER DEVELOPMENT COMMISSION

SEPTEMBER 1993

1515 Ninth Street
Rock Springs, Wyoming 82901

Phone (307) 362-7519
3 December 1993
Project No. 3285-92E

Mr. Mike Carnevale
Wyoming Water Development Commission
4th Floor West
122 West 25th Street
Cheyenne, WY  82002

Subject:  Phase II Report - Pinedale Water Supply Project

Dear Mr. Carnevale:

We are transmitting herewith forty copies of the above report. Combined with the ten copies already submitted, this transmittal will fulfill the fifty copies required. Also included is one set of reproducible originals.

Thanks for the assistance and consideration you provided during the course of this study.

Sincerely,

Robert E. Johnson, PE & LS
Project Manager

encs.
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I. INTRODUCTION

A. Background

The Town of Pinedale, Wyoming has historically obtained its water supply from Fremont Lake, a large pristine cold water lake at the foot of the Wind River Mountain Range. The lake is nine miles long, about one mile wide and 608 feet deep at its deepest point.

The quality of the water conveyed from the lake is excellent and totally satisfactory for potable purposes; however, the provisions of the Safe Drinking Water Act (SDWA), Surface Water Treatment Rule (SWTR) and the EPA requirements impose stringent conditions on water users who obtain their water supplies from surface water sources. It has, therefore, become necessary for the Town of Pinedale to look closely at the ramifications associated with continued use of water from Fremont Lake.

Furthermore, as the State of Wyoming has not assumed primacy for implementation of the Safe Drinking Water Act, the Town has been in direct contact with the Denver Office of the Environmental Protection Agency (EPA). In that regard, two letters from the EPA play a very important role in the direction and objectives of the studies and investigations involved with Phase II of the Pinedale Water Project. These letters are referred to as:

1. "EPA Letter to Town of Pinedale - March 17, 1992."
2. "EPA Letter to Town of Pinedale - June 10, 1992 and Administrative Consent Order Docket No. 8-PWS VIII - 92-21, PWS ID # 560041C."
B. EPA Letter to Town of Pinedale - March 17, 1992

The March 17 letter was sent Certified Mail Return Receipt Requested, addressed to the Honorable Miriam Carlson, Mayor, and signed by Debra J. Kovars, Chief, P.W.S. Implementation and Enforcement Section, Region VIII. This letter was in response to a letter from Pinedale to the EPA, dated January 22, 1992, which expressed an interest on the part of Pinedale to continue to use unfiltered Fremont Lake water. The Pinedale letter also transmitted a watershed control program which was requested by EPA.

The March EPA letter stated that a comprehensive watershed control program includes:

- A base map or maps delineating the watershed land ownership, land use zoning, sewage disposal works, water intake, and activities on the lake
- Inventory of animal populations
- Activities subject to permitting requirements
- Risk assessment
- Description of existing and future actions to safeguard the watershed inclusive of landowner agreements
- Prohibition of recreational activity near the water supply intake
- Prohibition of sewer discharge in the watershed
- A monitoring program
- An annual report
- Long term plan of implementation.

The letter defined a time schedule and addressed disinfection criteria and further recommended filtration. Continued source water monitoring, as required by SWTR, was also referenced.
C. EPA Letter to Town of Pinedale - June 10, 1992 and Administrative Consent Order

The June 10 letter from EPA to the Town of Pinedale was sent Certified Mail Return Receipt Requested to the Honorable Miriam Carlson, Mayor, and signed by Max H. Dodson, Director, Water Management Division, Region VIII.

This letter transmitted "Administrative Consent Order," dealing with the Town's effort to meet the criteria to avoid filtration and to ensure compliance with the disinfection requirement for a public water system. The letter also defined some time schedules and commented on applicable possible penalties.

The Administrative Consent Order:

- Defined statutory authority
- Presented findings that:
  1. Pinedale is a municipality within the meaning of applicable Federal Law.
  2. The Town owns and operates the Municipal Water System.
  3. The system is a "community water system."
  4. The Town owns and operates a Public Water System and is subject to compliance with Federal Regulations.
  5. The system is supplied solely by Fremont Lake, a surface water source.
  6. 40 CFR §141.70 establishes criteria to require filtration.
  7. 40 CFR §141.7 establishes criteria to provide treatment.
  8. 40 CFR §141.71 establishes criteria for avoiding filtration.
  9. Pinedale uses a surface water source, does not filter and does not meet disinfection requirements specified under 40 CFR §141.72 (a).
Stipulated an order to:

1. Continue to monitor source water conditions as required by Federal Regulations.
2. Submit detailed plans for monitoring a watershed control plan.
4. Provide for an annual on-site inspection of the watershed control program.
5. Submit detailed plans to EPA by July 31, 1993 for system modifications to achieve inactivation rates in compliance with Federal Regulations.
7. Continue to monitor residual disinfectant concentrations.
11. Initiate filtration within 18 months of failure of system to comply with Federal Regulations.
12. Comply with Federal Regulations by reporting any failure to comply with National Primary Drinking Water Regulations to EPA and the State within 48 hours of any such failure.

The Administrative Consent Order also presented General Provisions to the effect that:

1. The Order does not constitute a waiver, suspension or modification to any applicable Federal Regulations or provisions of the SDWA.
2. Violation of any terms of the Order may subject the Town of Pinedale to civil penalties.
3. Violation of the requirements of SDWA may subject the Town to civil penalties.

4. The Order does not relieve the Town of any responsibilities of any other federal, state or local laws.

5. Town of Pinedale waives its right to a hearing when the Administrative Consent Order becomes effective.

6. The Order becomes effective upon the signature of both parties.

The Administrative Consent order was not signed by the Town of Pinedale as of the date of this Phase II Report.

D. Summary Phase I Study and Report


- Technical Team

The technical team assigned to this study consisted of professional personnel from the following firms:

- Johnson-Fermelia Co. Inc. Management/Prime Consultant
  Rock Springs, Wyoming

- Lidstone & Anderson, Inc. Watershed Management
  Fort Collins, Colorado
  Planning/SDWA Interpretation

- T.S.T. Engineers Water Treatment
  Fort Collins, Colorado

- Bishop-Brogden Associates Inc. Geology and Groundwater
  Lakewood, Colorado

- George F. (Pete) Dana Geology and Groundwater
  Laramie, Wyoming
Investigation, Field Work and Meetings

The investigation and field work was conducted from July 1992 on through January 1993. The investigation included data research, field reconnaissance, personal contacts, reconnaissance by boat and a fly-over of Fremont Lake and Pine Creek and Fremont Creek watersheds to the Continental Divide.

Meetings conducted during the course of the work included:

1. Scoping Meeting in Pinedale with the EPA, WWDC, Mayor and Town Council - September 14, 1992.

Alternatives Studied

The alternatives that were examined are divided into two basic categories:

1. Filtered System
2. Unfiltered System

Facilities considered in the filtered system consisted of:

1. 3 M Bag Filter Pilot Test Run
2. Improved Disinfection and Storage
3. Fluoridation
4. Rapid Rate Filtration
5. Slow Sand Filtration
6. Diatomaceous Earth Filtration
Facilities or options considered in the unfiltered system included:

1. Improved Disinfection and Storage
2. Fluoridation
3. Conversion to a Groundwater Source
4. Glacial Moraine Diversion
5. Watershed Management Control Plan

The 3M Bag Filter pilot test run proved to be unsatisfactory due to the short bag-life experienced during the pilot run. This alternative was therefore dropped from further consideration.

The glacial moraine diversion was initially identified as a potentially viable option because of the possibility that wells drilled into the glacial moraine might produce water in sufficient quantity and quality to avoid filtration. Essentially, the glacial moraine deposits would provide a filtering affect on groundwater moving from the lake into the wells. The work conducted during the groundwater investigation phase of the study revealed that the geological conditions around the lake were not conducive to this theory. Therefore, the glacial moraine diversion concept was dropped from further consideration.

Ultimately, five alternates were examined in sufficient depth to develop estimates of capital and operating costs. These five alternates are explained as follows:

<table>
<thead>
<tr>
<th>Alternate</th>
<th>Project Features</th>
</tr>
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<tbody>
<tr>
<td>I.</td>
<td>Rapid Rate Filtration, Storage and Improved Disinfection</td>
</tr>
<tr>
<td>II.</td>
<td>Slow Sand Filtration, Storage and Improved Disinfection</td>
</tr>
<tr>
<td>III.</td>
<td>Diatomaceous Earth Filtration, Storage and Improved Disinfection</td>
</tr>
</tbody>
</table>
IV. Improved Disinfection, Storage and Watershed Management Control Plan

V. Conversion to a Groundwater Source

Alternates I, II and III apply to a filtered system and Alternates IV and V involve a non-filtered system.

- Project Costs

Capital, operating, present worth of operating costs, and total present worth costs are presented in the following table.

<table>
<thead>
<tr>
<th>ALTERNATE</th>
<th>CAPITAL COSTS</th>
<th>ANNUAL OPERATING COSTS</th>
<th>PRESENT WORTH* OF OPERATING COSTS</th>
<th>TOTAL PRESENT WORTH COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>$1,469,930.00</td>
<td>$82,795.00</td>
<td>$1,139,670.00</td>
<td>$2,729,900.00</td>
</tr>
<tr>
<td>II</td>
<td>$2,286,870.00</td>
<td>$62,406.00</td>
<td>$859,020.00</td>
<td>$3,145,890.00</td>
</tr>
<tr>
<td>III</td>
<td>$1,380,460.00</td>
<td>$109,040.00</td>
<td>$1,500,940.00</td>
<td>$2,881,400.00</td>
</tr>
<tr>
<td>IV</td>
<td>$690,800.00</td>
<td><strong>$61,546.00</strong></td>
<td>$847,200.00</td>
<td>$1,538,000.00</td>
</tr>
<tr>
<td>V</td>
<td>$1,924,500.00</td>
<td>$113,500.00</td>
<td>$1,562,000.00</td>
<td>$3,516,500.00</td>
</tr>
</tbody>
</table>

* Present Worth - 30 years @ 6%
** Includes $10,000 per year for Watershed Management Control Plan

- Comments on Unfiltered System

It must be pointed out that there are various potential problems associated with the Unfiltered System (Alternate IV) that incorporates a watershed management control plan into the operation of the system. These potential problems consist of events or conditions which are referred to as "triggering mechanisms" that would force abandonment of the unfiltered plan and conversion to a filtered
These "triggers" include eleven events or conditions that are specified in: Chapter 40, Code of Federal Regulations; the Safe Drinking Water Act (SDWA); Surface Water Treatment Rules (SWTR); and the EPA Letters of March 17, 1992 and June 10, 1992; and the Administrative Consent Order.

**Least Cost Alternatives**

Further analysis was completed for Alternates I and III for the Filtered System Alternatives and Alternate IV for Unfiltered Alternatives to determine their impacts on water rates. These alternates were chosen for further analysis due to the lower overall present worth costs. The small difference in present worth costs between Alternates I and III required further examination to see which alternate actually resulted in lower estimates of water rates.

**Funding Sources**

Costs and financial obligations to the Town of Pinedale that would result from a specific water project were calculated on the assumption that:

1. The cost of some project features would qualify for a 50% grant and a 50% loan from the Wyoming Farm Loan Board (WFLB).

2. The cost of other features within the same project would qualify for a 67% grant and 33% loan from the Wyoming Water Development Commission (WWDC).

3. The loan portion of funding received from WFLB would be repaid over 30 years at 8 1/2% interest.

4. The loan portion of funding received from WWDC would be repaid over 30 years at 4% interest.

Costs of the alternates studied were therefore categorized as to funding source and the resultant water rates were calculated accordingly.
- **Projected Water Rates**

The following table provides the impact on water rates that would result from Alternates I, III and IV.

<table>
<thead>
<tr>
<th>TYPE OF SERVICE</th>
<th>EXISTING QUARTERLY RATE</th>
<th>QUARTERLY WATER RATES RESULTING FROM ALTERNATE</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Residence</td>
<td>$30.42</td>
<td>$74.22</td>
</tr>
<tr>
<td>Business</td>
<td>$38.88</td>
<td>$94.87</td>
</tr>
<tr>
<td>Bar</td>
<td>$75.96</td>
<td>$185.34</td>
</tr>
<tr>
<td>Apartment with 6 Units</td>
<td>$185.52</td>
<td>$445.35</td>
</tr>
<tr>
<td>Motel with 15 units</td>
<td>$178.20</td>
<td>$434.81</td>
</tr>
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</table>

The information presented in the foregoing table clearly demonstrates that:

1. The construction and subsequent operation of an unfiltered water system inclusive of a watershed management control plan (Alternate IV) will have a significant impact on water rates in the Town of Pinedale.

2. The construction and subsequent operation of a filtered water system (Alternates I or III) will impose a serious and dramatic impact on water rates in the Town of Pinedale.

- **Draft Phase I Report**


Appropriate drawings and maps were submitted with the report.
E. Public Meeting and Selected Plan

- Public Meeting - March 29, 1993

The findings, data, conclusions and maps of the Draft Phase I Report on the Pinedale Water Supply Project were presented to the Mayor, Town Council and residents of Pinedale in a public meeting on March 29, 1993 in the Sublette County Courthouse.

- Selected Plan

The Town of Pinedale requested that WWDC authorize JFC to proceed with a Phase II effort of the Pinedale Water Supply Project further defining Alternate IV of the Draft Report subsequent to the March 29 Public Meeting. This alternate considered an unfiltered system and embraced the development of the Watershed Management Control Plan as herein presented.

F. Amendment to Consultant's Contract

The WWDC authorized JFC to proceed with the Watershed Management Control Plan and Phase II of the study pursuant to Amendment No. III to their contract. That amendment authorized JFC to proceed with conceptual designs and cost estimates for the selected plan.

The tasks specifically authorized included:

Task 1 - Conceptual Design of Project Features
Task 2 - Cost Estimates
Task 3 - Geotechnical Evaluation of Project Site of Planned Structures
Task 4 - Surveying and Mapping as Necessary to Complete Phase II Effort
Task 5 - Permitting Requirements / Identification of Permits, Easements and Land Acquisition Necessary to Implement the Conceptual Design

Task 6 - Watershed Control Plan

Task 7 - Reports

Task 8 - Meetings

G. Watershed Management Control Plan

The Watershed Management Control Plan (Task 6 of the Phase II Study) has been completed and submitted to WWDC as a separate document together with maps and drawings that relate specifically to the Watershed Control Plan. A brief overview of the Watershed Management Control Plan is presented later in this Phase II Report.

H. Summary Phase II Report

- Facilities

Facilities and construction work considered in this Phase II Report include:

- 800,000 gallon storage reservoir
- Yard piping
- Soda ash feeder
- Chlorinator
- Stand by power
- Chemical feed building
- Mechanical
- Electrical / instrumentation
- Site work

- Capital Costs

Capital costs for project features are estimated to be $796,895.00.
Annual Operating Costs

Annual operating costs are estimated to be:

<table>
<thead>
<tr>
<th>Facility</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Facilities</td>
<td>$60,240.00</td>
</tr>
<tr>
<td>Watershed Management Control Plan</td>
<td>$10,000.00</td>
</tr>
<tr>
<td><strong>Total Annual Operating Costs</strong></td>
<td><strong>$70,240.00</strong></td>
</tr>
</tbody>
</table>

Funding Sources

Costs and financial obligations to the Town of Pinedale that would result from a specific water project were calculated on the assumption that:

1. The cost of some project features would qualify for a 50% grant and a 50% loan from the Wyoming Farm Loan Board (WFLB).
2. The cost of other features within the same project would qualify for a 67% grant and 33% loan from the Wyoming Water Development Commission (WWDC).
3. The loan portion of funding received from WFLB would be repaid over 30 years at 8 1/2% interest.
4. The loan portion of funding received from WWDC would be repaid over 30 years at 4% interest.

Costs of the alternates studied were therefore categorized as to funding source and the resultant water rates were calculated accordingly.

Projected Water Rates

The following table provides the impact on water rates that would result from the water project embraced in the selected plan and implementation of the Watershed Management Control Plan.
II. WATER SYSTEM IMPROVEMENTS

A. Background

The source of Pinedale's present water supply is Fremont Lake and its mountain tributaries. Studies have shown that the water within the lake is among the most chemically dilute lakes within the United States. The water quality is considered excellent, and the only treatment presently applied is chlorination.

The United States Environmental Protection Agency (EPA) finalized the Surface Water Treatment Rule (SWTR) on June 29, 1989 to address the increasing problem of waterborne disease outbreaks. This rule requires the treatment of all surface water supplies as a primary means of controlling giardia and enteric viruses. The rule also requires that public water systems be required to satisfy the design and operating standards of the state or other primary agencies to insure the overall removal or inactivation of at least 99.9% (3 log) of giardia cysts and 99.99% (4 log) of enteric viruses. Pinedale's water treatment methods and operations do not comply with the new regulations, and the Town is presently under an Administrative Consent Order which was issued by Region VIII EPA to implement the system modifications necessary for the water system to comply with the SWTR.
A Phase I - Preliminary Analysis study which evaluated the existing system and evaluated treatment alternatives needed to bring Pinedale's system into conformance with the SWTR was prepared for the Wyoming Water Development Commission in February of 1993. The Phase I study evaluated several treatment alternatives including:

- Slow sand filtration
- Rapid rate filtration
- Diatomaceous earth filtration
- Direct filtration

The Phase I study also evaluated the alternative of remaining as an unfiltered water supply and improving the water system to satisfy the Avoidance Criteria of the SWTR. It was the conclusion of this Phase I study that the most preferred alternative is to remain as an unfiltered water supply by developing a watershed control plan to protect the water quality of Fremont Lake and improving the disinfection capabilities to satisfy the CT requirements defined within the SWTR.

This report was submitted to the Wyoming Water Development Commission in February of 1993, and was later submitted to Region VIII of EPA for their review. EPA's review comments were received on April 22, 1993 and are attached in the appendix of this report.

The Phase II study will respond to EPA's comments and present a more detailed analysis and preliminary design of the unfiltered alternative. This study will also present a more detailed evaluation of the water quality and preliminary designs of system modifications required to comply with other safe drinking water regulations such as the Lead and Copper Rule.

The Phase II study will also address the changes in the SWTR. The draft of the Enhanced SWTR is presently under agency review by EPA. The new rule is directed at larger systems; however, it may contain an additional requirement for smaller systems such as the Town of Pinedale. Other considerations are the outbreaks of
cryptosporidiosis, which occurred in a number of isolated cases in the United States during the spring of 1993, and the concerns that these outbreaks have raised about the adequacy of the SWTR's *Avoidance Criteria*. Cryptosporidium is unaffected by chlorination. An effective watershed protection plan is therefore extremely important for unfiltered systems. EPA is considering more restrictions within the SWTR to protect against cryptosporidium entering public water systems. The proposed rule changes are expected in 1994. The removal requirements under the revised SWTR are expected to increase. Many systems that currently do not filter may ultimately find filtration necessary to protect the public health.

**B. Unfiltered Water Supply**

The SWTR specifies strict requirements that a public water system must meet to avoid filtration. Public systems which fail to satisfy these conditions must install filtration processes within 18 months of the failure of the system to meet the SWTR criteria. The conditions to avoid filtration are divided into two categories: 1) source water quality; and 2) site-specific conditions.

*Source Water Quality Conditions*

- Coliform level
- Turbidity levels

*Site-Specific Conditions*

- Disinfection
- Disinfection equipment redundancy
- Disinfection residual entering the distribution system
- Disinfection residual within the distribution system
- Approved watershed control program
- Annual inspection
- Absence of waterborne disease outbreak.
- Compliance with the total coliform (MCL)
- Compliance with the total trihalomethane (TTHM) MCL
C. Source Water Quality

The water supply from Fremont Lake is consistently of better quality than the source water quality requirements of the SWTR. Test results have never exceeded the SWTR limits of:

- Total coliform - 100/100 ml
- Fecal coliform - 20/100 ml

Turbidity is consistently 0.2 NTU and seldom higher than 0.4 NTU. The SWTR's limit for turbidity is 5.0 NTU. The water supply from Fremont Lake easily fulfills the source water quality requirement of the Avoidance Criteria.

D. Site-Specific Conditions

The site-specific conditions of the Avoidance Criteria place very rigid use controls, monitoring, and performance requirements upon unfiltered water supplies. Protection of the public is dependent upon a watershed control plan and reliable disinfection facilities.

The watershed control program must be implemented to minimize the potential for source water contamination by viruses and the giardia cyst. Watershed characteristics and uses that may threaten or degrade the source water quality must be identified. The public entity must demonstrate that it can control the human and other activities within the watershed of the water source. The specifics of the watershed control plan are presented in the Watershed Management Control Plan, bound and submitted separately from this Phase II Report.

Disinfection is the sole process for the inactivation of the microbial and bacteriological elements of an unfiltered water supply, and as such, the Avoidance Criteria impose very rigid monitoring and performance requirements. A failure to meet these requirements will result in an immediate order to add filtration.
Pinedale presently chlorinates. The chlorination facility is located approximately 2800 l.f. downstream of the Town's intake to the water system. There is approximately 10,000 l.f. of 14-inch diameter transmission line downstream of the chlorination facility before the water enters the distribution system. The chlorine residual at this location is normally held at 1.2 mg/l. Monitoring tests of chlorine residuals within the distribution system are normally 1.0 mg/l. There is no record of a test result which indicated that the residual within the Town's system was less than the 0.2 mg/l required by the Avoidance Criteria.

The Town has never experienced an outbreak of waterborne diseases, nor are there any reported violations of the maximum contaminant levels for total coliform and total trihalomethanes.

Pinedale's water supply consistently complies with the site-specific conditions related to disinfection residuals, MCLs of TTHM, total coliform, and the absence of waterborne disease outbreaks.

The only identifiable deficiencies within Pinedale's disinfection process are system reliability during power outages and equipment failures, and disinfection contact time during peak hourly use.

The Phase I report recommended the addition of potable water storage to increase the contact time plus the addition of redundancy equipment for the chlorination process. The Phase II study will present a more detailed evaluation of this alternative.
III. FINISHED WATER STORAGE

A. Design Criteria

Storage volumes are required within Pinedale's water system to satisfy the CT requirements for the 3-log inactivation of giardia. However, because of the prospects of more restrictive SWTR regulations and the anticipation that EPA may eventually require filtration for the Town of Pinedale, the design criteria used for the Phase II study included considerations for the design standards of Wyoming DEQ as well as the volume required to meet the CT requirements of the SWTR.

Wyoming DEQ requires storage equal to 25 percent of the maximum daily demand plus fire storage in accordance with the State Fire Marshall or the Local Fire Agency. The maximum daily demand was computed in the Phase I report and projected to be 1.5 mgd for the year 2022.

<table>
<thead>
<tr>
<th>Storage Volume</th>
<th>Wyoming DEQ Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>25% of Maximum Day</td>
<td>375,000 gallons</td>
</tr>
<tr>
<td>Fire flow 2500 gpm for 2 hours</td>
<td>300,000 gallons</td>
</tr>
<tr>
<td>TOTAL</td>
<td>675,000 gallons</td>
</tr>
</tbody>
</table>

The CT value to meet the SWTR requirements is estimated to be 170, based upon a temperature of 5°C, a pH of 7.3, and a chlorine residual of 1.2 mg/l. The existing CT value within the pipeline downstream of the chlorinator facility was computed to be 48.

\[
\frac{CT_{\text{pipeline}}}{CT_{\text{required}}} = 0.28 < 1
\]

The existing ratio of CT/CT_{required} is less than 1; therefore, additional contact time is required. The present system is estimated to be deficient by a CT of 134 ml-min.
These calculations are based upon a water temperature of 5°C, a pH of 7.3, chlorine residual of 1.2, a \( T_{10}/T \) ratio of 0.3, and a sustained peak-hour flow of 2,000 gpm. The estimated volume required to fulfill the CT deficiency is 744,000 gallons.

EPA has questioned previous calculations which use a chlorine residual of 2.0 mg/l which the agency considered too high. The new calculations use a chlorine residual of 1.2 mg/l which is the actual current residual entering Pinedale's distribution system. EPA also questioned the use of a \( T_{10}/T \) value of 0.3. The EPA Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources use the 0.3 value for a baffling classification of poor. Internal baffling and improved inlet and outlet conditions can be designed within the storage reservoir. A \( T_{10}/T \) value of 0.3 is therefore considered conservative.

The Phase II study recommends that a potable water storage reservoir be added to Pinedale's water system and that the storage volume be a minimum of 800,000 gallons. This volume of storage will satisfy the disinfection requirements of the SWTR and also satisfy the storage requirements of the Wyoming DEQ.

Storage is preferred for a number of reasons:

1. Storage volumes provide the chlorination contact time to comply with the CT requirements of the SWTR.
2. Storage provides emergency supplies during equipment failures.
3. Storage provides equalization volumes which will improve the operating efficiency of filtration facilities if, and when, filtration is required.
4. Storage provides reserve supplies for fire protection.

B. Storage Tank Site

Exhibit A, bound in the back of this report, illustrates the location and site improvements for the storage tank. The selected site is located on land owned by the
Bureau of Land Management in the Northwest quarter of Section 26, Range 109 West, and Township 34 North. A preliminary geotechnical investigation was conducted as part of the Phase II study. Bearing values at the tank site are approximately 2,500 pounds per square foot, which are suitable values for a reservoir structure. The site is adjacent to a platted subdivision. Many of the lots are occupied; therefore, it is recommended that the structure be partially buried to camouflage it from the view of the neighboring residents. The structure must therefore be constructed of post-tensioned reinforced concrete. A preliminary design of the reservoir is presented in Exhibit B.

Other tank site improvements include the installation of an isolation valve on the existing 14-inch waterline to divert flows to the tank, an altitude valve and vault to control flows to the tank, piping and valves, and access improvements. The tank site will also include building-to-house chemical feed equipment to control corrosivity and a new meter and vault. These facilities will be discussed in later sections of this report.

IV. EQUIPMENT - REDUNDANT DISINFECTION

Pinedale's existing chlorination facility is equipped with gas chlorinators. Existing equipment also includes two on-line chlorine booster pumps and automatic switch-over equipment to change the feed from one chlorine cylinder to the other before the first empties or becomes inoperable. The facility is reliable but is vulnerable to equipment failures and power outages. The SWTR requires either redundant disinfection equipment with auxiliary power and automatic start-up and alarms, or an automatic shutoff of the delivery of water to the distribution system when the chlorine residual declines below 0.2 mg/l. Pinedale has one supply source and will be extremely vulnerable if this supply is interrupted. An automatic shutdown of the supply is therefore not recommended.
It is recommended that the existing facilities be improved to provide total redundancy. The proposed improvements include:

1. A 15 KVA gasoline-powered standby generator with automatic transfer switch. This generator will be housed in a weatherproof container located outside of the existing chlorination facility. This generator will be capable of generating sufficient electricity to power the chlorine booster pump, instrumentation, and lighting.

2. A spare chlorine feed system which is identical to the existing chlorinator. The spare chlorine feed system can be manually activated if the main system is inoperable.

Complete redundancy of the chlorine feed equipment plus standby power, in combination with a storage reservoir that contains finished water which meets the CT requirement of the SWTR, provides the Town of Pinedale with an extremely reliable and safe water supply.

V. LEAD AND COPPER RULE

The Corrosion Rule (Lead and Copper Rule) was adopted by EPA in May of 1991. It set maximum contaminant levels for lead and copper at 15 ppb and 1.3 mg/l, respectively. The levels in the potable water supply must be met at the consumer's tap. Elevated lead and copper levels in drinking water usually are related to the use of lead service lines, copper pipe, and lead solder. Lead and copper enter the potable systems through corrosion. If the above-referenced levels are exceeded, the water provider must respond by conducting a corrosion-control study and implementing mitigation measures.

Water quality will serve as an indicator of corrosivity and the potential of lead and copper levels in the drinking water. The Phase I study concluded that the water from Fremont Lake was corrosive as indicated by the internal corrosion in the asbestos cement pipeline and by the popular indices such as the Langlier Index and the Aggressiveness Index.
Pinedale will begin monitoring tests to detect the lead and copper concentrations within its potable water in September of 1993. The results of monitoring tests are therefore unavailable at this time to evaluate the true corrosivity of the drinking water.

Additional water sampling and testing were therefore conducted during the Phase II study to confirm earlier conclusions. The corrosion indices computed from the new water tests are as follows:

<table>
<thead>
<tr>
<th>Langlier Index</th>
<th>- 3.86</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressiveness Index</td>
<td>8.38</td>
</tr>
</tbody>
</table>

Negative Langlier Index values indicate corrosive water. Aggressiveness Index values less than 10 also indicate corrosive water.

The two most popular indices, therefore, indicate a very aggressive water and confirm earlier conclusions that the Town of Pinedale may have elevated lead and copper concentrations in their drinking water.

The reliability of using these indices as indicators of lead and copper problems were tested during Phase II work by taking one "first draw" sample from the Wagon Wheel Motel and testing this water sample for lead and copper. The results of this test show lead and copper concentrations to be 0.016 mg/l and 1.95 mg/l, respectively. The lead and copper concentrations within this water sample exceed the MCL, as defined by the Corrosion Rule, by 0.001 mg/l and 0.65 mg/l, respectively. It must be noted that this is the result of a single test of one sample, and should not be interpreted to indicate that a problem with lead and copper concentrations exists throughout Pinedale's water system. The test results do, however, indicate that there is a potential corrosivity problem and that mitigation measures may be necessary.

It is the conclusion of the Phase II study that the corrosiveness of the drinking water must be corrected. Laboratory tests and theoretical water chemistry calculations show that the
corrosiveness can be reduced by adding small concentrations of lime and soda ash to the drinking water to raise the pH, alkalinity, and hardness. Soda ash is added to increase the carbonate alkalinity. Its concentrations must be controlled because this chemical adds sodium to the water. Sodium at elevated concentrations can have negative health consequences. Lime is added to increase the calcium hardness. Laboratory tests of water samples treated with a combination of the two chemicals show that the corrosivity of Pinedale's water can be reduced, as indicated by the positive adjustments to the values for the Langlier Index and the Aggressiveness Index.

Preliminary designs were prepared for the chemical feed facilities. Schematic drawings of these facilities are shown on Exhibit C. The optimum location for chemical feed facilities is downstream of the proposed storage reservoir. Chlorine disinfection is most effective at lower pH and alkalinity values. Chemical adjustments to pH and alkalinity should, therefore, occur downstream of the disinfection process.

VI. LAND ACQUISITION - PERMITTING

A. Bureau of Land Management

The site for the water storage tank and chemical feed building is located on Federal land under the jurisdiction of the Bureau of Land Management (BLM). A right-of-way for the site will have to be obtained from the BLM by filing a SF 299 form. This form will require preparation of an appropriate legal description and map of the property and explanation of the intended use. Plans for the tank and building should be submitted with the SF 299.

The drawings, map and SF 299 should be submitted to:

Bureau of Land Management
P.O. Box 299
Pinedale, WY 82941
B. Wyoming Department of Environmental Quality

A permit to construct the water storage tank, chemical feed building, back-up chlorinator, stand-by power generator and related piping will have to be obtained from the Wyoming Department of Environmental Quality (DEQ). Construction plans for these facilities should be submitted in their final form to the Lander Office of the DEQ at:

State of Wyoming
Department of Environmental Quality
Water Quality Division
250 Lincoln St.
Lander, WY 82520

C. Sublette County

Construction plans should be submitted to the Sublette County Planning and Zoning Office to obtain a County Building Permit. The Planning and Zoning Office is located in:

Sublette County Courthouse
Pinedale, WY 82941

VII. WATERSHED MANAGEMENT CONTROL PLAN

A. Overview

A detailed Watershed Management Control Plan has been completed as part of this Phase II effort. That plan is bound separately from this Phase II Report; however, a brief overview of the plan is presented here to demonstrate what the plan involves. The costs of implementing and operating the plan are included in the Phase II Report and integrated with other appropriate costs to arrive at an estimate of water rates necessary to amortize a water project inclusive of the Watershed Management Control Plan. A Schedule for Implementation of the Plan is also included herein.
The following elements are involved with approving and implementing the plan:

- **Watershed Management Control Plan Review**

The plan is presently under review by:

1. Wyoming Water Development Commission
2. Town of Pinedale
3. EPA

- **Plan Authorization**

Funding and implementation of the Plan will have to be authorized by the Town Administration upon approval and acceptance of the Plan by EPA.

- **Physical Works**

Various physical elements will have to be constructed and erected to establish the plan which consist of:

1. Identifying monitoring points.
2. Erecting signs.
3. Delineating a control zone around the water system intake to prohibit boating and ice fishing.

- **Monitoring Program**

A water quality monitoring program will have to be initiated. The program calls for drawing water samples on a quarterly basis at six locations around the lake. The samples will then be analyzed for water quality constituents and contents.
- Landowner Agreements

Agreements with all landowners and lessees in the watershed will have to be executed with the Town of Pinedale prohibiting activities that could lead to or result in contaminants entering the lake.

- Commitments from Sublette County

Commitments will have to be obtained from Sublette County to the effect that they will require permits for all small wastewater facilities to be constructed in that watershed and that they will also inspect such facilities for compliance during construction.

- Closure of South Fremont Boat Ramp

The plan calls for closing the south Fremont Boat Ramp due to its proximity to the water system intake. Approval of this closure must be obtained from the U.S. Forest Service and Wyoming Game and Fish Commission.

All the foregoing items are addressed and explained in the Watershed Management Control Plan.

B. Cost

The costs of implementing and monitoring the Watershed Management Control Plan are presented in Section X, Cost Estimates, of this report.

C. Schedule

The Schedule for Implementation of the Watershed Management Control Plan is bound in the back of this report.
VIII. PROJECT FUNDING

A. Funding Sources

Various elements of this water project will qualify for funding from the Wyoming Water Development Commission (WWDC) and Wyoming Farm Loan Board (WFLB).

The following project features qualify for loans and grants from WWDC:

- Pumping facilities
- Conveyance pipelines
- Storage facilities

Costs for these features could be funded by a 67% grant; 37% loan from WWDC. The loan portion would be paid back over a 30 year period at 4% interest.

The following project features qualify for loans and grants from WFLB:

- Water treatment facilities including buildings
- Plant piping
- Back wash pumping facilities
- Soda ash, fluoride and polymer feeders
- Chlorination equipment
- All other equipment and facilities necessary for treatment and disinfection

Costs for project features qualifying for funding from WFLB would be financed by a 50% loan and 50% grant. The loan portion would be repaid over 30 years at 8.5% interest.

All project operating costs and expenses to implement and maintain the Watershed Management Control Plan would have to be born by the Town of Pinedale. These costs plus money to repay loans from WWDC and WFLB are assumed to be recovered through increased water rates.
IX. COST ESTIMATES

A. Watershed Management Control Plan

The first year's costs to implement the Watershed Control Plan are estimated to be $13,500.00. Annual costs thereafter are estimated to be $7,000.00. These figures, however, are rounded to $10,000.00 per year on the assumption that the Town will recoup the amount in excess of $10,000.00 expended in the first year and to provide a cushion for inflation in future years. Also, a small reserve can be built up to pay for repairs and replacement to signs and markers for the intake control zone and other unanticipated expenses.

A detailed itemization of costs to establish, operate and administer the Watershed Management Control Plan is presented on the following pages.
FIRST YEAR COSTS:

Signs:
- Trailhead Signs - 2 @ $250.00 ......................... $500.00
- Boat Launch Areas - 4 @ $250.00 ....................... $1,000.00
Subtotal Signs ........................................... $1,500.00

Intake Control Zone Markers:
- Buoys, etc. .................................................. $1,250.00
- Monitoring Point Markers - 6 @ $100.00 ............... $600.00
- Portable Generator and Pump ............................ $600.00
- Incidental Supplies ........................................ $500.00
- Legal Fees ................................................. $2,000.00

First Year - One Time Cost ................................ $6,450.00
(round to) ................................................... $6,500.00

MONITORING PROGRAM (PER QUARTER):
- Boat / Snow Machine Rental .............................. $200.00
- Water Quality Analysis ................................... $1,000.00
- Labor - 8 hours @ $25.00/hr. ............................. $200.00
- Incidental Supplies ........................................ $100.00

Total Quarterly Cost for Monitoring Program .......... $1,500.00

Annual Cost - Monitoring Program ....................... $6,000.00

ANNUAL REPORT:

40 Hours @ $25.00/hr. ....................................... $1,000.00

Total Annual Cost of Monitoring Program and Annual Report .......... $7,000.00

Plus First Year - One Time Costs ......................... $6,500.00

Total First Year Costs ...................................... $13,500.00
(Assume Annual Cost of $10,000.00)
B. System Improvements

Construction costs for the storage tank, chemical feed building, redundant chlorination and appurtenances are estimated as follows:

- 800,000 Gallon Storage Reservoir ... $280,000
- Yard Piping ................. $71,000
- Lime Feeder ................. $27,000
- Soda Ash Feeder ........... $25,900
- Chlorinator ................. $5,000
- Stand By Power ............. $15,000
- Chemical Feed Building ...... $38,000
- Mechanical .................. $30,000
- Electrical / Instrumentation . $40,000
- Site Work ..................... $42,000

Total Construction Cost ........ $573,900

Estimates of annual operating costs for system improvements are given below:

Chemicals:
- Soda Ash ................... $12,000
- Lime ....................... $27,000
- Chlorine ................... $5,000
- Power ....................... $2,200
- Labor ....................... $14,040

Total Annual Operating Costs .... $60,240

C. Capital Costs Funded under WWDC and WFLB

Capital costs allocable to loans and grants from WWDC and WFLB are segregated on the following pages. Annual costs for repayment to loans from WWDC and WFLB are also presented.
## IMPROVED DISINFECTION AND STORAGE

### Costs Qualifying for Funding from WWDC

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation of Final Designs and Specifications</td>
<td>$31,440.00</td>
</tr>
<tr>
<td>Permitting and Mitigation</td>
<td>$8,000.00</td>
</tr>
<tr>
<td>Legal Fees</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>Acquisition of Access and Rights-of-Way</td>
<td>$7,000.00</td>
</tr>
</tbody>
</table>

### Cost of Project Components

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>800,000 Gallon Storage Reservoir</td>
<td>$280,000.00</td>
</tr>
<tr>
<td>Site Work</td>
<td>$42,000.00</td>
</tr>
<tr>
<td>Yard Piping</td>
<td>$71,000.00</td>
</tr>
<tr>
<td><strong>Construction Cost Subtotal</strong></td>
<td><strong>$393,000.00</strong></td>
</tr>
<tr>
<td>Engineering Cost (10%)</td>
<td>$39,300.00</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$432,300.00</strong></td>
</tr>
<tr>
<td>Contingency (15%)</td>
<td>$64,845.00</td>
</tr>
<tr>
<td><strong>Construction Cost Total</strong></td>
<td><strong>$497,145.00</strong></td>
</tr>
</tbody>
</table>

Construction Cost Total ........................................ $547,585.00

### Project Cost Total (WWDC Funding) ........................................ $547,585.00

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>67% Grant</td>
<td>$366,880.00</td>
</tr>
<tr>
<td>33% Loan</td>
<td>$180,705.00</td>
</tr>
<tr>
<td>Annual Debt Service (WWDC) 30 years @ 4%</td>
<td>$10,450.00</td>
</tr>
</tbody>
</table>
Costs Qualifying for Funding from WFLB

Preparation of Final Designs and Specifications .................... $14,470.00
Permitting and Mitigation ............................................ $2,000.00
Legal Fees ......................................................... $1,000.00
Acquisition of Access and Rights-of-Way .......................... $3,000.00

Cost of Project Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lime Feeder</td>
<td>$27,000.00</td>
</tr>
<tr>
<td>Soda Ash Feeder</td>
<td>$25,900.00</td>
</tr>
<tr>
<td>Chlorinator</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>Stand By Power</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Chemical Feed Building</td>
<td>$38,000.00</td>
</tr>
<tr>
<td>Mechanical</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>Electrical /Instrumentation</td>
<td>$40,000.00</td>
</tr>
</tbody>
</table>

Construction Cost Subtotal .................. $180,900.00

Engineering Cost (10%) ....................... $18,090.00
Subtotal ........................................ $198,990.00
Contingency (15%) ............................ $29,850.00
Construction Cost Total ........................ $228,840.00

Construction Cost Total ................................ $228,840.00

Project Cost Total (WFLB Funding) ................. $249,310.00

- 33 -
50% Grant .................................................. $124,655.00
50% Loan .................................................. $124,655.00

Annual Debt Service (WFLB) 30 years @ 8.5% (.09305) .................... $11,600.00
Annual Debt Service (WWDC) ........................................ $10,450.00

Annual Operating Costs ........................................... $60,240.00

Watershed Management Control Plan ................................. $10,000.00

Total Annual Costs ................................................ $92,290.00
X. PROJECTED WATER RATES

The foregoing cost figures demonstrated that annual costs to maintain the Watershed Management Control Plan, satisfy debt service to WWDC and WFLB and meet operating expenses total $92,290.00. Annual revenues from existing water rates generate $95,000.00 annually which presumably covers current water system operating costs. The total of $92,290.00 equals 97% of $95,000.00; therefore, water rates would have to be increased by 97% to meet the financial obligations necessary to construct and operate the facilities outlined herein, inclusive of the Watershed Management Control Plan.

The resulting water rates are summarized in the following table:

<table>
<thead>
<tr>
<th>TYPE OF SERVICE</th>
<th>EXISTING QUARTERLY RATE</th>
<th>QUARTERLY WATER RATES RESULTING FROM PROJECT AND IMPLEMENTATION OF CONTROL PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence</td>
<td>$30.42</td>
<td>$60.00</td>
</tr>
<tr>
<td>Business</td>
<td>$38.88</td>
<td>$77.00</td>
</tr>
<tr>
<td>Bar</td>
<td>$75.96</td>
<td>$150.00</td>
</tr>
<tr>
<td>Apartment with 6 Units</td>
<td>$185.52</td>
<td>$366.00</td>
</tr>
<tr>
<td>Motel with 15 units</td>
<td>$178.20</td>
<td>$351.00</td>
</tr>
</tbody>
</table>

XI. TIME SCHEDULES

The Schedule for Implementation of Phase II Project Features and Schedule for Implementation of the Watershed Management Control Plan are bound in the back of this report. The concurrent implementation of both schedules is necessary to achieve full compliance with EPA mandates.
The Schedule for Implementation of Phase II Project Features is predicated on the assumption that the application to WFLB funding will be submitted in mid-April for action by WFLB in their July meeting.

Also the construction period shown on this schedule extends into mid-December. An early, severe winter may preclude construction work extending beyond perhaps mid-November or so, in which case a Stop Order would be issued to the contractor so that work could be suspended and resumed in the Spring of 1995 at such time as weather conditions permit.
APPENDIX
Ref: 8WM-DW-PWS1&E

Honorable Miriam Carlson, Mayor
Town of Pinedale
Box 709
Pinedale, WY 82941

Re: Pinedale Water Supply Project Phase I Report
PWS ID# 5600041C

Dear Mayor Carlson:

The Wyoming Water Development Commission sent us a copy of the Pinedale Water Supply Project Phase I Draft Interim Report for review.

We have reviewed the report and noticed that detailed plans for a watershed control program, system modifications to meet the disinfection treatment requirements, and system modifications for redundant disinfection system were not furnished in the Phase I report nor identified as a task of the Phase II study.

The requirement to submit these plans was specified in the Administrative Consent Order Docket No. 8-PWS-VIII-92-21 (ACO) issued on June 10, 1992 under order items #2, #5, and #8. The deadline for submitting these plans to EPA is July 31, 1993. Therefore, these plans must be included in the Phase II study if Pinedale still wants to retain the option of remaining unfiltered.

We also have some comments on the Phase I report; these are noted below:

Criteria used to estimate the filtered water storage volume were different from the criteria used for the unfiltered alternative. We strongly recommend that the cost estimates for both filtered and unfiltered alternatives be based on the same criteria from Wyoming DEQ if the storage volume to meet CT requirement is not the governing factor.

Disinfection contact time was estimated based on the assumption of the T10/T ratio of 0.3. We recommend that a more conservative assumption be used for this estimate at this preliminary stage.
Honorable Miriam Carlson, Mayor  
Town of Pinedale  
Page 2

Water storage volume to meet the CT requirement was estimated assuming a chlorine residual of 2 mg/l by the engineer. This concentration is equivalent to a swimming pool chlorine concentration. This high chlorine residual may create taste and odor complaints from water users. Also, this high chlorine residual is not recommended for a public water supply system if total trihalomethane is a concern to the system. The Surface Water Treatment Rule (SWTR) requires that chlorine residual be maintained at a minimum of 0.2 mg/l at the entrance to the distribution system and remain detectable throughout the distribution system. Long chlorine contact time, not high chlorine residual concentration, should be designed to meet the CT requirement.

In the Phase I report, annual operating labor costs for the unfiltered alternative did not reflect the intensive labor required for source water monitoring to meet the avoidance criteria (this requirement is in addition to the watershed control program.) Moreover, this report indicated that labor costs for slow sand filtration are high compared to the other filtration alternatives. It is my understanding that slow sand filtration generally has low labor costs; however, this report indicates the opposite.

Cost estimates for all three filtration treatment alternatives are high because they are based on the current high consumption rate in Pinedale. The reason for this high rate is because water is not metered, but charged on a flat rate. The average daily water usage for Pinedale is among the highest in Wyoming (average daily use per capita per day is 853 gallons), and the water fee is among the lowest (average monthly water bill for a family of four is $10.15). This information is based on the 1992 Municipal Water Rates Survey in Wyoming. If Pinedale were to install water meters to encourage water conservation, the cost estimates for all of the filtration alternatives would be more affordable.

We are concerned about the degraded water quality in the Fremont Lake. As pointed out in the report, dissolved solids concentration is 50 mg/l in 1991 compared to that of 13 mg/l in 1972. This concern was also expressed in the letter EPA sent to you on March 17, 1992 (USGS studies concluded that an average of 800 tons of net sediments are transported to the Fremont Lake annually.) We strongly recommend that Pinedale implement a watershed control program as soon as possible not only because it is required for Pinedale to meet the avoidance criteria but to protect the water quality in Fremont Lake.
The report also indicates that there is some flexibility in the deadlines and penalties imposed by the EPA (page 66). Any changes in the deadlines/penalties in the administrative consent order (ACO) will require an amended consent order to be issued. EPA was flexible when working with Pinedale officials to develop compliance deadlines for the ACO to allow Pinedale to explore the option of remaining unfiltered. However, any violation of the compliance deadline in this ACO will trigger filtration requirements.

If you have any questions or need further information, please do not hesitate to contact me or Mary Wu at 1-800-227-8917, Ext. 1413; or 1-303-293-1413.

Sincerely,

Debra J. Kovacs, Chief
PWS Implementation and Enforcement Section

cc: Honorable Craig Thomas
    Mike Carnevale, WWDC
    Brad Miskimins, WFLB
TST INC.
102 Inverness Terrace E
Englewood, CO  80112

Attn: Bob Takeda
Received: 10-Sep-93 14:19
Project: 
PO #: 
Job: 938342E  Status: Final

ANALYTICAL REPORT PACKAGE

CASE NARRATIVE.................................i
ANALYTICAL RESULTS...........................R-1
QUALITY CONTROL REPORT.......................Q-1
CASE NARRATIVE

A total of 1 Water sample was received on 10-Sep-93. All were properly preserved and in good condition. As stated in the chain of custody, the sample was run for the following analyses: Pb and Cu. Our procedures are summarized on the Quality Control Data Sheet. Each sample was extracted and analyzed within the proper holding times.

Quality control standards for organic and inorganic analyses followed the appropriate SW-846 or EPA methodology. For radiochemistry, the acceptance criteria for spikes and laboratory control standards is fifteen percent, plus the counting error. Duplicates will pass if the Replicate Error Ratio (RER) is 1.00 or less. The RER is defined as follows:

\[
RER = \frac{\text{ABS}(R2 - R1)}{\text{SQRT}((\text{ERROR1}^2 + \text{ERROR2}^2))}
\]

where: \(R1/R2 = \text{original/duplicate sample result}\)

\(\text{ERROR1/ERROR2} = \text{total 2 sigma uncertainty of R1/R2}\)

All QC checks, including duplicates, spikes, and blanks, passed.

Signed:  
Steven L. Sincoff, Ph.D.
Director of Operations
Attn: Bob Takeda

Project:

PO #:

Job: 938342E

Status: Final

Sample Type: Water

<table>
<thead>
<tr>
<th>Sample Id</th>
<th>Lead Total (mg/l)</th>
<th>Copper Total (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TST #1</td>
<td>0.016</td>
<td>1.95</td>
</tr>
</tbody>
</table>
**Attn:** Bob Takeda  
**Project:**  
**Job:** 938342E  
**Status:** Final  

### QUALITY CONTROL REPORT

**Sample Type:** Water

<table>
<thead>
<tr>
<th>Sample Id</th>
<th>Lead Total (mg/l)</th>
<th>Copper Total (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate</td>
<td>0.016</td>
<td>1.95</td>
</tr>
<tr>
<td>Duplicate</td>
<td>0.017</td>
<td>1.96</td>
</tr>
<tr>
<td>Duplicate % diff.</td>
<td>6.1</td>
<td>0.5</td>
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<tr>
<td>Std (found value)</td>
<td>0.051</td>
<td>3.85</td>
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<tr>
<td>Std (true value)</td>
<td>0.050</td>
<td>4.00</td>
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<tr>
<td>Std % rec.</td>
<td>102</td>
<td>96.3</td>
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<tr>
<td>Blank</td>
<td>&lt;0.005</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Spike % rec.</td>
<td>107.2</td>
<td>100</td>
</tr>
</tbody>
</table>

**Received:** 10-Sep-93 14:19

**PO #:**
Attn: Bob Takeda

Project: 

Job: 938342E

PO #: 

Status: Final

Received: 10-Sep-93 14:19

Abbreviations:

Units:

mg/l : milligrams per liter
Attn: Bob Takeda
Project: 
Job: 938342E

Received by: gr Via: Hand Delivered

Sample Container Type: 479ml pl btl
Sample Type: Water
Preservative: None
Additional Lab Preparation: None

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method</th>
<th>LLD</th>
<th>Preservative Analyst</th>
<th>Date(s) of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb</td>
<td>239.2</td>
<td>0.005 mg/l</td>
<td>none</td>
<td>Woo</td>
</tr>
<tr>
<td>Cu</td>
<td>200.7</td>
<td>0.01 mg/l</td>
<td>none</td>
<td>Hand</td>
</tr>
</tbody>
</table>

Meeting The Analytical Challenges Of A Changing World
SCHEDULES
## SCHEDULE FOR IMPLEMENTATION

### PHASE II PROJECT FEATURES

Pinedale Water Supply Project

<table>
<thead>
<tr>
<th>TASK / ACTIVITY</th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCT</td>
<td>NOV</td>
</tr>
<tr>
<td>PHASE II REVIEW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Town of Pinedale and WWDC</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>EPA</td>
<td>☐</td>
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<tr>
<td>PROJECT AUTHORIZATION</td>
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<tr>
<td>WWDC</td>
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<tr>
<td>WWDC FUNDING</td>
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<tr>
<td>Wyoming State Legislature</td>
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<tr>
<td>APPLICATION TO WFLB</td>
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<tr>
<td>FUNDING AUTHORIZATION - WFLB</td>
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<tr>
<td>FINAL DESIGN, PLANS AND SPECIFICATIONS</td>
<td></td>
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</tr>
<tr>
<td>PERMITTING, RIGHT-OF-WAY ACQUISITION</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>ADVERTISING AND BIDDING</td>
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</tr>
<tr>
<td>AWARD OF CONTRACT</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Bonds, Insurance, Etc.)</td>
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<tr>
<td>CONSTRUCTION</td>
<td>☐</td>
<td>☐</td>
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</table>
# SCHEDULE FOR IMPLEMENTATION

## WATERSHED MANAGEMENT CONTROL PLAN

Fremont Lake, Wyoming

<table>
<thead>
<tr>
<th>TASK / ACTIVITY</th>
<th>1993</th>
<th>1994</th>
<th>1995</th>
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</thead>
<tbody>
<tr>
<td>REVIEW - WATERSHED MANAGEMENT CONTROL PLAN</td>
<td></td>
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<tr>
<td>1. Town of Pinedale and WWDC</td>
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<tr>
<td>2. EPA</td>
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<tr>
<td>PLAN AUTHORIZATION BY TOWN ADMINISTRATION</td>
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<tr>
<td>IMPLEMENTATION OF PHYSICAL FEATURES</td>
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</tr>
<tr>
<td>1. Monitoring Points</td>
<td></td>
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</tr>
<tr>
<td>2. Signage</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. Intake Control Zone</td>
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<tr>
<td>MONITORING PROGRAM</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>LANDOWNERS AGREEMENTS</td>
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</tr>
<tr>
<td>1. U.S. Forest Service</td>
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<tr>
<td>2. BLM</td>
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<tr>
<td>3. Private Owners / Lessees</td>
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<tr>
<td>COMMITMENTS FROM SUBLEETTE COUNTY</td>
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<tr>
<td>CLOSURE OF SOUTH FREMONT BOAT RAMP</td>
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<tr>
<td>1. Wyoming Game and Fish Department</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. U.S. Forest Service</td>
<td></td>
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<tr>
<td>ANNUAL REPORT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SQUARE FOOTING

FOOTING DETAIL

SCALE 1"=16'

Top of Roof
Elev. 7419

HWL
Elev. 7417

Top of Slab
Elev. 7397

SECTION A-A

Exhibit B
RESERVOIR

Town of Pinedale, Wy.

SEPTEMBER 1993
JOHNSON-FERMELIA/TST INC.
CHEMICAL STORAGE

VOLUMETRIC FEEDER WITH HOPPER AND 50 GALLON DISSOLVER

MECHANICAL VARIABLE SPEED DRIVER

50 GALLON DISSOLVING TANK

CHEMICAL FEEDERS-DETAIL

SECTION A-A

10'-4"

4'-0"

22'-0"

17'-0"

12'-0"

30'-4"

12'-0"

13'-4"

16'-0"

6" SUPPORT BASE